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Epidemiological profile, management and outcomes of patients with acute coronary syndrome: Single centre experience from a tertiary care hospital in North India

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ABSTRACT

Background: Cardiovascular disease is the leading cause of death in India. Our aim is to study the clinical, epidemiological profile and in-hospital outcomes of patients presenting with acute coronary syndrome.
Methods: We did a prospective single center observational study of the 1203 patients presenting with ACS to a tertiary referral center in North India over a period of one year (July 2018–June 2019).
Results: The mean age of study population was 58.4 ± 12.5 years. STEMI and NSTE-ACS accounted for 69.9% and 31.1% respectively. 62.1% of our patients were from rural background. The median time to hospital admission was 600 min for STEMI patients, thrombolysis was performed in 52% of cases. Cardiogenic shock at presentation was noted in 18%. Coronary angiography and percutaneous coronary intervention were done in 1062 (88.3%) and 733 (60.9%) patients respectively. The overall in-hospital mortality was 7.6%. STEMI patients had higher mortality than NSTE-ACS (8.9% vs 4.5% $p < 0.001$). Female gender (OR−3.306 C.I. 1.87−5.845), severe MR (OR−4.65, C.I.−1.187−18.18), acute kidney injury (AKI) at admission (OR-5.15, C.I.−2.5−10.63), higher Killip class (class III/IV) (OR−3.378,C.I.−1.292 −8.849), AF (OR−3.25, C.I.−1,18−8.92), complete heart block (CHB) (OR−4.44,C.I.−2.09−9.43) and right bundle branch block (RBBB) (OR−2.86, C.I.−1.2−6.8) were significant predictors of in hospital mortality.
Conclusions: Our study represents the predominance of STEMI as the initial ACS presentation with a considerable delay in first medical contact and higher prevalence of cardiogenic shock (CS). STEMI patients had higher mortality. Female sex, severe MR, AKI, higher Killips class, AF, CHB, RBBB being predictors of high in-hospital mortality in ACS patients.

1. Introduction

Coronary artery disease (CAD) is not only the commonest cause of death in both developed and developing world, but also the leading cause of Disability Adjusted Life Year (DALY).[1–3] A quarter of all deaths in India are attributed to cardiovascular disease (CVD) and the age standardized CVD death rate in India is much higher than global average (272 vs 235 per 100,000 population).[4] CVD including CAD leads to premature mortality and morbidity. With heterogeneously distributed health care services which are predominantly concentrated in urban areas, the health care requirements of the vast rural population are far from being dealt with. Moreover, the poor literacy rate, poor reach of preventive education and health care measures, changing demographics have further accelerated the curve of CVD in our country.[5] Added to this, lack of awareness about health insurance, exorbitant out of pocket expenditure in private health care lead to overwhelming of public health care system. Moreover, lack of appropriate number of facilities offering timely primary percutaneous coronary intervention (PCI) services in public health sector further adds to the problem.

There are few large registries on acute coronary syndrome (ACS) from India; the important two being CREATE (20,937 patients; 2001−2005)[6] and KERALA -ACS registry (25,748 patients 2007−2009)[7] which provided basic insights into varied spectrum

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of presentation of ACS patients and their outcomes. HP-ACS registry (5180 patients 2012—2014)[8] is the only large registry from North India. Postgraduate Institute of Medical Education and Research (PGIMER) is a tertiary care center in North India, which is the referral center for neighboring states including Punjab, Haryana, Himachal Pradesh, Jammu and Kashmir. Our aim is to study the clinical, epidemiological profile, of ACS patients presenting to our institute along with their angiographic features, treatment outcomes and to evaluate predictors of in-hospital mortality.

2. Methodology

2.1. Study design

This was a prospective, single center observational study of consecutive patients with ACS presenting to a tertiary care hospital. Our aim was to study the epidemiological, clinical and angiographic profile of ACS patients presenting to our institute and their outcomes.

