

# Patterns of Cardiovascular Diseases in Covid-19 Patients Admitted to Tertiary Cardiac Care Centre

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## ABSTRACT

**Background and Aim:** Globally public health has been drastically affected by the Coronavirus disease (COVID-19) pandemic. There is a scarcity of data regarding risk factors, cardiac injury, and the treatment of cardiovascular disease associated with coronavirus disease. The present study aimed to assess the pattern of cardiovascular disease in COVID-19 patients referred to Tertiary Care Hospital.

**Methodology:** This retrospective study was conducted on 446 adult patients with new-onset or existing cardiovascular disease patients at the department of Cardiology, PNS Shifa hospital Karachi during the period from February 2021 to July 2021. Demographic details, physical examination, comorbid conditions, and laboratory findings were used for data collection from the patient's admission file. All the patients above 18 years and positively diagnosed with COVID-19 infections through rapid antigen test were enrolled and admitted with cardiovascular disease. The clinical features, chest X-ray, echocardiography, biochemical parameters, and electrocardiogram (ECG) were analyzed for each individual. Congenital heart disease, coronary artery disease, cardiomyopathy, heart failure, arrhythmias, peripheral arterial disease, and myocarditis were different cardiovascular diseases. Statistical analysis was carried out in SPSS version 23.

**Results:** Of the total 446 cardiovascular disease patients, about 334 (74.9%) were male and 112 (25.1%) were females. The overall mean age was 52.82±10.62 years. Out of 446 CVDs patients, the incidence of preexisting and new cardiovascular disease was 225 (50.4%) and 221 (49.5%) respectively. Acute coronary syndrome was the prevalent (50.7%) cardiovascular manifestation followed by elevation myocardial infarction. The incidence of myocarditis, Rhythm and conduction abnormalities was 45 (10.1%) and 126 (28.3%) respectively. QT prolongation and hospital mortality was seen in 45 (10.1%) and 85 (19.1%) respectively. The prevalence of pre-existing cardiovascular disease, atrial fibrillation, cardiogenic shock, and renal failure were predominantly higher in mortality group compared to survival group.

**Conclusion:** Our study found acute coronary syndrome was the prevalent cardiovascular disease. Elevated serum ferritin, lymphopenia, advanced age, cardiogenic shock, lower haemoglobin, renal failure, pre-existing heart failure, and leukocytosis were significantly related to cardiovascular disease increased mortality.

## INTRODUCTION

The pandemic of Coronavirus disease 2019 (COVID-19) had a significant impact on global health, with 4,248,389 million confirmed cases and a death toll of 294,046 as of May 2020 [1]. The diverse clinical course of the disease might vary from multi-organ failure like the lethal outcome to the asymptomatic carrier. The coronavirus fatality cases vary from 0.7 to 67% [2-4]. During this disease, the respiratory tract is mostly affected organ system whereas the heart like other organs might be affected leading to poor outcomes [5]. Additionally, these patients' severity and mortality can be influenced by pre-existing cardiovascular disease (CVD). Despite numerous research on CVDs patients in the COVID-19 pandemic, the identification of appropriate risk levels and high-risk patients based on the triage risk stratification tool (TRST) lacks addressable unanswered questions [6].

The infection caused by symptomatic coronavirus disease (COVID-19) varies from mild disease to critical pneumonia, in turn, might lead to multi-organ failure and mortality [7]. The incidence of cardiac complications varies from 20% to 25% significantly contributing to increased mortality among COVID-19 infected patients [8, 9]. The mortality rate of coronavirus infectious disease is approximately 3.4%. However, the mortality rate rises to 10.5% due to the cardiovascular disease present in the patients [10, 11]. The current study is an attempt to assess the cardiovascular disease pattern among coronavirus disease patients. The cardiovascular disease might be a new-onset or pre-existing disease. Diabetes, acute hepatic, hypertension, renal injuries and failure, and cardiac symptoms are the coronavirus's first manifestation along with inflammatory biomarkers, cardiac elevation, and newly developed cardiovascular disease.

