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Research Article

Clinical, Angiographic Profile and Immediate Outcome of COVID-19 Patients Presenting as Acute Coronary Syndrome: An Observational Study

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ABSTRACT

Background: COVID-19 pandemic has involved around 213 countries and affected around 33 million people worldwide and around 6.2 million in India with about 1 million deaths worldwide. Lockdown was enforced in India as in other parts of the world to contain the spread of COVID-19 pandemic. However, it resulted in decreased hospitalization for acute coronary syndrome, delayed presentation and change in decision making. The main aim of our study was to analyze the presenting pattern and outcome of COVID-19 patients.

Materials and Methods: In this study, done at tertiary care centre, patients of acute coronary syndrome over last 4 months underwent RT-PCR for SARS-CoV-2 and HRCT chest prior to admission. A total of 25 (5.8%) patients with acute coronary syndrome who had evidence of COVID-19 infection were enrolled in the study. This group was evaluated for the risk factors, presenting symptoms, killip class, type of acute coronary syndrome (STEMI vs NSTEMI), time to presentation to hospital, treatment received (medical management/thrombolysis/PCI/CABG), cardiac arrhythmias, mean ejection fraction, HRCT chest (CORADS grading), any complications and immediate outcome.

Results: In this study group, mean age of presentation was 50.9±12.8 years involving predominantly males (72%). Hypertension was present in 11(44%), diabetes in 7 (28%), smoking in 8 (32%) and obesity in 5 (20%) patients, respectively. The main presenting symptom was only chest pain in 20 (80%) patients followed by chest pain and dyspnea in 4 (16%) patients. Fever was present at the time of presentation in only 8 (32%) patients. Most common

presentation was STEMI (84%). Only 5 patients (23.8%) in the STEMI group presented to the hospital within the window period. Around 60% patients presented with killip class I, 4 patients had cardiac arrhythmias (first degree heart block, 2:1 AV block, atrial fibrillation and ventricular tachycardia). Mean ejection fraction of our study group was 40.6±8.9. Most common finding on HRCT chest was CORADS 5 (40%) followed by CORADS 4 (24%). Coronary angiogram was done in 4 (16%) patients who had persistent chest pain and intervention was attempted/done in 3 of these patients. Around 7 (28%) patients had complications which included acute kidney injury in 1 patient, multiorgan dysfunction (MODS) in 3 patients out of which 2 patients died, ischemic hepatitis in 1 patient, lower limb DVT in 1 patient and DVT with pulmonary thromboembolism in 1 patient. Both the expired patients belonged to the nonintervention arm.

Conclusion: In this study, 5.8% patients of acute coronary syndrome had evidence of COVID-19 infection. Most of these patients had delayed presentation to the hospital, a less of interventional strategy and more of conservative management was instituted. Intervention was done/attempted in 4 patients who had persistent chest pain. Complications developed in 24% of the patients with a mortality of 8%. The expired patients belonged to the nonintervention arm and had multiorgan dysfunction.

