

Management of cardiovascular emergencies during the COVID-19 pandemic

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ABSTRACT

Background It has been reported that patients attending the emergency department with other pathologies may not have received optimal medical care due to the lockdown measures in the early phase of the COVID-19 pandemic.

Methods This was a retrospective study of patients presenting with cardiovascular emergencies to four tertiary regional emergency departments in western India during the government implementation of complete lockdown.

Results 25.0% of patients during the lockdown period and 17.4% of patients during the pre-lockdown period presented outside the window period (presentation after 12 hours of symptom onset) compared with only 6% during the pre-COVID period. In the pre-COVID period, 46.9% of patients with ST elevation myocardial infarction underwent emergent catheterisation, while in the pre-lockdown and lockdown periods, these values were 26.1% and 18.8%, respectively. The proportion of patients treated with intravenous thrombolytic therapy increased from 18.4% in the pre-COVID period to 32.3% in the post-lockdown period. In-hospital mortality for acute coronary syndrome (ACS) increased from 2.69% in the pre-COVID period to 7.27% in the post-lockdown period. There was also a significant decline in emergency admissions for non-ACS conditions, such as acute decompensated heart failure and high degree or complete atrioventricular block.

Conclusion The COVID-19 pandemic has led to delays in patients seeking care for cardiac problems and also affected the use of optimum therapy in our institutions.

INTRODUCTION

The strict and early government decision of a complete lockdown¹ initially slowed the spread of SARS-CoV-2 in India. It has been reported that patients attending the emergency department with other ailments may not have received optimal medical care.² Utilisation of the health-care infrastructure, human resources and accompanying apprehension during the initial phase of the COVID-19 pandemic resulted in an altered pattern of patient arrival and care for life threatening emergencies.³ We determined the impact of a strict lockdown in India on patient presentation and treatment for cardiovascular emergencies.

METHODS

Design and setting

We performed a retrospective descriptive analysis of consecutive patients who were admitted for cardiovascular emergencies to medical college hospitals

Key messages

What is already known on this subject

- ▶ Cardiovascular disease is the leading cause of mortality in the world, although it is highly preventable.
- ▶ Strained healthcare systems and widespread apprehension resulting from the COVID-19 pandemic may collaterally impact patients presenting with cardiovascular emergencies.
- ▶ Studies from several countries have shown reductions in admissions for acute coronary syndrome (ACS) and primary percutaneous coronary intervention procedures during the COVID-19 pandemic but there is limited information regarding timing of presentation, differences in risk factors for poor outcomes, ejection fraction, adopted treatment and mortality rates among patients admitted for cardiovascular emergencies during the pandemic.

What this study adds

- ▶ Our retrospective study from four emergency departments in India found that presentation with ACS and other serious cardiac diseases declined during the pre-lockdown and lockdown periods, and among those who did attend, delay in seeking care and risk factors for poor outcome on arrival were more common.
- ▶ For patients reaching the emergency department, treating physicians adopted a more conservative approach, using more thrombolysis and less primary angioplasty, contrary to guidelines.
- ▶ Approaches are needed to encourage patients with cardiovascular emergencies to attend emergency departments sooner and allow optimal management, even under pandemic conditions.

across western India (AIIMS-Jodhpur, Dr SN Medical College Jodhpur, SMS Medical College Jaipur and SP Medical College Bikaner). All hospitals were regional tertiary care centres of local hub and spoke networks for the management of various cardiovascular emergencies, such as acute coronary syndromes (ACS), acute decompensated heart failures (ADHF), and high degree or complete atrioventricular (AV) block.

Participants

Patients visiting the emergency department who were diagnosed by the attending physician as



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having ACS (ST elevation myocardial infarction (STEMI) and non-STEMI (NSTEMI)), ADHF and high degree AV block based on a clinical history and investigations such as ECG, echocardiography with Doppler and cardiac biomarkers were included. Patients diagnosed with SARS-CoV-2 were not included in the study.

Study period

The study period of 3 months was divided into three intervals: pre-COVID period when there were no COVID-19 cases (25 January to 24 February 2020); pre-lockdown period when there were COVID-19 cases but no lockdown was imposed (25 February to 24 March 2020); and lockdown period when near total lockdown was imposed by the government of India (25 March to 24 April 2020).

