Acute Coronary Syndrome admissions and outcome during COVID-19 Pandemic—Report from large tertiary centre in India

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A B S T R A C T
Few studies from various countries have reported decline in Acute Coronary Syndrome (ACS) admissions to hospital during COVID-19 pandemic. We studied the impact of COVID-19 strict lockdown on ACS admission in a tertiary referral hospital in India. This showed 43% decline in admissions (n = 104 vs mean n = 183) and even in those who got admitted, there was a delay in presentation compared to previous year, which was reflected in the outcome of patients. Government and health organizations should educate the public early-on during the pandemic about the consequences of ignoring other acute medical problems such as ACS.

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1. Introduction

Further to the announcement of COVID-19 as a pandemic by the World Health Organization (WHO) on 11th March 2020, most countries went on strict lockdown at various time frames. India’s first lockdown started on 25th March for a period of 21 days, which subsequently got extended till 31st May 2020. The first guidelines from cardiac societies like ESC, ACC/SCAI and CSI were released in April about the management of cardiovascular disease and myocardial infarction during COVID-19.1–3 Few studies from various countries have reported significant reduction in Acute Coronary Syndrome (ACS) admissions to hospital during this pandemic period.

We aimed to study the ACS admissions to a tertiary centre in India during the strict national lockdown period and compare this and their outcome with ACS patients admitted during the same time frame in the previous years.

2. Methods

This is an observational study of patients admitted with ACS from 25th March to 31st May (inclusive) of 2020 in our tertiary Institute in South India, which was not considered as a COVID-19 dedicated centre during the study period. We also collected information about the ACS admissions in the same time frame of 10 weeks in the previous 2 years (2018 and 2019). The study was conducted in compliance with the ethical standards of the responsible institution on human subjects as well as with the 1975 Declaration of Helsinki.

3. Results

During the study period in 2020, 104 patients (Age 59 ± 13 year, 21 f) were admitted with ACS, which is a 43% decline in admissions compared to the same time period in previous 2 years (mean n = 183) (Fig. 1). The decline in STEMI, NSTEMI and Unstable angina admissions were 47%, 33%, and 54% respectively. The admission rates were static in the first 5 weeks of the pandemic and then started to gradually increase in the next 5 weeks of the study period, while it was static in the previous 2 years (Fig. 2). The flowchart of management of patients admitted in 2020 is shown in Fig. 3. There was no significant difference between the baseline characteristics of patients admitted in 2019 and 2020 (Table 1). The symptom to door (STD) time was prolonged in 2020 compared to previous year [24, 8–48 vs 8, 4–24 h, (median, IQR) p = 0.0006]. The admission Left ventricular ejection fraction (LVEF) was lower this year [46 ± 8 vs 50 ± 8%, p = 0.0001]. Coronary angiography and Percutaneous Coronary Intervention (PCI) were performed in 80% and 66% of patients respectively this year. There was no significant
difference in procedure related characteristics in both groups (Table 2). Overall, COVID-19 RTPCR test was positive in 7 patients (7%), out of which 2 (29%) of them died during hospital stay. In those patients who presented with STEMI, 6 patients had fibrinolytic therapy compared to 1 in 2019 (11.8% vs 1%, \( p = 0.006 \)). All 6 patients were found to have symptoms suspicious of COVID-19. More STEMI patients had TIMI 0 or 1 flow noted during emergency coronary angiography (93% vs 78%, \( p = 0.03 \)) and post-PCI TIMI 3 flow rate was achieved in fewer patients this year (83.3 vs 95.5%, \( p = 0.04 \)) compared to 2019. In those who underwent primary PCI, there was no significant difference in “door to wire crossing time” this year compared to 2019 (54 ± 21 vs 52 ± 20 min, \( p = 0.28 \)).