KEYWORDS

COVID-19, acute coronary syndrome, mortality, CORADS grading

INTRODUCTION

COVID-19 pandemic has involved around 219 countries and affected around 96 million people worldwide and around 11 million in India with about 2 million deaths worldwide¹⁻³. Patients infected with the virus SARS-CoV-2 and its clinical disease COVID-19 are often minimally symptomatic or asymptomatic. More severe presentations include pneumonia and acute respiratory distress syndrome. In some patients, the heart may be affected and this can occur in individuals with or without a prior cardiovascular diagnosis. Thus, among patients who are diagnosed with COVID-19, there is a broad range for prevalent CAD. Rates between 4.2 and 25% have been reported, with most series from China^{4,5}. Among patients admitted to intensive care units or those who died⁵, the percent is higher. Multiple studies have found that the incidence of hospitalization for acute Myocardial Infarction (MI) and admissions for most diagnoses have decreased by as much as 40-50% during the pandemic⁶⁻⁸. Possible explanations for the decreased hospitalization rate include patient fear of being infected if hospitalized (avoidance of medical care) and a redistribution of health care⁹⁻¹¹. Perhaps consequent to the decrease in hospitalization rates, at least three studies have documented a decline in the number of acute coronary syndrome patients referred for percutaneous coronary intervention¹²⁻¹⁴. It is likely that COVID-19 directly and indirectly affects the cardiovascular system and the heart in particular. Potential mechanisms of cardiovascular injury have been identified and include direct myocardial injury from hemodynamic derangement or hypoxemia, inflammatory myocarditis, stress cardiomyopathy, microvascular dysfunction or thrombosis due to hypercoagulability or systemic inflammation (cytokine storm), which may also destabilize coronary artery plaques¹⁵. Pneumonia and influenza infections have been associated with sixfold increased risk of acute MI¹⁶⁻¹⁸. Patients with severe COVID-19, such as those with high fever or hypoxia due to lung disease, may need a significant increase in cardiac output. Type II myocardial ischemia, therefore, may result in patients with obstructive CAD. There is some evidence that COVID-19 increases the risk of acute MI¹⁹⁻²¹. The clinical impact of SARS-CoV-2 infection will, across a population, be greater in those with prior disease and increasing age. In one study, patients with prior cardiovascular disease made up 22.7% of all fatal cases and the case fatality rate was 10.5%²². Patient and health care system factors have led to delays in the presentation of patients with STEMI. Later presentation has

likely led to worse outcomes²³. In addition, reperfusion delays by as much as 20 min have been reported¹². There have been reports of increased coronary artery thrombus burden in patients with STEMI²³. This is consistent with an increased frequency of thrombotic strokes, particularly in young people, during the pandemic. Alterations in the coagulation system, abnormal platelet function, or abnormal endothelial function have been postulated²⁴. To contain the spread the COVID-19 infection, lockdown was imposed in India as in other parts of the world leading to decreased hospitalization and delayed presentation of myocardial infarction. The aim of our study was to observe the incidence and impact of COVID-19 in myocardial infarction patients presenting to the hospital.

MATERIALS AND METHODS

The study was done at Nizam's Institute of Medical Sciences, Hyderabad over last 4 months. All patients who presented with myocardial infarction underwent RTPCR for SARS-CoV-2 and HRCT chest prior to admission. Patients who were confirmed RTPCR positive for SARS-CoV-2 were enrolled for the study and detailed history, examination, ECG, echocardiography, pattern of myocardial infarction, rate of angiography and intervention (conservative/thrombolysis/PCI/CABG), complications and in hospital mortality were evaluated. Lung involvement was evaluated with HRCT chest and CORADS grading was done.

RESULTS

In our study group, patients of myocardial infarction who had COVID 19 infection had mean age of 50.9+12.8 years. Among the total patients, 18 (72%) were males and 7 (28%) were females with history of hypertension present in 11 (44%), diabetes in 7 (28%), smoking in 8 (32%), alcoholism in 7 (28%) and obesity in 5 (20%) (Figure 1). The main presenting symptom was only chest pain in 20 (80%) patients, pain and dyspnea in 4 (16%) patients and 1 (4%) with only dyspnea and syncope respectively. Fever was present at the time of presentation in only 8 (32%) patients (Figure 2). Only 5 patients (23.8%) in the STEMI group presented to the hospital within the window period. The average time of presentation to hospital from onset of chest pain in STEMI group who were within the window period was around 7.4 hrs (Figure 3). Rest of the 16 patients in the STEMI group had average time of presentation to hospital of 6 days and those in NSTEMI group of 10 days, respectively.

