

Incidence of Cardiac Complications of Covid-19: A Retrospective Study from a Tertiary Care Center

Received: 24 October 2022, **Revised:** 26 November 2022, **Accepted:** 22 December 2022

Dr Achyut Kannawar

Resident, Dept of Cardiology, Krishna Institute of Medical Sciences, Karad, Maharashtra, India

Keywords:

myocarditis, COVID-19, heart failure, cardiac complications, acute coronary syndrome, mortality.

Abstract

Introduction: COVID-19 has been linked to a variety of cardiac conditions, including myocarditis, acute coronary syndrome, and heart failure. On the other hand, neither the prevalence nor the clinical characteristics of COVID-19 patients' cardiac problems are known. The purpose of this research was to investigate the frequency of COVID-19 cardiac issues among patients who were admitted to tertiary care centres for medical treatment.

Methods: A retrospective study was conducted on a group of 500 patients who were diagnosed with COVID-19 and admitted to a tertiary care facility between January 2021 and June 2022. After analysing the patients' medical records, data was collected on the patients' demographics, comorbidities, laboratory results, electrocardiograms (ECG), echocardiograms, and cardiac biomarkers. An examination of the frequency of cardiac issues and a determination of the nature of the connection between cardiac complications and death rates are both included.

Results: The findings showed that out of a total of 500 patients, 75 (15%) had heart problems. Myocarditis, acute coronary syndrome, and heart failure were the most common cardiac complications. The percentage of patients who passed away due to cardiac difficulties was three times higher (35%) than the percentage of patients who did not have cardiac complications (10%). Patients who had cardiac issues, on average, were older (65.2 ± 8.7) than patients who did not have cardiac complications, who were 54.6 ± 10.4 years old. According to a multivariate study, factors such as an individual's age, being male, having hypertension or diabetes, and having elevated cardiac biomarkers were all independent predictors of cardiac issues in COVID-19 individuals.

Conclusion: In conclusion, cardiac issues are associated with a greater mortality rate, and they are rather common among COVID-19 patients who are admitted to tertiary care centres. Early diagnosis and treatment of heart conditions may be beneficial. Patients diagnosed with COVID-19 have a more favourable prognosis.

1. Introduction

Since the first case of COVID-19 was identified in December 2019, the illness has rapidly disseminated across the world and developed into a significant threat to public health. COVID-19 is caused by the coronavirus known as SARS-CoV-2, which primarily manifests its symptoms in the respiratory system [1]. New information, on the other hand, suggests that COVID-19 may have the potential to cause a variety of extrapulmonary symptoms, including problems with the cardiovascular system [2].

Complications of COVID-19 that affect the cardiovascular system pose a particularly grave threat [3], as they have a greater death rate. In the past, COVID-19 has been connected to a variety of cardiac issues, such as myocarditis, acute coronary syndrome, and heart failure [4, 5]. On the other hand, there is a paucity of information

regarding the frequency and clinical manifestations of these cardiac problems in COVID-19 patients.

The current study aimed to determine how frequently COVID-19 cardiac issues occurred in patients who were being treated at tertiary care centres so as to better understand the prevalence of these issues. This study also tried to determine whether or not there was a correlation between cardiac problems and mortality among the COVID-19 participants.

2. Material and Methods

Population and study design

Retrospective research was done in a tertiary care facility. All COVID-19 patients with hospital admissions between January 2021 and June 2022 had their medical data examined. The ethical clearance was obtained for this study. Since the research was retrospective in nature the consent from the subjects was pardoned. All the patients who have attended the center were considered for the study. However the study eliminated patients who were under the age of 18, were pregnant, or had insufficient medical information.

Data gathering

From the patients' medical records, information was gathered on their demographic traits, comorbidities, laboratory data, "electrocardiogram (ECG)", echocardiography, and cardiac biomarkers. Comorbidities included cancer, hypertension, diabetes, "chronic kidney disease (CKD)", and "chronic obstructive pulmonary disease (COPD)".

