The Trend of Hospitalisation of Acute Coronary Syndrome Cases Pre and during COVID-19 - An Insight from a Tertiary Cardiac Centre

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ABSTRACT

BACKGROUND

There is reduction in acute coronary syndrome (ACS) admissions worldwide during the COVID-19 pandemic.

MATERIAL AND METHODS

We studied the trend in hospitalization of patients admitted with ACS March 9th till 31st May, a period of 83 days and compared it with the hospitalizations during same time frame of 2019. It was a retrospective observational study.

RESULTS

The mean admission rate for ACS during the study period was 13.28 admissions per day compared to 16.1 admissions per day in same period of 2019 .There were significantly more patients who presented with NSTEMI (28.76%) in 2019 when compared to 2020, 22.78% (P <0.0001). Association of concurrent lower respiratory tract infections (LRTI) with ACS is more in 2020. A statistically significant difference in Killip's class IV was seen with p-value <0.0001 suggesting that during the COVID outbreak, some patients with ACS were hospitalized in more critical condition. There was no significant difference in, in-hospital mortality in both periods. However, the admission to death time was significantly lesser in 2020. The duration of hospitalization was also less in 2020.

CONCLUSION

ACS admissions during COVID period was significantly lesser than in the same time frame during the past year. Patients who received revascularisation procedures were also less during COVID period. More patients presented with STEMI with reduction in NSTEMI. Lockdown, non- availability of public transport and fear of contracting the disease may have contributed to the reduction rather than actual incidence.

KEYWORDS

COVID-19; ACS; Demographic Indian data

ABBREVIATIONS

COVID-19: Coronavirus Disease 2019; ACS: Acute Coronary Syndrome; STEMI: ST-Elevation Myocardial Infarction; NSTEMI: Non-ST Elevation Myocardial infarction; UA: Unstable Angina; LRTI: Lower Respiratory Tract Infections; PTCA: Percutaneous Transluminal Coronary Angioplasty

INTRODUCTION

There is a considerable decline in cardiac-related hospitalizations worldwide. There are plenty of hypothesis put forward as to what could drive acute coronary syndromes (ACS) down during this COVID pandemic. Psychological and mental stress tend to be more during the COVID-19 times. Respiratory infections tend to precipitate acute coronary events. There have been anecdotal reports of an increase in STEMI mimics. They can present with arrhythmias secondary to COVID myocarditis. Systemic inflammatory response syndrome seen in COVID-19 can increase plaque destabilization and atherothrombotic events resulting in acute coronary syndrome and cerebrovascular events, as evidenced by reports of large vessel Cerebrovascular accidents in otherwise, young, healthy individuals [1].

These reasons should increase the acute coronary events and hospitalizations. But we witnessed a reduction in the admissions. We wanted to study the trend in hospitalization of patients admitted with ACS in our institute which is a tertiary cardiac centre in tier two city of India. This centre is associated with the main centre inclusive of four branches and together they contribute to the highest interventional procedures done by an institution in the country and in South Asia.

OBJECTIVE

To study the effects of coronavirus pandemic on the trend of hospitalization of acute coronary syndrome.

MATERIAL AND METHODS

It was a retrospective, observational case control study. The first case of coronavirus was documented in the state (Karnataka) on March 9th, 2020. Hence, we studied the admission trend of ACS patients from March 9th till 31st May, a period of 83 days and compared it with historical control of patients admitted during the same time frame of 2019. Data was collected from inpatient discharge summaries stored in the medical record section. The study was started after obtaining the ethical clearance from the institutional ethics committee. The primary outcome was the overall rate of hospital admissions for ACS and deaths associated with ACS.

ST-elevation myocardial infarction (STEMI), Non-ST elevation myocardial infarction (NSTEMI) and unstable angina (UA) were defined as per the fourth universal definition of myocardial infarction [2]. Inclusion criteria: Consecutive patients of >18 years admitted with ACS were included in the study. Exclusion criteria were hospitalizations other than ACS and age less than 18-years.

Statistical Analysis

Analysis was done in SPSS (Statistical Package for the Social Sciences) version 20 software. The metric variables such as age, lipid levels and window period were compared between 2019 and 2020 groups by using independent T-test. If SD (standard deviation) was more than half the value of the variable Mann-Whitney test was used to find the P values. Admission rate differences between 2019 and 2020 were compared by chi-square test. The odds ratio of risk factors for death was analysed by binominal multivariate analysis.

RESULTS

The mean admission rate for ACS during the study period was 13.28 admissions per day. This rate was significantly lower than the rate during the earlier period in the same year, 16.1 admissions per day. During 2020, of the 1102 patients who were hospitalized for ACS during the study period, 949(75.05%) were males; the mean age was 57 ± 12.63 years, of these patients, 852(77.3%) presented with ST-segment elevation myocardial infarction (STEMI).