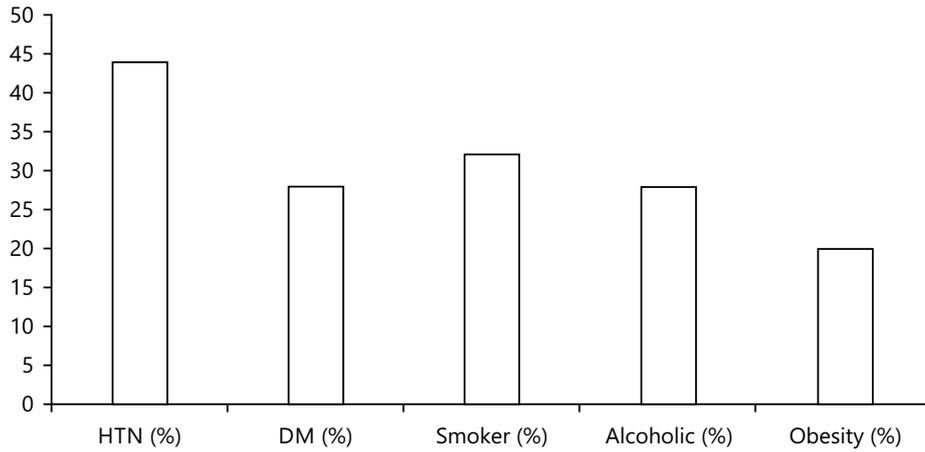


Figure 1: Risk factor profile of myocardial infarction patients with COVID-19

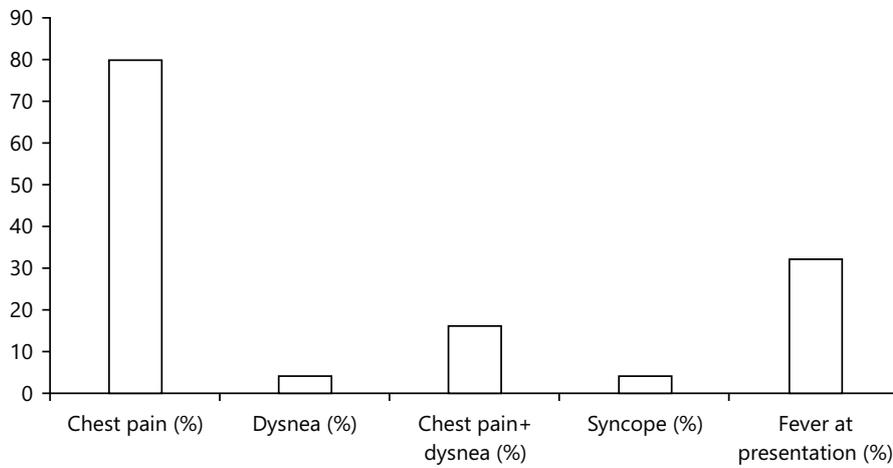


Figure 2: Clinical presentation in myocardial infarction with COVID-19

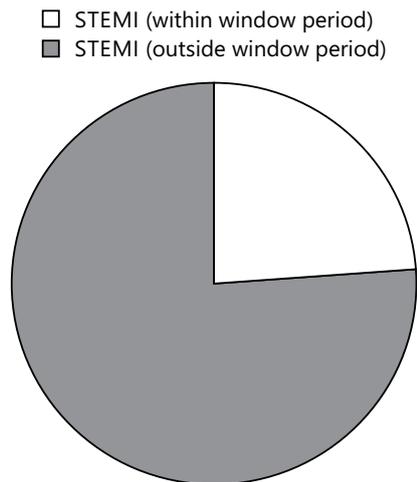


Figure 3: Pie chart depicting the time to presentation in STEMI group with COVID-19
Majority (76.2%) of this group presented outside the window period

Pattern of myocardial infarction

Myocardial infarction with COVID-19 infection had STEMI in 21 (84%) patients out of which 11 (52.3%) patients had

anterior wall MI and 9 (47.7%) patients presented with inferior wall MI whereas, 4 (16%) patients presented with NSTEMI (Figure 4).