2.2. Material and methods

The study enrolled consecutive patients who presented with ACS over a period of 1 year (July 2018—June 2019). Acute myocardial infarction was defined as per the third universal definition of myocardial infarction.[9] Non ST segment elevation myocardial infarction (NSTEMI)/Unstable angina (UA) was defined as per 2014 American Heart Association (AHA)/American college of cardiology (ACC) non ST elevation-acute coronary syndrome (NSTE-ACS) guidelines.[10] Two dimensional echocardiography (Vivid Q, GE Healthcare™, New York, USA) was done to assess the left ventricular (LV) ejection fraction and associated mechanical complications. The severity of mitral regurgitation (MR) was classified in accordance with the ACC/AHA 2014 guidelines on valvular heart disease.[11] Acute Kidney Injury (AKI) was defined as in Kidney Disease: Improving Global Outcomes (KDIGO) 2012 practice guidelines.[12] Cardiogenic shock was defined as a systolic blood pressure (SBP) < 90 mm Hg for at least 30 min or the need of supportive measures to maintain an SBP $\geq$ 90 mm Hg despite adequate filling pressures and signs of end-organ hypoperfusion.[13]

The angiographic profiles were analyzed by two interventional cardiologists, both of whom were unaware of the patient outcomes. Significance of lesions was estimated visually. More than 70% stenosis of left anterior descending (LAD), right coronary artery (RCA), left circumflex artery (LCX), and more than 50% stenosis of the left main coronary artery (LMCA) was considered significant. Patients were monitored throughout the duration of hospitalization to assess for clinical outcomes. The major clinical outcome was in-hospital mortality. Non-fatal major adverse cardiovascular events (MACE) like ischemic stroke, intracranial hemorrhage, heart failure, cardiogenic shock were evaluated during their stay in hospital. Medical or drug treatment of all ACS patients was according to ACC/AHA guidelines for the management of STEMI and NSTE-ACS.[10,14] Primary PCI was done for those who presented within the window period and were willing for PCI. Gp 2b/3a inhibitors were used in patients with high thrombotic burden. PCI of the culprit vessel was done during index procedure, and treatment of non-culprit vessels was decided on a case to case basis according to the operator's preference.

2.3. Data collection

Data related to demographics, rural/urban background, time to first medical contact/appropriate medical treatment, ACS types, angiographic profiles, hemodynamics including cardiogenic shock, treatments and in hospital mortality trends were recorded. Rural or urban background of the patients was taken from the "Census of India, 2011", whenever the rural or urban status was not clear from the census, it has been confirmed from the revenue department of the location/indwelling of the study participant.

The study protocol conforms to the ethical guidelines of the Declaration of Helsinki and was reviewed and cleared by the Ethics committee of the Post Graduate Institute of Medical education and Research, Chandigarh. Informed written consent was obtained from all patients or appropriate legally authorized representatives.

2.4. Statistical analysis

All data was prospectively collected by trained physicians (four authors of the study) and entered into a spreadsheet (Microsoft Excel 2016™, Microsoft Corporation, USA). Statistical analysis was performed using the Statistical package for social sciences (SPSS Inc., version 23.0™; IBM corporation, Chicago, USA). All continuous variables were expressed as mean + standard deviation or median (interquartile range (IQ)) as appropriate. Categorical variables were described as proportions and frequencies (%). The comparison between two groups for continuous variables was performed using student's *t*-test or Wilcoxon—Mann—Whitney test. The comparison between two categorical variables was performed by using the chi-square test or Fisher exact test. Subsequently, variables with $p < 0.01$ on univariate analyses were included in multivariable regression analyses to identify independent predictors of outcome. All p-values are two-tailed and set at a statistical significance of 0.05. Binary logistical regression (forward conditional) was used to detect significant variables associated with an expected outcome.