The baseline clinical characteristics, type of ACS is tabulated in Table 1.

Parameters	2019 (n = 1335) Mean ± SD/ N (%)	2020 (n = 1102) Mean ± SD/ N (%)	P Value
Age (in Years)	58.33 ± 12.86	57.01 ± 12.63	0.011
Males	949 (71.09%)	827 (75.05%)	0.028
Females	386 (28.9%)	275 (25%)	0.032
Type 2 Diabetes	499 (37.4%)	375 (34%)	0.086
Hypertension	499 (37.4%)	385 (34.9%)	0.212
LRTI	8 (0.6%)	104 (9.4%)	<0.0001
Smoking	255 (19.1%)	170 (15.4%)	0.017
Type of ACS			
NSTEMI	415 (31.1%)	285 (25.9%)	<0.0001
STEMI	835 (62.5%)	734 (66.6%)	<0.081
UA	85 (6.4%)	83 (7.5%)	0.48
Duration of Hospitalisation (days)	4.69 ± 4.1	3.61 ± 3.1	<0.0001
Coronary Angiogram	955 (71.55)	650 (58.98)	<0.0001
Single Vessel Disease (SVD)	368 (27.6%)	204 (18.5%)	<0.0001
Double Vessel Disease (DVD)	236 (17.7%)	190 (17.2%)	0.778
Triple Vessel Disease (TVD)	229 (17.2%)	169 (15.3%)	0.227
Left Main Coronary Artery (LMCA)	39 (4.5%)	37 (3.4%)	0.194
Percutaneous Coronary Transluminal angioplasty (PTCA)	587 (43.97%)	411 (37.3%)	0.0008
In Hospital All-Cause Mortality	109 (8.16%)	98 (8.89%)	0.52

Table 1: Clinical and angiographic characteristics.

The mean age did not significantly differ, 58.33 ± 12.86 years in 2019 *vs*. 57.01 ± 12.63 years in 2020 (P = 0.011). Patients who received revascularisation in 2020 were less in number compared to 2019 which was statistically significant. 58.98% underwent angiograms in 2020 compared to 71.54% in 2019. 37.3% patients underwent PTCA in 2020 compared to 43.97% in 2019 (p = 0.0008).

There was no significant change in the percentage of patients presenting with STEMI and unstable angina. There were significantly more patients who presented with NSTEMI (28.76%) in 2019 when compared to 2020, 22.78% (P <0.0001).

A significant percentage of patients (9.4%) were documented to have concurrent lower respiratory tract infections (LRTI) in 2020. During the time frame of data collection, testing for COVID was restricted only to SARI-severe acute respiratory illness as a Governmental policy. It is, therefore, a matter of debate whether these patients had COVID illness or non-COVID infections.

A statistically significant difference in Killip's class IV was seen with p-value <0.0001 suggesting that during the COVID outbreak, some patients with ACS were hospitalised in more critical condition (Table 2). There was a higher percentage of patients in Killip's class I which accounts for the shorter duration of hospitalization in 2020.

Killip's Class	2019 (n = 1335) Number (%)	2020 (n = 1102) Number (%)	P Value	OR for Death	95% CI
I	1064 (79.7%)	931 (84.48%)			
II	184 (13.78%)	84 (7.62%)	<0.001	11.96	
III	69 (5.17%)	52 (4.72%)	<0.001	41.68	26.28 - 66.08
IV	18 (1.35%)	35 (3.18%)	<0.001	161.78	78.32 - 334.15

Table 2: Killip's class.

There was no significant difference in, in-hospital mortality in both periods. Percentage of deaths and type of ACS in the study period given in Table 3. However, the admission to death time was significantly lesser in 2020 suggesting that patients came in with more severe disease. The duration of hospitalization was also less in 2020. The admission to death duration was significantly less (p <0.001) in 2020 (median 0.455, quartiles - 0.095, 2) than in 2019 (median 1, quartiles - 0.25, 3). There was no significant difference in mortality between the two time periods; STEMI accounted for majority of deaths.

	Total Deaths n (%)	STEMI n (%)	NSTEMI n (%)	UA n (%)
2019	109 (8.16%)	92 (84.4%)	16 (14.67%)	1 (0.92%)
2020	98 (8.89%)	81 (82.65%)	15 (15.31%)	2 (2.04%)

Table 3: Percentage of deaths and type of ACS in the study period.