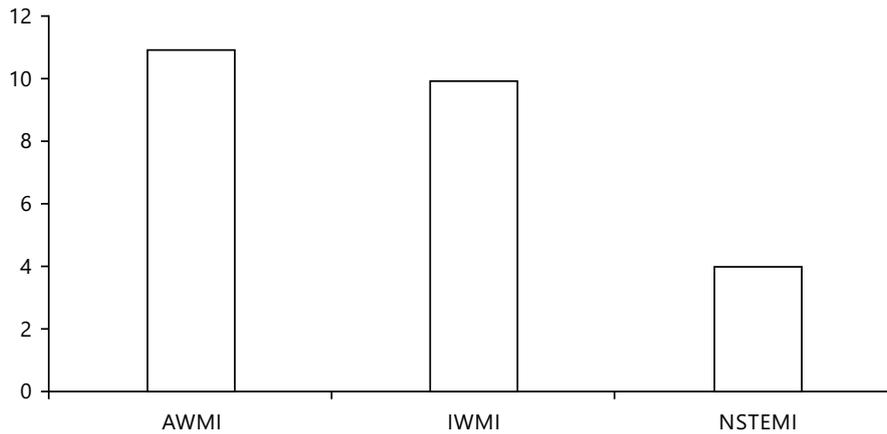


Figure 4: Pattern of myocardial infarction with COVID-19 infection

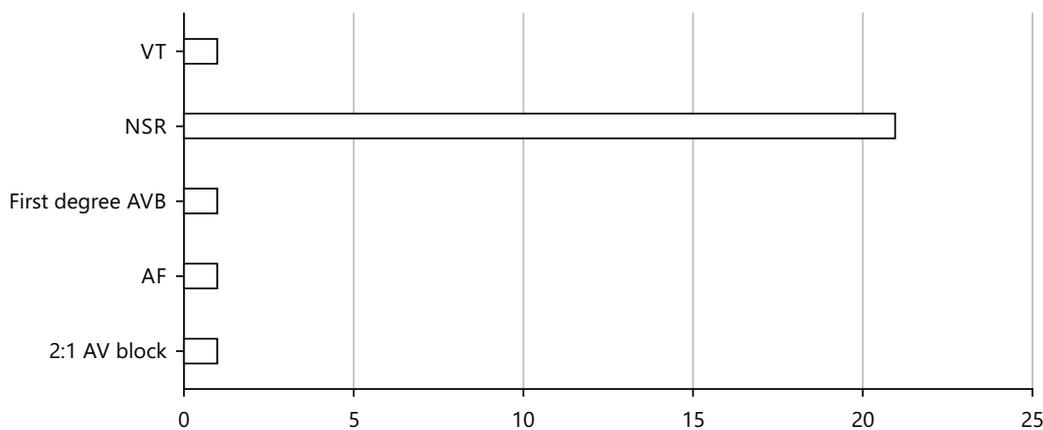


Figure 5: ECG presentation of myocardial infarction with COVID-19 patients

NSR: Normal sinus rhythm, VT: Ventricular tachycardia, AVB: Atrioventricular block and AF: Atrial fibrillation

Fifteen patients (60%) presented in Killip class I, 5 patients (20%) in Killip class II, 4 patients (16%) in Killip class III and 1 patient (4%) in Killip class IV, respectively. Only around 7 patients (28%) of the patients had fever at the time of presentation.

Electrocardiogram

Among the 25 patients, 20 patients presented with normal sinus rhythm, 1 patient presented with each 1st degree AV block, 2:1 AV block, Atrial fibrillation and ventricular tachycardia. First degree AV block and 2:1 block persisted during the hospital stay, atrial fibrillation reverted to NSR spontaneously and ventricular tachycardia was reverted to sinus rhythm with the help of DC (100J) cardioversion (Figure 5).

Echocardiogram

Mean ejection fraction of myocardial infarction with COVID-19 infection was around 40.6±8.9. Diastolic dysfunction of grade 1 (72%), grade 2 (20%) and grade 3 (8%) of the patients (Figure 6).

HRCT chest

CORADS grading was done for all patients. Among all patients CORADS 1 (16%), CORADS 2 (4%), CORADS 3 (8%), CORADS 4 (24%), CORADS 5 (40%) and CORADS 6 (8%) of the patients (Figure 7).