3. Results

3.1. Baseline characteristics

A total of 1203 ACS patients were included for analysis. The mean age of the study population was 58.14 ($\pm$12.5) years with 99 (8.2%) of them $\leq$40years. Females accounted for 25.4% of cases. Majority of our patients belonged to rural backgrounds (62.1%). STEMI occurred in 69.9% (841/1203) of cases with 39.4% (473/1203) of patients having anterior wall involvement. Thrombolysis was done in 52% cases of STEMI at a median of 9.5 h. Streptokinase was used for thrombolysis in 57.3% (251/438) cases and reteplase and tenecteplase were used in 39.3% (173/438) and 3.4% (15/438) of cases respectively. Coronary angiography (CAG) and percutaneous coronary intervention (PCI) were done in 88.3% and 60.9% of patients respectively (Table 2). Majority of STEMI patients in our cohort were managed by pharmacoinvasive strategy. Cardiogenic shock at presentation was seen in 18% (217/1203) of patients (Table 1).

3.2. Comparison between ACS groups

Diabetes mellitus, and hypertension were significantly more common in patients with NSTE-ACS, whereas smoking, alcohol, and history of CVA were more common in STEMI patients. The median time period for appropriate medical therapy for STEMI, NSTE-ACS patients was 10,36 h respectively while the median time for PCI was 48, 72 h respectively. The incidence of VT/VF, and AF were more common in STEMI patients, whereas moderate to severe MR was more common in NSTE-ACS group. Cardiogenic shock at presentation was seen in 20.9% of STEMI and 11.3% of NSTE-ACS patients. Around 73.1% (536 pts) of STEMI and 54.5% (197 pts) have undergone percutaneous intervention. Mortality was more in STEMI group (8.9%) when compared to NSTE-ACS (4.5%). The glycoprotein

Table 1
Baseline characteristics of the study population.

Characteristics/variable	n = 1203
Age, (years) mean (±SD)	58.14 ± 12.5
Age strata	
≤40 years	99 (8.2%)
41–50 years	230 (19.1%)
51–60 years	362 (30.1%)
61–70 years	326 (27.1%)
71–80 years	140 (11.7%)
81–90 years	46 (3.3%)
Sex, n (%)	
Male	898 (74.6%)
Female	305 (25.4%)
Risk factors, n (%)	
Diabetes mellitus	420 (34.9%)
Hypertension	647 (53.8%)
Family history of CAD	79 (6.6%)
Chronic kidney disease	54 (4.3%)
Peripheral artery disease	8 (0.7%)
Cerebrovascular accident	29 (2.4%)
Smoking	472 (39.2%)
Alcohol	306 (25.4%)
Prior PCI/CABG	26 (4.6%)
Residence, n (%)	
Rural	747 (62.1%)
Urban	456 (37.9%)
Type of ACS, n (%)	
STEMI	841 (69.9%)
AWMI	473 (39.4%)
IWMI ± PWMI	357 (29.7%)
LWMI	11 (0.9%)
NST-ACS	361 (30.1%)
KILLIPS class, n (%)	
Class I	897 (74.6%)
Class II	89 (7.4%)
Class III	96 (8%)
Class IV	121 (10%)
Treatment, n (%)	
Time to appropriate medical contact (IQR)	16 (41)
Thrombolysis (STEMI)[a]	438 (52%)
Time to lysis, hrs (IQR)	9.5 (2.5–15)
CAG	1062 (88.3%)
PCI	733 (60.9%)
CABG referral, n (%)	74 (6.15%)
Shock at presentation, n (%)	217 (18%)
IABP usage, n (%)	20 (1.6% of total/9.2% of shock)
Duration of hospitalization, (in days) mean (±SD)	4.67 (±3.67)
Emergency CABG, n (%)	4 (0.4%)

Abbreviations: CABG, Coronary artery bypass surgery; CAG, coronary angiography, NSTE-ACS, Non-ST segment elevation acute coronary syndrome; PCI, Percutaneous coronary Intervention; STEMI, ST segment elevation myocardial infarction; UA, Unstable Angina; continuous variables were expressed as either mean and standard deviation or median and interquartile range, categorical variables were expressed as percentages.
[a] Values are based on 841 STEMI patients.