Outcomes of interest

The outcomes of interest were total number and proportion of patients presenting with cardiovascular illnesses, proportion of STEMI patients presenting outside the window period (presentation after 12 hours of symptom onset) and the management adopted for ACS patients.

Statistical analysis

The data were analysed using SPSS V.22 (SPSS, Chicago, Illinois, USA). Continuous variables are expressed as mean±SD. Differences between groups were analysed using the Student's *t* test. One way analysis of variance was used to compare descriptive parameters after confirming normal distribution. Categorical variables are expressed as number (percentage). Associations of presenting characteristics and treatment in the interval in which patients presented were analysed using the χ^2 test.

RESULTS

Of 289 emergency cardiovascular admissions during the lockdown period, 228 (78.89%) presented with ACS, 31 (10.73%) with ADHF and 30 (10.38%) with high degree or complete AV block. The numbers of patients were significantly lower than the pre-lockdown and pre-COVID periods for all diagnoses (table 1). The percentage of STEMI patients who presented outside the window period (presentation after 12 hours of symptom onset) was 6.1% in the pre-COVID period, 17.4% during the pre-lockdown period and 25.0% during the lockdown period. In the pre-COVID period, 46.9% of STEMI patients underwent emergent catheterisation, while in the pre-lockdown and lockdown periods, these values were 26.1% and 18.8%, respectively. Thrombolysis was performed in 30.8% and 32.3% of STEMI patients during the pre-lockdown and lockdown periods, respectively, compared with 18.4% in the pre-COVID period.

Among the 36 NSTEMI patients during the lockdown period, 80.56% were managed conservatively with medical therapy; this percentage was significantly higher than during the pre-lockdown period (total number of NSTEMI admissions 336, 20.54% managed medically) or during the pre-COVID period (total number of NSTEMI admissions 504, 6.34% managed medically).

Risk factors associated with a poor prognosis in ACS, such as cardiogenic shock, heart failure, ventricular arrhythmia, complete heart block and acute kidney injury, were present in 71 (31.14%) patients during the lockdown period, 108 (17.65%) patients in the pre-lockdown period whereas only 120 (10.99%) patients in the pre-COVID period had these risk factors. Mean (±SD) ejection fraction of patients hospitalised during the pre-COVID, pre-lockdown and lockdown periods was 47.5% (±10.0), 43.6% (±9.6) and 37.9% (±10.4), respectively. We

Table 1 Demographics, clinical characteristic, management strategy and outcome in patients with cardiovascular emergencies

	Pre-COVID period	Pre-lockdown period	Lockdown period	P value
No of emergency admissions	1488	830	289	
Age (years) (mean±SD)	61.1±11.9	58.1±11.2	61.7±12.4	<0.001
Men (n (%))	1057 (71.04)	597 (71.93)	257 (88.93)	<0.001
STEMI (n (%))	588 (39.52)	276 (33.25)	192 (66.44)	<0.001
NSTEMI (n (%))	504 (33.87)	336 (40.48)	36 (12.46)	<0.001
Acute decompensated heart failure (n (%))	240 (16.13)	112 (13.49)	31 (10.73)	0.030
Advanced* or third degree AV block† (n (%))	156 (10.48)	106 (12.77)	30 (10.38)	0.021
Management of STEMI (n (%))				
Outside window period	36 (6.12)	48 (17.39)	48 (25.00)	<0.001
Thrombolysis	108 (18.37)	85 (30.80)	62 (32.29)	<0.001
Pharmacoinvasive‡	168 (28.57)	71 (25.072)	46 (23.96)	0.002
Primary percutaneous coronary intervention	276 (46.94)	72 (26.09)	36 (18.75)	<0.001
NSTEMI patients managed conservatively (n (%))	32 (6.34)	69 (20.54)	29 (80.56)	<0.001
ACS patients associated with risk factors§ (n (%))	120 (10.99)	108 (17.65)	71 (31.14)	<0.001
Ejection fraction (%) (mean±SD)	47.52±10.0	43.63±9.6	37.85±10.4	<0.001
Inhospital mortality (n (%))	40 (2.69)	29 (3.49)	21 (7.27)	<0.001

The pre-COVID period was defined as the period when there were no COVID-19 cases (25 January to 24 February 2020), the pre-lockdown period was defined as the period when there were COVID-19 cases but no lockdown was imposed (25 February to 24 March 2020) and the lockdown period was defined as the period when total lockdown was imposed by the government of India (25 March to 24 April 2020).