There was no difference in in-hospital mortality (IHM) between the two study period of 2020 and 2019 respectively (8.7% vs 6.3%, OR 1.3, 95% CI 0.39–4.36, \( p = 0.48 \)). However, the duration of hospital stay is longer [4.5, 4–5 vs 4, 3–5 days, (median, IQR) \( p = 0.001 \)] and patients were discharged with more cardiac medications (5.6 ± 1.9 vs 4.6 ± 1.6, \( p = 0.0001 \)) compared to last year (Table 3). On separate analysis of STEMI patients, there was still no significant difference in IHM this year (9.8% vs 6.9%, OR 1.45, 95% CI 0.44–4.84, \( p = 0.53 \)).
compared to 2019. In STEMI patients, however, there were more patients with LVEF ≤ 40% at the time of discharge compared to 2019 (30% vs 14.9%, p 0.04).

4. Discussion

Though there were multiple reports from various countries about the decline in ACS admissions during this COVID-19 pandemic,4–13 we believe this is the first report from India addressing this issue (Table 4). We also have analysed the outcome of ACS patients and compared this with previous year admissions. Even in those who attended the hospital, there was a delay in presentation as shown by prolongation of STD time. This delayed presentation was probably responsible for the low LVEF noted in these patients on admission, though rate of cardiogenic shock was not increased. The increase in duration of hospital stay and the increase in cardiac medications on discharge could also be attributed to this lower LVEF on admission. Particularly, in STEMI patients, this delayed presentation also has reflected in the TIMI 0/1 flow noted during emergency coronary angiography. There were significantly higher number of patients with TIMI 0/1 flow pre-PCI this year than 2019.

Table 1
Baseline characteristics of patients admitted with Acute Coronary Syndrome (ACS).

| n (%) | 2020 (n = 104) | 2019 (n = 190) | p value |
|-------|---------------|---------------|---------|
| Age (in years) (mean ± SD) | 59 ± 13 | 61 ± 12 | 0.12 |
| Female | 22 (21) | 39 (21) | 0.88 |
| Diabetes | 58 (56) | 98 (52) | 0.54 |
| Hypertension | 57 (55) | 87 (46) | 0.14 |
| Smoking | 29 (28) | 44 (23) | 0.40 |
| Dyslipidaemia | 24 (23) | 43 (23) | 1.0 |
| Cardiogenic shock | 7 (7) | 14 (7) | 1.0 |
| STEMI | 51 (49) | 101 (53) | 0.54 |
| NSTEMI | 39 (38) | 60 (32) | 0.30 |
| Unstable Angina | 14 (14) | 29 (15) | 0.73 |
| LVEF | 46 ± 8 | 50 ± 8 | 0.0001 |

NSTEMI- Non-ST elevation myocardial Infarction, STEMI- ST elevation myocardial Infarction.

Table 2
Procedure related comparisons between patients admitted in 2019 and 2020 study period.

| n (%) | 2020 (n = 104) | 2019 (n = 190) | p value |
|-------|---------------|---------------|---------|
| Coronary Angiogram | 83 (80) | 158 (83) | 0.53 |
| PCI | 69 (66) | 144 (76) | 0.10 |
| Single vessel PCI | 65 (63) | 129 (68) | 0.37 |
| Double vessel PCI | 4 (4) | 15 (8) | 0.22 |
| LAD/D1 | 34 (33) | 74 (39) | 0.31 |
| RCA/PDA | 22 (21) | 47 (25) | 0.56 |
| Cx/OM | 15 (14) | 35 (18) | 0.42 |
| LMS | 2 (2) | 4 (2) | 0.29 |
| Grafts | 0 (0) | 2 (1) | 1.0 |
| CABG referral | 12 (12) | 18 (10) | 0.69 |

CABG- Coronary artery bypass surgery, Cx- Circumflex artery, D1- Diagonal artery, IABP- Intra-aortic balloon pump, LAD- Left anterior descending artery, LMS- Left main stem, OM-bstuse marginal artery, PDA- Posterior descending artery, PCI- Percutaneous coronary intervention, RCA- Right coronary artery.