The occurrence of any of the following conditions was considered to be a cardiac complication: myocarditis, acute coronary syndrome, heart failure, arrhythmias, or cardiac arrest. Clinical symptoms, ECG abnormalities, increased cardiac biomarkers, and aberrant results on cardiac imaging, such as echocardiography or "magnetic resonance imaging (MRI)", were used to identify myocarditis.

Chest pain or discomfort, ischemia-related ECG abnormalities, and increased cardiac biomarkers were all considered to be symptoms of acute coronary syndrome. Clinical symptoms such as dyspnea, tiredness, or peripheral edema as well as objective evidence of cardiac dysfunction on echocardiography or other imaging modalities were used to identify heart failure.

Statistic evaluation

The IBM Corp., Armonk, NY, USA, company's SPSS version 25 was used for the statistical study. Comparing categorical and continuous variables was done using the chi-squared test for category variables and the t-test for continuous variables. It was possible to find independent predictors of cardiac problems using logistic regression analysis. A <0.05 p-value was regarded as statistically significant.

3. Results

Clinical and demographic characteristics

The study comprised 500 patients with COVID-19 diagnoses in total. 275 (55%) of the patients were male, with a mean age of 57.5 ± 10.9 years. The most prevalent comorbidities were COPD (n=50, 10%), hypertension (n=180, 36%), and diabetes (n=120, 24%). **Table 1**

Cardiovascular issues

75 (about 15%) of the 500 patients experienced cardiac issues. Myocarditis (n=25), acute coronary syndrome (n=20), and heart failure (n=15) were the most prevalent cardiac consequences. Arrhythmias (n=10) and cardiac arrests (n=5) were other cardiac problems. Patients with cardiac difficulties on average were older on average (65.2 ± 8.7 years) than patients without cardiac complications (54.6 ± 10.4 years) ($p < 0.001$). **Table 2**

Cardiac problems and mortality

When compared to patients without cardiac complications, patients with cardiac complications had a higher mortality rate (35%) ($p < 0.001$). Age, male gender, hypertension, diabetes, and increased cardiac biomarkers were all independent predictors of cardiac problems in COVID-19 patients, according to multivariate analysis. **Table 3**

Table 1: Demographic and Clinical Characteristics

Characteristic	Total (n=500)
Age (years), mean \pm SD	57.5 \pm 10.9
Male, n (%)	275 (55%)

Comorbidities, n (%)	
Hypertension	180 (36%)
Diabetes	120 (24%)
COPD	50 (10%)

Table 2: Cardiac Complications

Cardiac Complication	Number of Cases (n=75)
Acute coronary syndrome	20
Arrhythmias	10
Cardiac arrest	5
Heart failure	15
Myocarditis	25

Table 3: Association between Cardiac Complications and Mortality

Variable	Cardiac Complications (n=75)	No Cardiac Complications (n=425)	p-value
Mortality rate, n (%)	26 (35%)	43 (10%)	<0.001
Age (years), mean ± SD	65.2±8.7	54.6±10.4	<0.001
Male gender, n (%)	47 (63%)	228 (54%)	0.22
Hypertension, n (%)	42 (56%)	138 (32%)	<0.001
Diabetes, n (%)	32 (43%)	88 (21%)	<0.001
Elevated cardiac biomarkers, n (%)	52 (69%)	65 (15%)	<0.001

4. Discussion

In the current investigation, patients admitted to a tertiary care facility were examined for the prevalence of COVID-19 cardiac problems. Current findings indicated that 15% of COVID-19 patients had cardiac problems, with myocarditis, acute coronary syndrome, and heart failure

being the most prevalent. Patients with cardiac complications had a greater death rate than patients without and with cardiac complications were independently predicted by age, male gender, hypertension, diabetes, and increased cardiac biomarkers.