(GP) 2b/3a inhibitors were used more commonly in STEMI than in NSTE-ACS (27.4% vs 16.6%). The comparison of the characteristics between STEMI and NSTE-ACS has been displayed in Supplementary Table S1.

3.3. In-hospital outcomes and predictors of outcomes

The in-hospital mortality rate was 8.9% in STEMI patients, compared with lower rates in NSTE-ACS (4.5%). Non-fatal MACE (major adverse cardiovascular outcomes) such as stroke, heart failure, or cardiogenic shock were more common in STEMI group.

Those who died were relatively older (62.6 (±10.81) vs 58.1 (±12.57) yr, p-0.001) and a higher proportion of them were women (43.5% vs 23.9% p-0.0001). In those who died, CAG rates (37% vs 92.5%, p-0.0001) and PCI rates (20.7% vs 64.3%, p-0.001) were low.

Table 2
Comparison of angiographic characteristics among ACS patients.

Characteristic	STEMI (N-841)	NSTE-ACS (N-361)	p value
CAG, n (%)	736 (87.51%)	326 (90.3%)	0.352
Access			
Radial, n (%)	520 (70.65%)	236 (72.39%)	0.103
Femoral, n (%)	151 (20.51%)	70 (21.47%)	
Radial and femoral, n (%)	65 (8.83%)	20 (6.13%)	
Single vessel disease, n (%)	353 (47.96%)	120 (36.8%)	0.001
Double vessel disease, n (%)	228 (30.9%)	113 (34.66%)	0.055
Triple vessel disease, n (%)	155 (21.05%)	93 (28.52%)	0.07
PCI, n (%)	536 (63.7%)	197 (54.5%)	0.07
Complete revascularization, n (%)	340 (40.4%)	115 (31.8%)	0.02
CABG referral, n (%)	41 (4.9%)	33 (9.1%)	0.009

Abbreviations: CABG, Coronary artery bypass surgery; IRA, Infarct related artery; categorical variables were expressed as percentages, p value < 0.05 is considered significant for association between variables.

Mechanical complications like severe MR, free wall rupture, ventricular septal rupture and arrhythmic complications like CHB, VT, and atrial fibrillation were more common in those who died. The mortality in cardiogenic shock patients was 37.3% (81/217). The comparison between survivors and non-survivors is shown in Table 3.

A binary logistic regression was performed to determine the effects of several variables found significant in univariate analyses (Fig. 1). Female gender [Odds ratio (OR) 3.3; 95% CI 1.87–5.84], severe mitral regurgitation (MR) (OR 4.65; CI 1.18–18.18), acute kidney injury (AKI) (OR 5.15; CI 2.5–10.63), Killip class III/IV (OR 3.378; CI 1.29–8.85), atrial fibrillation (AF) (OR 3.25; CI 1.18–8.92), complete heart block (OR 4.44; CI 2.09–9.43), and right bundle branch block (OR 2.86; CI 1.2–6.8) were independently associated with an increased risk of mortality after adjusting for the covariates.