Table 3
Comparison of outcome between patients admitted in 2019 and 2020 study period.

| n (%) | 2020 (n = 104) | 2019 (n = 190) | p value |
|-------|---------------|---------------|---------|
| In-hospital mortality (ACS) | 9 (8.7) | 12 (6.3) | 0.48 |
| Duration of hospital stay in days (median, IQR) | 4.5 (4–5) | 4 (3–5) | 0.001 |
| Hospital stay ≤ 3 days | 17/95 (18) | 83/178 (47) | 0.0001 |
| Hospital stay 4–7 days | 65/95 (68) | 81/178 (46) | 0.0003 |
| Hospital stay ≥ 7 days | 13/95 (14) | 14/178 (7) | 0.14 |
| Number of cardiac drugs on discharge (median, IQR) | 5.6 ± 1.9 | 4.6 ± 1.6 | 0.0001 |

ACS- Acute Coronary syndrome.

Table 4
Previous studies reporting about the decline in ACS/MI admissions during COVID-19 pandemic.

| Authors | Country | No of centres | No of patients | % decline | Study duration (weeks) |
|---------|---------|---------------|----------------|-----------|-----------------------|
| Braith et al6 | USA | 4 | 180 | 41% (ACS) | 8 |
| Metzler et al6 | Austria | 19 | 725 | 39% (ACS) | 4 |
| Rodriguez-Loe et al6 | Spain | 81 | 260 | 40% (PCI for STEMI) | 4 |
| Secco GC et al15 | Italy | 3 | 84 | 52% (ACS) | 4 |
| Rattka M et al16 | Germany | 1 | 52 | 25% (AMI) | 4 |
| Tsoufis K et al17 | Greece | 1 | 39 | p value < 0.001 | 8 |
| De Rosa S et al18 | Italy | 15 | 547 | 48% (AMI) | 1 |
| Filippo O D et al19 | Italy | 1 | 547 | 50% (ACS) | 6 |
| Tsim C et al20 | Hong kong | 1 | 7 | STEMI | 2 |
| Garcia et al21 | USA | 9 | 138 | 38% (STEMI activations) | 12 |

a Numbers not available.
Another interesting analysis noted in our study was the gradual increase in admissions after the first 5- week period of lockdown. During the initial lockdown period, patients were more reluctant to seek medical attention. However, as time went by either they were little more confident to come to hospital or they would not have tolerated the symptoms and ended up coming to hospital.

Six patients had fibrinolysis though we are a 24/7 primary PCI centre. This is due to the fact that during the initial 2 weeks of the study period, clinicians were reluctant to do primary PCI in those patients who had international travel history along with suspicious symptoms of COVID-19, and all these 6 patients fulfill the above criteria during the triage process. Therefore, to avoid delay in reperfusion, they were given fibrinolytic therapy (FT) in our institute. There were also concerns about the availability of personal protective equipment (PPE) and the technique of donning and doffing of PPE by all cardiac catheter laboratory staff. Once training was undertaken by the staff in the initial 2 weeks, clinicians were able to undertake primary PCI even in COVID-19 suspect patients with the necessary precautions.

Several hypotheses have been postulated to explain this decline in admissions for cardiac emergencies. 

i. Iatrophobia, which is not very uncommon, cannot be ruled out as a major contributing factor for the decline in admissions for ACS. The fear of getting in contact with COVID-19 infected patients and the risk of infection keeps symptomatic patients from seeking acute medical care or delaying the visit to hospital. Apart from these factors discussed earlier, there are some unique factors in India that would have contributed to the reduction in ACS admissions. Almost 50% of patients who get admitted for acute illness, use their own transport to reach the hospital. Considering the strict lockdown meant frequent vehicle checks by authorities and also lesser ambulance services during the initial lockdown period would have had a major impact on hospital admissions.

5. Conclusion

Our study from a tertiary cardiac centre in India showed that ACS admissions during COVID-19 pandemic has declined and even in those who presented to hospital, there was delay in presentation leading to outcome differences compared to previous year. Government and health organizations should educate the public early on during the pandemic about the consequences of ignoring other acute medical problems such as ACS.

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Conflicts of interest

All authors have none to declare.

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