Journal of Coastal Life Medicine

Several studies have reported the frequency of cardiac complications in COVID-19 patients. According to a Chinese study, 7.2% of COVID-19 patients exhibited myocardial damage, which is indicated by higher cardiac biomarker levels [6]. Another American study found that 19.7% of COVID-19 hospital patients experienced myocardial damage, which is indicated by an increase in cardiac troponin levels [7]. Compared to earlier investigations, current study revealed a greater prevalence of cardiac problems, which could be explained by the fact that it was carried out in a tertiary care facility where patients with more serious illnesses are admitted.

According to other research [8, 9], myocarditis was the most typical cardiac consequence in current study. Viral infection can directly infect and harm cardiomyocytes, which can lead to myocarditis [10]. Heart failure and acute coronary syndrome were very frequent side effects in current study. A prothrombotic state brought on by the virus, which can result in coronary thrombosis, can cause acute coronary syndrome in COVID-19 individuals [11]. Myocardial damage, myocarditis, and pulmonary embolism are among recognized COVID-19 side effects that might result in heart failure [12].

In line with prior research [13, 14], current analysis found that patients with cardiac problems died at a higher rate than individuals without such difficulties. Cardiovascular problems in COVID-19 individuals are a sign of a more serious illness and a worse prognosis.

Current study also found that age, male gender, hypertension, diabetes, and increased cardiac biomarkers are all independent predictors of cardiac problems. These indicators support findings from earlier research [15, 16] that found comparable risk factors for cardiac problems in COVID-19 patients.

The current study contains a number of drawbacks. First of all, because it was a retrospective study and the data were taken from medical records, it's possible that they're erroneous or incomplete. Second, because just one centre was used for the study, the results might not be applicable to other populations. Last but not least, the study did not look into the causes of the cardiac problems seen in COVID-19 individuals.

5. Conclusion

Current study concluded that cardiac problems occurred in 15% of COVID-19 patients admitted to tertiary care facilities, with myocarditis, acute coronary syndrome, and heart failure being the most prevalent types. People with cardiac complications had a greater death rate than those without cardiac complications, and cardiac complications were independently predicted by age, male gender, hypertension, diabetes, and increased cardiac biomarkers. Current research emphasizes the significance of keeping an eye out for cardiac problems in COVID-19 patients, especially those with risk factors such age, male gender, male genitalia, hypertension, and diabetes. Additional research is required to determine efficient preventive and therapeutic approaches as well as to better understand the mechanisms underlying the development of cardiac complications in COVID-19 patients.

References

- [1] Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet*. 2020 Feb 15;395(10223):497-506. doi: 10.1016/S0140-6736(20)30183-5. Epub 2020 Jan 24. Erratum in: *Lancet*. 2020 Jan 30;: PMID: 31986264; PMCID: PMC7159299.
- [2] World Health Organization. Coronavirus disease (COVID-19) weekly epidemiological update and weekly operational update. Accessed March 20, 2021. <https://www.who.int/emergencies/disease/novel-coronavirus-2019/situation-reports/>
- [3] Shi S, Qin M, Shen B, Cai Y, Liu T, Yang F, Gong W, Liu X, Liang J, Zhao Q, Huang H, Yang B, Huang C. Association of Cardiac Injury With Mortality in Hospitalized Patients With COVID-19 in Wuhan, China. *JAMA Cardiol*. 2020 Jul 1;5(7):802-810. doi:

Journal of Coastal Life Medicine

- 10.1001/jamacardio.2020.0950. PMID: 32211816; PMCID: PMC7097841.
- [4] Guo T, Fan Y, Chen M, Wu X, Zhang L, He T, et al. Cardiovascular Implications of Fatal Outcomes of Patients With Coronavirus Disease 2019 (COVID-19). *JAMA Cardiol.* 2020 Jul 1;5(7):811-818. doi: 10.1001/jamacardio.2020.1017. Erratum in: *JAMA Cardiol.* 2020 Jul 1;5(7):848. PMID: 32219356; PMCID: PMC7101506..
- [5] Zheng Y, Ma Y, Zhang J, Xie X. COVID-19 and the cardiovascular system. *Nat Rev Cardiol.* 2020;17(5):259-260.
- [6] Lala A, Johnson KW, Januzzi JL, Russak AJ, Paranjpe I, Richter F, et al. Mount Sinai COVID Informatics Center. Prevalence and Impact of Myocardial Injury in Patients Hospitalized With COVID-19 Infection. *J Am Coll Cardiol.* 2020 Aug 4;76(5):533-546. doi: 10.1016/j.jacc.2020.06.007. Epub 2020 Jun 8. PMID: 32517963; PMCID: PMC7279721.
- [7] Inciardi RM, Adamo M, Lupi L, Cani DS, Di Pasquale M, Tomasoni D, et al. Characteristics and outcomes of patients hospitalized for COVID-19 and cardiac disease in Northern Italy. *Eur Heart J.* 2020 May 14;41(19):1821-1829. doi: 10.1093/eurheartj/ehaa388. Erratum in: *Eur Heart J.* 2020 Dec 21;41(48):4591. PMID: 32383763; PMCID: PMC7239204.
- [8] Basu-Ray I, Almaddah Nk, Adeboye A. Cardiac Manifestations Of Coronavirus (COVID-19) [Updated 2023 Jan 9]. In: *StatPearls* [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK556152/>
- [9] Sala S, Peretto G, Gramegna M, Palmisano A, Villatore A, Vignale D, De Cobelli F, Tresoldi M, Cappelletti AM, Basso C, Godino C, Esposito A. Acute myocarditis presenting as a reverse Tako-Tsubo syndrome in a patient with SARS-CoV-2 respiratory infection. *Eur Heart J.* 2020 May 14;41(19):1861-1862. doi: 10.1093/eurheartj/ehaa286. PMID: 32267502; PMCID: PMC7184339.
- [10] Tavazzi G, Pellegrini C, Maurelli M, Belliato M, Sciutti F, Bottazzi A, et al. Myocardial localization of coronavirus in COVID-19 cardiogenic shock. *Eur J Heart Fail.* 2020 May;22(5):911-915. doi: 10.1002/ejhf.1828. Epub 2020 Apr 11. PMID: 32275347; PMCID: PMC7262276.
- [11] Bikdeli B, Madhavan MV, Jimenez D, Chuich T, Dreyfus I, Driggin E, et al. Global COVID-19 Thrombosis Collaborative Group, Endorsed by the ISTH, NATF, ESVM, and the IUA, Supported by the ESC Working Group on Pulmonary Circulation and Right Ventricular Function. COVID-19 and Thrombotic or Thromboembolic Disease: Implications for Prevention, Antithrombotic Therapy, and Follow-Up: JACC State-of-the-Art Review. *J Am Coll Cardiol.* 2020 Jun 16;75(23):2950-2973. doi: 10.1016/j.jacc.2020.04.031.
- [12] Guan WJ, Ni ZY, Hu Y, et al. Clinical characteristics of coronavirus disease 2019 in China. *N Engl J Med.* 2020;382(18):1708-1720.
- [13] Liu PP, Blet A, Smyth D, Li H. The Science Underlying COVID-19: Implications for the Cardiovascular System. *Circulation.* 2020 Jul 7;142(1):68-78. doi: 10.1161/CIRCULATIONAHA.120.047549 . Epub 2020 Apr 15. PMID: 32293910.
- [14] Chen T, Wu D, Chen H, Yan W, Yang D, Chen G et al. Clinical characteristics of 113 deceased patients with coronavirus disease 2019: retrospective study. *BMJ.* 2020;368:m1091.
- [15] Lippi G, South AM, Henry BM. Electrolyte imbalances in patients with severe coronavirus disease 2019 (COVID-19). *Ann Clin Biochem.* 2020;57(3):262-265.
- [16] Clerkin KJ, Fried JA, Raikhelkar J, Sayer G, Griffin JM, Masoumi A, et al. COVID-19 and Cardiovascular Disease. *Circulation.* 2020 May 19;141(20):1648-1655. doi: 10.1161/CIRCULATIONAHA.120.046941 . Epub 2020 Mar 21. PMID: 32200663.