4. Discussion

The current study depicts the ground reality of presentation of ACS patients and their outcomes in developing countries. The lack of PCI-enabled centers, in rural and semi-urban regions along with the poor patient awareness accounts for the approximately 10-h delay from symptom onset to presentation. This delay in presentation to a PCI-enabled center is in sharp contrast to developed countries. In view of late presentation, fibrinolysis was performed in only around half of the patients with STEMI. The poor financial status, lack of healthcare insurance and cashless facilities accounts for the use of streptokinase as the most common fibrinolytic agent.
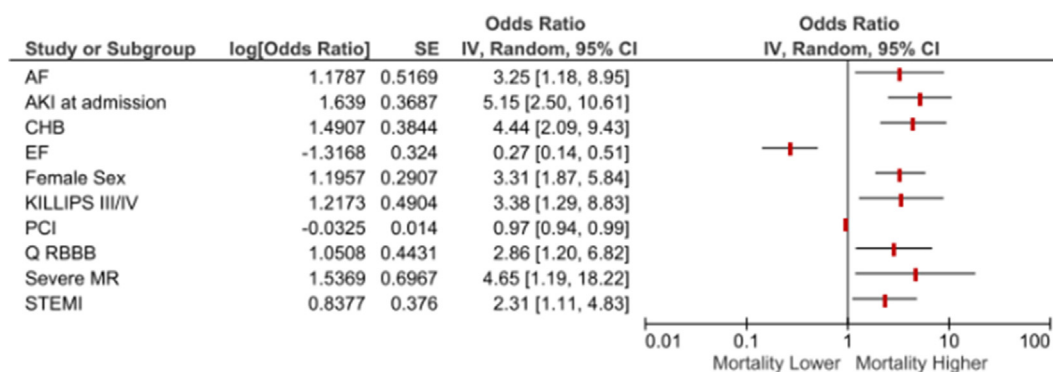
4.1. Comparison with other Indian registries

The major ACS registries in Indian patients are compared in Table 4. The mean age of our study population and proportion of females in our cohort are comparable with other Indian registries. The median time to hospital admission for STEMI patients was 600 min in comparison to 300 min in CREATE registry[6] and 780 min in HP-ACS registry.[8] A lack of public awareness, misinterpretation of symptoms, lack of rapid transport modalities like ambulance, lack of health care facilities equipped with PCI/CABG, financial constraints, geographic restrictions, predominant rural background, hilly terrain accounted for the delay in presentation. STEMI was the most common presentation in 69.9% of patients, in contrast to other registries. The mortality of the overall cohort was 7.6%, whereas STEMI and NSTE-ACS patients had mortality of 8.9% and 4.7% which were comparable to other Indian registries. The overall mortality in our study differs from that of DEMAT registry[15] (2.04%), Kerala ACS[7] (3.9%) registry and ACS- QUIK randomized controlled trial[16] (4.4%).

Table 3
Comparison of characteristics between survivors and non-survivors.