Coronary angiogram

Out of the 25 patients admitted, only 4 (16%) patients underwent coronary angiogram which revealed single vessel disease, double vessel disease, triple vessel disease and Spontaneous Coronary Artery Dissection (SCAD), respectively (Figure 8).

Treatment

Five patients of the STEMI group in the window period were thrombolysed, with none of them taken for primary PTCA. Three patients were thrombolysed with streptokinase, 1 patient with tenecteplase and 1 patient with reteplase. Rest of the 16 patients in the STEMI group who were outside the window period, 13 patients were

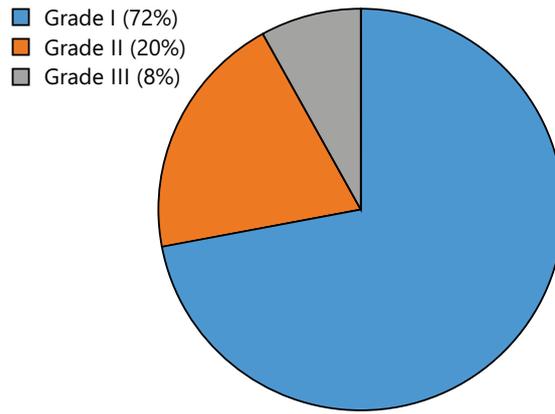


Figure 6: Diastolic dysfunction in myocardial infarction with COVID-19 patients

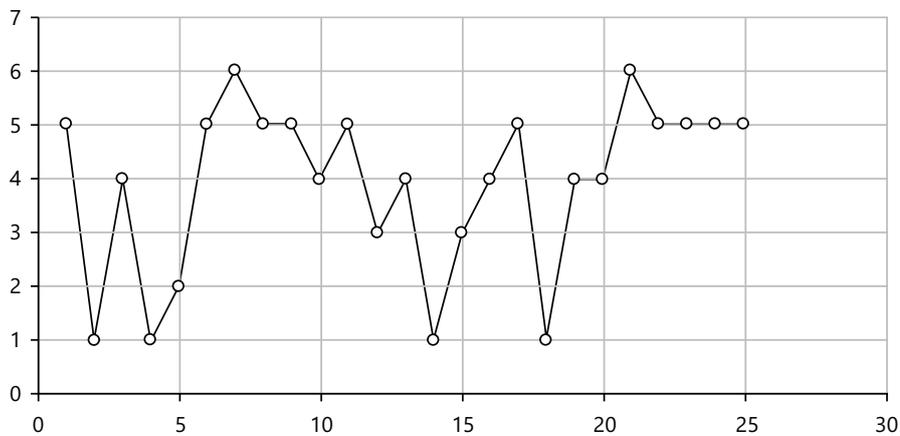


Figure 7: CORADS grading on HRCT chest in patients of myocardial infarction with COVID-19

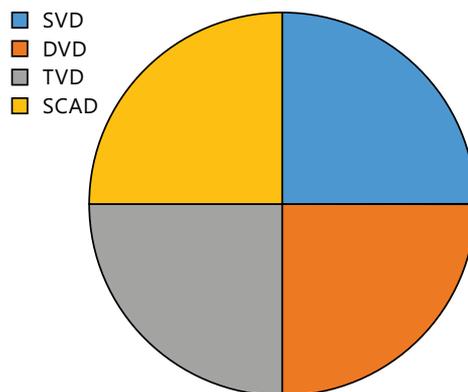


Figure 8: Coronary angiographic profile of 4 patients of myocardial infarction with COVID-19

managed conservatively, 1st patient who had TVD on coronary angiogram was sent for CABG, the 2nd patient who had SVD underwent PTCA+stenting to ostioproximal LAD artery and 3rd patient who had DVD, PTCA was attempted but it was not successful. Patient with SCAD was managed conservatively. However, all patients in the NSTEMI group were managed conservatively.