## METHODOLOGY

This retrospective study was conducted on 446 adult patients with new-onset or existing cardiovascular disease patients at the

department of Cardiology, PNS Shifa hospital Karachi during the period from February 2021 to July 2021. Demographic details, physical examination, comorbid conditions, and laboratory findings were used for data collection from the patient's admission file. All the patients above 18 years and positively diagnosed with COVID-19 infections through rapid antigen test were enrolled and admitted with cardiovascular disease. The clinical features, chest X-ray, echocardiography, biochemical parameters, and electrocardiogram (ECG) were analyzed for each individual. Congenital heart disease, coronary artery disease, cardiomyopathy, heart failure, arrhythmias, peripheral arterial disease, and myocarditis were different cardiovascular diseases. Cardiac troponin T-serum increases above 99<sup>th</sup> percent of the upper limit might be referred to as myocardial injury. It could be either ischemic or non-ischemic myocarditis. Echocardiography, clinical history, elevated troponin T, and electrocardiography was used for possible diagnosis of myocarditis. Others were arrhythmias, global ST-T changes, and sinus tachycardia as possible diagnostic features of myocarditis on ECG. On echocardiography, left ventricular reduced ejection and global hypokinesia were observed on echocardiography.

SPSS version 23 was used for data analysis. Quantitative variables such as age and laboratory findings were described as mean and standard deviation whereas qualitative variables were articulated in percentages and frequencies utilizing the Chi-square test for comparison. All the calculation was done based on a 0.05 value as a level of significance.

## RESULTS

Of the total 446 cardiovascular disease patients, about 334 (74.9%) were male and 112 (25.1%) were females. The overall mean age was 52.82±10.62 years. Out of 446 CVDs patients, the incidence of preexisting and new cardiovascular disease was 225 (50.4%) and 221 (49.5%) respectively. Acute coronary syndrome was the prevalent (50.7%) cardiovascular manifestation followed

by elevation myocardial infarction followed by elevation myocardial infarction. The incidence of myocarditis and Rhythm and conduction abnormalities was 45 (10.1%) and 126 (28.3%) respectively. QT prolongation and hospital mortality was seen in 45 (10.1%) and 85 (19.1%) respectively. The prevalence of pre-existing cardiovascular disease, atrial fibrillation, renal failure, and cardiogenic shock were predominantly higher in mortality group compared to survival group. Figure-1 illustrate gender distribution. Table-I shows the baseline characteristics of patients. The prevalence of presented complaints are shown in Figure-2. Cardiovascular manifestation of COVID -19 infected patients are shown in Table-II.

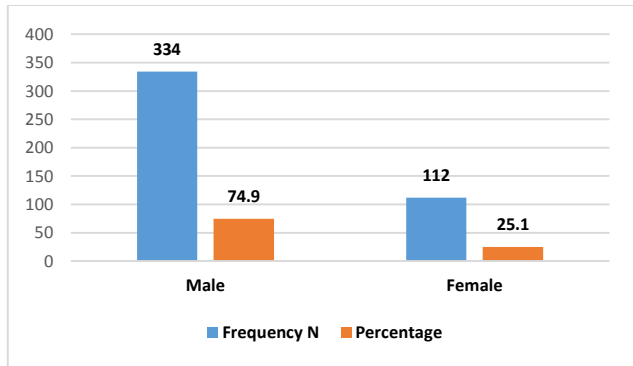


Figure 1: Gender distribution (n=446)

Table 1: Baseline Characteristics

Parameters	Frequency N	Percentage %
Age ( years)	52.82±10.62	
Gender (M/F)	334 (74.9%)/112 (25.1%)	
Comorbidities	314	70.5
Hypertension	161	36.1
Diabetes	181	40.6
Renal Failure	73	16.4
Chronic obstructive pulmonary disease	18	40.4
Dyslipidemia	55	12.3
Pre-existing Cardiovascular disease	225	50.4
Ischemic heart disease	131	29.4
Valvular heart disease	35	7.8
Dilated cardiomyopathy	26	5.8
Congenital heart disease	2	0.44
Heart failure others	127	28.5
Heart failure	38	8.5