Variable	Non-survivors (n-92)	Survivors (n-1111)	p-value
Age, years, mean ± SD	62.6 ± 10.81	58.1 ± 12.57	0.001
Age< 40 yr, n (%)	3 (3.3%)	96 (8.6%)	0.071
Female, n (%)	40 (43.5%)	265 (23.9%)	0.0001
Risk factors, n (%)			
Diabetes	31 (33.7%)	389 (35%)	0.799
Hypertension	50 (54.3%)	597 (53.7%)	0.91
CVA	6 (6.5%)	1 (0.1%)	0.0001
CKD	2 (3.7%)	52 (4.7%)	0.264
Smoking	31 (33.7%)	441 (39.7%)	0.257
Alcohol	19 (20.7%)	287 (25.8%)	0.273
PCI/CABG	10 (10.9%)	100 (9%)	0.55
Residence			
Rural, n (%)	65 (70.6%)	694 (62.46%)	0.66
Urban, n (%)	27 (28.4%)	417 (37.54%)	
Time to presentation, hours, median (IQ)	16.5 (5.5—48)	12 (7—49)	0.95
Types of ACS, n (%)			
STEMI, n (%)	75 (81.5%)	767 (69%)	0.008
NSTE-ACS, n (%)	17 (18.5%)	344 (30.9%)	
KILLIPS III, n (%)	14 (15.2%)	82 (7.4%)	0.0001
KILLIPS IV, n (%)	39 (42.4%)	82 (7.4%)	
CAG, n (%)	34 (37%)	1028 (92.5%)	0.0001
PCI, n (%)	19 (20.7%)	714 (64.3%)	0.001
Time to intervention, hrs (IQR)	42 (17—68)	48 (18—88)	0.078
Arrhythmia, n (%)			
VT	21 (22.8%)	34 (3.1%)	0.001
AF	11 (12%)	30 (2.7%)	0.0001
q RBBB	14 (15.2%)	42 (3.8%)	0.0001
LV ejection fraction, %, median (IQ)	30 (25—40)	40 (35—50)	0.0001
Mechanical complications, n (%) moderate-severe MR	18 (19.5%)	83 (7.4%)	0.0001
VSR	6 (6.5%)	3 (0.3%)	0.001
Free wall rupture	5 (5.4%)	—	0.0001
Cardiogenic shock, n (%)	81 (88.2%)	136 (12.1%)	0.0001
Acute kidney injury at admission, n (%)	35 (38%)	79 (7.1%)	0.0001
Gp 2b/3a inhibitors, n (%)	20 (21.7%)	271 (24.4%)	0.568
Investigations (IQR)			
Hemoglobin g/dl	12 (10.7—13)	13.1 (11.6—14.2)	0.001
Total leukocyte count/mm^3	12,900 (9900—16,900)	10,300 (8300—13,000)	0.0001
Platelets *10^3/mm^3	201 (151—260)	207 (157—256)	0.336
Potassium (m eq/l)	4.4 (4—4.8)	4.2 (4—4.6)	0.07
Urea (mg/dl)	56 (30—81)	33 (23—42)	0.0001
Creatinine (mg/dl)	1.4 (0.9—2.1)	0.9 (0.5—1.3)	0.001
CK-MB (IU/L)	80 (40—229)	56.5 (26.5—140)	0.004
Single vessel disease, n (%)	13/34 (37.1%)	430/1028 (42.4%)	0.535
Double vessel disease, n (%)	10/34 (27.1%)	304/1028 (29.3%)	0.761
Triple vessel disease, n (%)	11/34 (31.4%)	212/1028 (20.9%)	0.135

Abbreviations: AF, atrial fibrillation; CABG, Coronary artery bypass surgery; CHB, Complete heart block; CK-MB, Creatine kinase-muscle brain; CVA, Cerebrovascular accident; EF, Ejection Fraction; Gp, glycoprotein; IABP, Intra aortic balloon pump; IC bleed, Intracranial bleed; IQR, Interquartile range; MR, mitral regurgitation; NSTEMI, Non ST segment elevation Myocardial Infarction; PCI, percutaneous coronary intervention; RBBB, Right bundle branch block; SD, Standard deviation; STEMI, ST segment elevation myocardial Infarction; UA, Unstable Angina; VSR, Ventricular septal rupture; VT/VF, Ventricular tachycardia/fibrillation; continuous variables were expressed as either mean and standard deviation or median and interquartile range, categorical variables were expressed as percentages.

Study or Subgroup	log[Odds Ratio]	SE	Odds Ratio IV, Random, 95% CI	Odds Ratio IV, Random, 95% CI
AF	1.1787	0.5169	3.25 [1.18, 8.95]	
AKI at admission	1.639	0.3687	5.15 [2.50, 10.61]	
CHB	1.4907	0.3844	4.44 [2.09, 9.43]	
EF	-1.3168	0.324	0.27 [0.14, 0.51]	
Female Sex	1.1957	0.2907	3.31 [1.87, 5.84]	
KILLIPS III/IV	1.2173	0.4904	3.38 [1.29, 8.83]	
PCI	-0.0325	0.014	0.97 [0.94, 0.99]	
Q RBBB	1.0508	0.4431	2.86 [1.20, 6.82]	
Severe MR	1.5369	0.6967	4.65 [1.19, 18.22]	
STEMI	0.8377	0.376	2.31 [1.11, 4.83]	

Fig. 1. Multivariable logistic regression model to evaluate for the predictors of mortality (in-hospital deaths). Abbreviations: AF, atrial fibrillation; AKI, Acute kidney Injury; CHB, Complete heart block; C.I, Confidence Interval; EF, ejection fraction; MR, Mitral regurgitation; PCI, percutaneous coronary intervention; RBBB, right bundle branch block; STEMI, ST segment elevation Myocardial Infarction.