In STEMI group

Five patients were managed by Thrombolysis while 13 patients were prescribed for Medical Management.

In NSTEMI group

All patients were managed by Medical Management, while 4 patients who had persistent chest pain underwent

coronary angiogram which revealed Single Vessel Disease (SVD), Double Vessel Disease (DVD), Triple Vessel Disease (TVD) and Spontaneous Coronary Artery Dissection (SCAD), respectively. These patients were further managed as [SVD (PTCA+stenting to LAD), DVD (PTCA attempted (not successful) and TVD (CABG), SCAD (Medical Management).

Complications and mortality

In this study group, complication rate was around 24% and mortality of 8% during the hospital stay. One patient developed AKI which subsequently recovered, 3 patients developed MODS, out of which one recovered and the other two expired, one had ischemic hepatitis, 1 patient developed DVT and one patient developed DVT with pulmonary thromboembolism who recovered subsequently.

DISCUSSION

As there have been multiple reports from various countries about the decline in acute coronary syndrome admissions, delayed presentations and change in decision making during COVID-19 pandemic¹⁹⁻²¹. The main aim of this study was to observe the clinical profile, risk factors, angiographic profile and immediate outcome of COVID-19 patients presenting as acute coronary syndrome. In this study, it was found out that, only 5 patients (23.8%) presented within window period whereas, majority of the patients (76.2%) had delayed presentation to the hospital. The reason for delayed presentation may be due to fear of contracting infections during hospital visit from the COVID-19 patients. Also, because of the lockdown enforced, as majority of the people in India come to hospitals in public/private vehicles, the strict and frequent vehicle checkups by the authorities along with less number of ambulance services may have led to delayed presentation to the hospital. This delayed presentation may have led to increased ischemic damage to the myocardium, thus, resulting in increased number of heart failure patients and risk of sudden death due to ventricular tachycardia in coming years.

Another major impact of COVID-19 pandemic was that a less interventional strategy was adopted with only 4 patients who had persistent chest pain undergoing coronary artery intervention. This strategy was adopted may be because of the fear of the health care professionals for risk of contracting COVID-19 infection and subsequently be a source of infection to other patients, health care staff and their families.

During hospital stay, 24% patients of COVID-19 developed complications with a mortality of 8%. However, it is pertinent to mention that all these patients belonged to the nonintervention arm.

CONCLUSION

In this study, 5.8% patients of acute coronary syndrome had evidence of COVID 19 infection. Most of these patients had delayed presentation to the hospital, a less of interventional strategy and more of conservative management was instituted. Complications developed in 24% of the patients with a mortality of 8%. The expired patients belonged to the nonintervention arm and had multiorgan dysfunction. The delayed presentation which might have resulted in more ischemic damage may lead to the increase in the heart failure hospitalizations and risk of sudden death due to ventricular tachycardia in coming years. Based on this study, Government has to take steps to inform the general public for the importance of timely seeking medical advice in acute coronary syndrome patients.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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DISCLAIMERS

The opinions expressed in this article are the authors' personal views and do not represent that of their affiliated organizations, employers, or associations.

DATA AVAILABILITY STATEMENT

Not Applicable

HIGHLIGHTS OF THE STUDY

- In this study, 5.8% patients of acute coronary syndrome had evidence of COVID-19 infection
- Most of these patients had delayed presentation to the hospital, a less of interventional strategy and more of conservative management was instituted
- The delayed presentation which might have resulted in more ischemic damage may lead to the increase in the heart failure hospitalizations and risk of sudden death due to ventricular tachycardia in coming years
- Based on this study, Government has to take steps to inform the general public for the importance of timely seeking medical advice in acute coronary syndrome patients

AUTHOR CONTRIBUTIONS

SA conceived the review idea. OS conducted the literature search. AR prepared the first draft of the manuscript. SA reviewed, edited and revised the manuscript substantially on the key intellectual content. AR finalized and approved the current version agreed to be accountable for accuracy and integrity and decided to submit the manuscript to Trends in Medical Research.

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