In Hospital Outcome of COVID-19 Patients with Acute Myocardial Infarction

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ABSTRACT

Objective: To determine the hospital outcome of acute myocardial infarction patients with COVID-19 and compare it with patients without COVID-19.

Study Design: Comparative cross-sectional study.

Place and Duration of Study: Armed Forces Institute of Cardiology and National Institute of Heart Diseases, Rawalpindi Pakistan, from Mar to Oct 2021.

Methodology: The study included PCR-positive patients with COVID-19 infection who had acute myocardial infarction diagnosed by a consultant cardiologist. The hospital recorded clinical outcomes within two days of acute myocardial infarction. Data regarding outcome was compared with patients who had acute myocardial infarction but did not have COVID-19.

Results: Fifty cases of COVID-19 and myocardial infarction were included in the study. An equal number of patients with no evidence of COVID-19 but having myocardial infarction were also included. The mean age of the study participants was 49.96±897 years. Out of 100 patients, 79(79%) were male, while 21(21%) were female. Statistical analysis showed that all the outcome parameters studied had no significant difference in both the acute myocardial infarction patients with and without COVID-19 (*p*-value>0.05).

Conclusion: Our study results revealed no statistically significant difference in the hospital outcome of patients with acute myocardial infarction who were suffering from COVID-19 and those who were not.

Keywords: COVID-19, Co-morbid, Myocardial infarction; Mortality.

INTRODUCTION

Acute myocardial infarction is one of the common clinical emergencies encountered at emergency reception of cardiac and general hospitals.[1] Usually, these patients require hospital treatment for a couple of days if complications do not make the clinical picture worse.[2] Patients suffering from acute myocardial infarction can acquire COVID-19 prehospital or in hospital. Similarly, patients suffering from COVID-19 can have acute cardiac events during viral illness.[3,4]

Some work has been done to look for a clinical spectrum of patients of acute MI suffering from COVID-19 as well.[5,6] Guckman *et al*. published a report in 2020 and concluded that the risk-adjusted mortality rate among patients with ST-segment elevation myocardial infarction increased substantially.[7] Similar results were generated by Primessing *et al*. in 2021. They concluded that higher mortality, more complications, and a worse short-term outcome of patients with acute MI.[8] Tamimi *et al*. in 2021 specifically targeted patients of acute MI who suffered from COVID-19 as well and came up with the findings that in-hospital adverse events were low in this largest cohort of COVID-19 patients presenting with AMI. They hypothesized that the younger age of their study cohort may be responsible for these findings and that a large sample size involving patients of all age groups may change the results.[9]

Pakistan has been fighting COVID-19 effectively in all ways, primary, secondary or tertiary. Complicated cases, especially those with severe viral illness and cardiac events, require more attention from clinicians and teamwork. A recent study published in Pakistan, though, did not specifically target COVID-19 patients suffering from acute MI but still came up with the findings that mortality and morbidity of patients with acute MI had increased during this pandemic.[10] We planned this study to determine the in-hospital outcome of COVID-19 patients with acute myocardial infarction and factors related to poor outcomes.

METHODOLOGY

The comparative cross-sectional study was conducted at the Armed Forces Institute of Cardiology

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and National Institute of Heart Diseases, Rawalpindi Pakistan, from March to November 2021, after approval was taken from the Ethical Committee of the Hospital (letter no. 27/12/R&D/2021/131). The sample size was calculated using the WHO sample size calculation using the population proportion of COVID-19 in MI patients as 4%.[11] No probability of consecutive sampling was used to gather the cases.

Inclusion Criteria: All the COVID-19 PCR-positive patients, aged 18 to 65 years, admitted to the hospital with acute myocardial infarction within the study period were included. Controls were age and gender-matched patients of acute myocardial infarction who were PCR-negative for COVID-19.

Exclusion Criteria: Patients with solid or haematological neoplastic disease and fungal infections, pregnant females, patients with any comorbid immunological disorders or using any anti-inflammatory or cytotoxic medications, patients who had COVID-19 complications at the time of diagnosis of acute myocardial infarction or those who were discharged against medical advice during admission, patients with cardiac events other than acute MI were excluded.

Patients positive for COVID-19 on PCR test who were admitted to the hospital after myocardial infarction were included in the study. Consultant cardiologist diagnosed myocardial infarction based on WHO criteria incorporating clinical, laboratory and electrocardiogram findings.[12,13] In hospital outcome included complications of MI like stroke, arrhythmia, pericarditis or ventricular systolic dysfunction. These were diagnosed based on clinical, radiological and laboratory investigations by a consultant cardiologist within 48 hours of diagnosis of acute myocardial infarction.[14]

Statistical analysis was performed using the Statistical Package for Social Sciences (SPSS) 24.0. Frequency and percentage were calculated for the qualitative variables, whereas mean and standard deviation were calculated for the quantitative variables. Chi-square and Fischer exact tests were used to look for differences in outcome parameters among the cases and controls. The p-value less than or equal to 0.05 was considered significant.