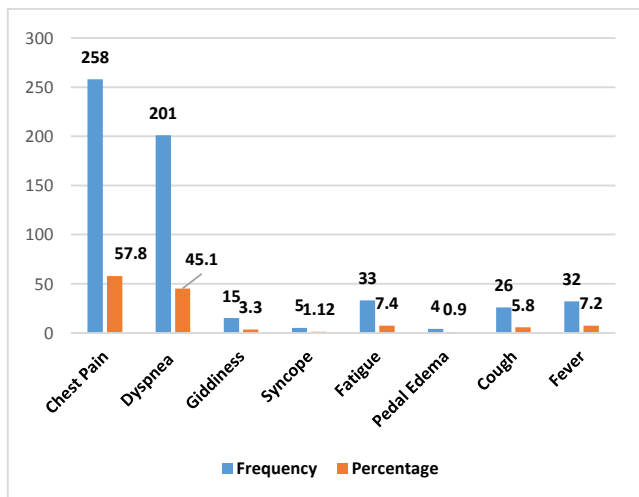


Figure 2: Presented Complaints

Table 2: Manifestation of cardiovascular diseases

CVDs	Frequency N	Percentage %
Acute coronary syndrome	226	50.7
Myocarditis	45	10.1
Heart failure	198	44.4
Cardiogenic shock	48	10.8
Pulmonary hypertension	135	30.3
Rhythm and conduction disturbance	126	28.2
Venous thromboembolism	10	2.2
Cerebrovascular events	2	0.44

**DISCUSSION**

The present study investigated the involvement of cardiac symptoms in coronavirus disease (COVID-19) patients referred to Tertiary Care Hospital. Pre-existing cardiovascular disease and associated risk factors had adverse effects which leads to poor clinical outcomes. About 50.5% patients had pre-existing cardiovascular disease in the present study which was higher than reported in previous studies [12, 13]. Patients with advanced age especially older are more susceptible to cardiovascular disease and impaired immune system. Also, Angiotensin elevated level conversion to enzyme make it more susceptible to coronavirus disease [14].

Our study found the incidence of acute myocardial injury in 60.8% of the total patients which is substantially higher than previous studies [15, 16]. The severity of inflammation correlates with myocardial injury could be directed by higher leukocyte counts, C-reactive protein (CRP), and procalcitonin related to elevated T-levels of troponin reported by Montazmanesh et al [17]. Similarly, troponin T elevation and leukocyte count are significantly associated to each other. Several COVID-19 mechanism involved in cardiac symptoms has been reported. In the present study, possible myocarditis was reported in 10.1% patients based on ECG, troponin, and echocardiographic findings. Bemtgen et al reported 12.5% incidence of myocarditis using similar criteria, which is higher than our results [18]. A cardiac MRI-based study, on the other hand, revealed a higher incidence (78 percent) of myocarditis [19].

In COVID-19 patients, both heart failure with new-onset and acute decompensation of chronic heart failure (ADHF) have been reported. Heart failure is caused by immune system over-activation and down regulation of ACE2 among COVID-19 patients, resulting in increased levels of Angiotensin II [20]. Heart failure affected 44.4% in our study. The majority of them had ADHF (145 patients, 63.9 percent). The prevalence of heart failure was 23 to 33% among coronavirus disease patients [21]. A higher mortality was observed in patients with pre-existing heart failure as reported in previous studies [22]. However, about 24.2% mortality rate was reported which is almost double than the previously reported mortality rate [23].

As per previous study, about 8% patients suffered from cardiogenic shock or heart failure among COVID-19 disease patients [24]. The prevalence of cardiogenic shock was 10.8% in the current study. Another study reported 75% mortality rate caused by cardiogenic shock in coronavirus disease patients [25].

Acute cardiac injury might cause arrhythmia with various etiologies such as systemic inflammatory response syndrome, ischemia, and direct myocardial damage among coronavirus disease patients. Chen et al reported that incidence of arrhythmia was 16.7% [26]. Rhythm and conduction disturbance was observed in 28.2 percent of the participants in our study. Hypokalemia increases the risk of various arrhythmias, and it was observed in 2.5 percent of patients in our study.

**CONCLUSION**

Our study found acute coronary syndrome was the prevalent cardiovascular disease. Elevated serum ferritin, lymphopenia, advanced age, cardiogenic shock, lower haemoglobin, renal

failure, pre-existing heart failure, and leukocytosis were significantly related to cardiovascular disease increased mortality.

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