*Advanced, high grade or high degree of AV block: ≥2 consecutive P waves at a constant physiological rate that did not conduct to the ventricles with evidence of some AV conduction.

†Third degree AV block (complete heart block): no evidence of AV conduction.

‡Pharmacoinvasive approach is defined as a strategy where fibrinolysis is followed by immediate transfer to a PCI capable hospital for either rescue PCI in the case of failed fibrinolysis or routine coronary angiography and PCI in the case of successful fibrinolysis.

§Risk factors associated with poor prognosis in ACS were cardiogenic shock, heart failure, ventricular arrhythmia, complete heart block and acute kidney injury.

ACS, acute coronary syndrome; AV, atrioventricular; NSTEMI, non-ST elevation myocardial infarction; PCI, percutaneous coronary intervention; STEMI, ST elevation myocardial infarction.

also observed increased in-hospital all cause mortality rates in ACS (2.7% vs 3.5% vs 7.3%) in the pre-COVID, pre-lockdown and post-lockdown periods, respectively.

DISCUSSION

Our study has shown how the COVID-19 pandemic can indirectly and adversely affect unrelated serious diseases. There was a 67% reduction in STEMI admissions in the lockdown period compared with the pre-COVID period; the reduction in NSTEMI was even greater (93%) during the same interval. There was an increase in the proportion of ACS patients with delayed presentations and mechanical complications (myocardial dysfunction, heart failure and cardiogenic shock). Even though primary percutaneous coronary intervention is recommended as the treatment of choice for patients with STEMI,⁴ we observed a large decline in catheterization laboratory activation during the pre-lockdown and lockdown periods as most of the patients either presented late or the treating physician opted for thrombolysis. A recently published analysis from the UK did not show an overall increase in in-hospital mortality,⁵ however in-hospital mortality rates in our study increased to 7.27% in the lockdown period compared with 2.79% in the pre-COVID period. An increase in ischaemic time due to a lack of or delayed reperfusion therapy and selective referral of patients with myocardial infarction related complications appears to have resulted in increased mortality rates in patients admitted during the pre-lockdown and lockdown periods, with the worst prognosis in patients presenting during lockdown.

Previous studies have indicated declines in admissions for ACS and catheterisation laboratory procedures in various countries during the COVID-19 pandemic.^{2 3 5} However, there is sparse information about the effect of the pandemic on cardiovascular emergencies other than ACS, such as ADHF and AV blocks. The significant decline in emergency admissions and thus treatment for non-ACS conditions, such as ADHF and high degree or complete AV block, was even more profound compared with ACS. A decrease in admissions related to ADHF and high degree or complete AV block is alarming as these conditions require urgent hospitalisation with a stringent diagnostic and management protocol, and if left untreated have a grave prognosis.

There are a few limitations regarding our analysis. It is possible that patients with cardiac emergencies may have travelled to other medical centres in less densely populated areas, although the medical colleges included in our study care for a broad geographic population in western Rajasthan, and all emergencies at primary and secondary healthcare levels are referred

to these centres only. Also, out of hospital cardiac arrests were not assessed in our study. It is believed that patients with cardiovascular emergencies are waiting too long at home to seek care, resulting in increased out of hospital cardiac arrests.⁶ Finally, we were not able to ascertain cause specific mortality in hospitalised patient.

In view of these findings, there is a great need for public health campaigns to convey that it is safe to come to the hospital for symptoms related to cardiac emergencies which, if left untreated, have high morbidity and mortality rates.

Contributors RC conceived the study. RC, DG, RM and DC initiated the study design and collected the data. RC analysed the data and drafted the article. All authors approved the final manuscript.

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