RESULTS

A total of 50 cases of COVID-19 and myocardial infarction were included in the study. An equal number of patients with no evidence of COVID-19 having myocardial infarction were also included. Table-I summarises the general characteristics of the study participants. The mean age of the study participants was 49.96±897 years. The mean duration of COVID-19 symptoms in cases was 4.23±5.553 days. Out of 100 patients, 79(79%) were male, while 21(21%) were female. Arrhythmias and ventricular systolic dysfunction were the most common complications faced by patients with myocardial infarction in our study. Table-II summarises the results of the statistical analysis. It was revealed that all the outcome parameters {stroke [case-1(2%)vs. controls-4(8%)], arrhythmias [case-6(12%) vs controls-9(18%)], pericarditis [case-2(4%) vs controls-7(14%)] and ventricular systolic dysfunction [case-9(18%) vs controls-6(12%)]} did not have any significant difference in patients of myocardial infarction with and without MI (p-value>0.05).

Table-I: Characteristics of Study Participants (n=100)

Parameters	n(%)
Age (years)	
Mean±SD	49.96±8.97years
Range (min-max)	19 years-65 years
Gender	
Male	79
Female	21
Comorbidities	
No comorbidity	62
Diabetes Mellitus	23
Hypertension	19
Previously Ischemic heart disease	17
Dyslipidemias	15
Others	5
Mean Duration of COVID 19 Symptoms	4.23±5.553 days
Complications	
Stroke	05
Pericarditis	09
Arrhythmias	15
Ventricular systolic dysfunction	15

Table-II: Comparison of Outcome Variables Among Patients of Myocardial Infarction With and Without COVID-19 (n=100)

Outcome Parameters	Patients without COVID-19	Patients with COVID-19	p-value
Stroke			
No	49(98%)	46(92%)	0.155
Yes	01(02%)	04(08%)	
Pericarditis			
No	48(96%)	43(86%)	0.073
Yes	02(4%)	07(14%)	
Ventricular systolic dysfunction			
No	41(82%)	44(88%)	0.399
Yes	09(18%)	06(12 %)	
Arrhythmias			
No	44(88%)	41(82%)	0.399
Yes	06(12%)	09(18%)	

DISCUSSION

Cases of COVID-19 have been on the rise in the last year in almost all parts of the world, and Pakistan has been no exception.[10] Hospitals, ICUs, quarantine and isolation centres were occupied to their full capacity most of the time. The outcome of COVID-19 has been highly variable among patients and linked to several factors. Hospitals and healthcare facilities have created various barriers to COVID-19 screening, which may have impeded healthcare provision. Moreover, this is a relatively new viral illness related to the respiratory system, but its impact on other systems is crucial and under investigation across the globe. We planned this study to determine the in-hospital outcome of acute myocardial infarction in patients of COVID-19 with acute myocardial infarction and compare it to patients without COVID-19.

Kite *et al*. assessed the database of patients suffering from ACS and COVID-19. They came up with the findings that COVID-19-positive with acute coronary syndromes presented later than usual and had increased in-hospital mortality compared with the pre-COVID-19 era. Excessive rates of mortality from cardiogenic shock were major contributors to the worse outcomes in COVID-19-positive STEMI patients.[15] Our study design was different because of the difference in the comparison group. They compa-red current cases with pre-COVID-19 patients, where our control group was comprised of patients with MI without COVID-19 who presented in the hospital at the same time as COVID-19-positive patients. Esposito *et al.* concluded that in addition to endothelial dys-function, patients suffering from COVID-19 are at increased risk of a decrease in platelets count, higher levels of d-dimer, ultra-large von Willebrand factor multimers, tissue factor, and prolongation of proth-rombin time.[16] These factors may increase the chances of these patients having cardiac illness and may also affect the outcome. Our study results did not show any such association or increased risk, but this was a small study, and this aspect of COVID-19 needs further exploration.

Rashid *et al.* assessed multiple healthcare records in the UK during COVID-19 times regarding COVID-19 and patients suffering from coronary diseases.[11] They revealed that around 4% of patients admitted with acute coronary syndrome turned out to be PCR positive for COVID-19 infection, and these patients were at risk of not being treated according to guidelines. We did not study the epidemiological sta-tistics of the incidence or prevalence of COVID-19 in patients of ACS or vice versa and only compared out-comes in patients of MI with and without COVID-19. Our results showed no difference regarding the in-hospital outcome of both groups.

Rowlnad *et al.*[17] and Nijjer *et al*.[18] conducted studies in 2020 regarding management difficulties among patients of myocardial infarction who have also been diagnosed with deadly corona virus. They highlighted that no difference exists in the short-term management of patients of MI with COVID-19 compared to those without COVID-19. Our case-control study supported the findings generated by these authors and found that no statistically significant difference existed in

the in-hospital outcomes of patients of MI with and without COVID-19 in our study.

LIMITATION OF STUDY

The main limitation of was that patients who died or were discharged against medical advice or those shifted were not included in the study. The non-inclusion of these parameters makes our data less generalizable to the local population.

CONCLUSION

Our study results revealed that no statistically significant difference exists between hospital outcomes of patients with acute myocardial infarction suffering from CO-VID-19 and those who were not suffering from COVID-19.

Conflict of Interest: None.

Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

AR & AHS: Data acquisition, critical review, approval of the final version to be published.

AK & MR: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

SZ & KRB: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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