DISCUSSION

This study shows a 17.5% decrease in ACS-related hospitalisation rates during the COVID-19 outbreak in 2020 than the corresponding time frame in 2019. Rate of admissions of ACS per day was less in 2020. During the period of declining admissions, there were reduction in the number of admissions for all types of acute coronary

syndrome, including both STEMI, UA and NSTEMI, but statistically significant reductions were larger for NSTEMI. However there was no significant difference in in-hospital mortality (8.89% in 2020 *vs.* 8.16% 2019).

There was no difference in the prevalence of diabetes and hypertension between the study and the control period. Smoking however was less in 2020 (15.4% *vs.* 19.1% in 2019 with P = 0.017). This may be due to availability of only essential commodities during lockdown.

A mixed model analysing data comparing before COVID-19 time (1 January 2019 to 29 February 2020) with after COVID-19 (1 March, 2020 - 31 March 2020) displayed a 38% reduction in STEMI activations in the USA in high volume centres (>100 PCI/year) [3].

40% reduction in hospitalisations were noted in a study in England with a decline in all types of ACS [4]. Indolfi *et al*. published a multi-centre observational survey from Italy examining consecutive patients admitted with acute myocardial infarction during the week of 12 March, 2020 - 19 March, 2020 at the height of the COVID-19 outbreak in Italy, compared with the same period in 2019. A total of 319 ACS was recorded during the 1 week in 2020, compared with 618 in the previous year, corresponding to a 48.4% reduction. There was a 26.5% reduction in STEMI admissions and a 65.4% reduction in NSTEMI admissions. There was a disproportionately greater decrease in STEMI reductions for women, 41.2%, than for men, 25.4%. The STEMI case fatality rate increased to 13.7% from 4.1% in 2019 [5].

'Stay at home' and 'social distancing & use of masks' being the paradigm of safety instructions issued in the public interest by most health organizations and governmental agencies, individuals with unclear or vague cardiac symptoms may waiver in their decision to seek medical care. Some studies have shown a reduction in cath lab activations for acute coronary events [6-8].

In our study, significantly more patients presented in Killip's class IV. However fewer patients presented in class II and class III. Patients are inherently fearful of contracting corona infection at hospitals and are delaying their visits and are presenting at a worse stage in clinical illness. They may also be finding it difficult to find modes of transport to reach the tertiary centres especially in our country where commuting is largely by public transport.

In our study, the length of stay of a patient in the hospital is significantly lesser than the previous year. This may be accounted for by a higher percentage of patients presenting with Killip's I class. It is also probably driven by the thought process of minimising patient's exposure to COVID during the patient's hospital stay, though it is not a formulated hospital policy. And secondly, culprit vessel only angioplasty is being followed in most cases. If other lesions are significant but not critical, staged angioplasty is being planned electively at a later date. This is done to reduce the length of the interventional procedure as pre-procedural COVID testing is being done only in select symptomatic cases. This, however, does not rule out asymptomatic COVID cases and COVID cases early in their disease who could have tested negative. CT coronary angiograms are being utilised more to aid in planning revascularisation during COVID era.

Angiographically, significantly less patients had single vessel disease in 2020 compared to 2019. This may be due to increased use of CT coronary angiograms in patients with stable hemodynamics.

The health care systems across the globe are grappling with the shortage of personal protective equipment. Efficient utilisation of resources becomes paramount in an institution like ours where we see close to 500 cardiac outpatients daily and perform close to 3900 coronary angiograms and 3700 angioplasties per year.

In our country, access to health care is still largely dependent on the availability of public transport and social health schemes. Public health system still plays a pivotal role in health care delivery in India. Access to super-specialty services, including cardiology is available at only district-level hospitals in most states of India. Treatment of patients with an acute coronary event, who have enrolled in social health schemes is free in certain tertiary centres of India including ours. Social health schemes are largely based on the financial status of the individual. Hence financial reasons per se cannot be attributed as a cause of reduced admissions. In our data, significantly fewer patients were admitted with acute coronary events in 2020.

The state was just entering into stage 2 of the pandemic, in clusters during the duration of the study. Lockdown and the absence of public transport could have been one of the prime reasons for reduced hospitalizations. Secondly, the fear of getting a COVID infection from others during hospital visits could have deterred patients from reaching a tertiary centre. Many could have been admitted at secondary care hospitals and managed medically. As India does not have a national health database, it will be difficult to gather that information.

CONCLUSION

ACS admissions during COVID period was significantly lesser than in the same time frame during the past year. Patients who received revascularisation procedures were also less during COVID period. More patients presented with STEMI with reduction in NSTEMI. Lockdown, non- availability of public transport and fear of contracting the disease may have contributed to the reduction rather than actual incidence.

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