Table 4
Comparison between various INDIAN ACS registries.

Study	Mean age (years)	Female gender (%)	Time to presentation in STEMI (min)	CS (%)	STEMI vs NSTEMI (%)	Thrombolysis (%)	Overall Mortality vs STEMI vs NSTE-ACS (%)	CAG and PCI (%)
CREATE (6) 2001−2005 n-20937	57.5	23.6%	300	NA	60.6% vs 39.4%	59%	6.7% vs 8.6% vs 3.8%	23.2% and 2.9%
KERALA ACS (7) 2007−2009 n-25748	60.4	22.6%	NA	1.9%	37% vs 31%	41.4%	3.9% vs 8.2% vs 1.8%	19.5% vs 11.9%
DEMAT (15) 2007−2008 n-1565	59.2	21%	NA	NA	51.6% vs 48.4%	45%	2.04% vs NA	NA vs 44.9%
GMC North east (16) 2011−2012 n-704	56.5	28.1%	700	12.3%	72.4% vs 27.8%	39%	10.2% vs 11.7% vs 6.8%	46.3% vs 12.7%
HP-ACS (8) 2012−2014 n-5807	60.9	21.9%	780	10.2%	45.5% vs 54.5%	35.6%	7.6% vs 10.8% vs 5%	1.4% vs 0.6%
PGIMER ACS 2018−2019 n-1203	58.44	25.4%	600	18%	69.9% vs 30.1%	52%	7.6% vs 8.9% vs 4.7%	88.3% vs 60.9%

ACS = Acute coronary syndrome; CREATE = Treatment and outcomes of acute coronary syndromes in India; DEMAT = Detection and management of coronary heart disease; GMC = Government medical college; HP-ACS = Himachal Pradesh - acute coronary syndrome; NSTE-ACS = Non ST segment elevation acute coronary syndrome; NSTEMI = Non ST segment elevation myocardial infarction; STEMI = ST segment elevation myocardial infarction.

In a single center report from Madras medical mission (Isezuo et al),[17] the overall mortality at 30 days was 0.7%. DEMAT registry[15] mainly catered to urban population and Kerala registry obtained data from the portion of state hospitals that voluntarily participated in the study (125/300) and lesser rural background (47% vs 62.1% in our study). Moreover, our study has relatively sicker patients with higher proportion of patients with cardiogenic shock (18%) than Kerala-ACS[7] (1.9%), HP-ACS[8] (10.2%) registries, a study by Isezuo et al (0.9%) and ACS- QUIK (1.8%) trial explaining high mortality. This high representation of cardiogenic shock can be explained due to delayed presentation and referral bias to our center. The mortality in patients with cardiogenic shock was 37.3% which is comparable to a similar study done in our institute which showed a mortality of 42.9%.[18] Female gender was associated with increased mortality rates (OR-3.306) which was higher than from other Indian registries like DEMAT[15] (OR-1.4), HP-ACS[8] (OR 1.36 C.I. 0.77−2.38) and Kerala -ACS[7] (OR−1.05, C.I.−0.8−1.38) registries. The possible reasons include low socioeconomic status, misinterpretation of symptoms, delayed presentation and cultural barriers.

The rates of inappropriate thrombolysis (0.1%) was lower than in Kerala-ACS[7] (19%) and CREATE registry[6] (3.5%). Our study was the first among Indian registries which provided insight into angiographic profiles of the ACS patients who had delayed presentation. The rates of CAG and PCI in our study (88.3% and 60.9% respectively) were higher than other Indian studies. In a single center study from Madras medical mission,[17] coronary angiography was done in 79.6% of patients, while PCI was done in only 42.2% of patients. In ACS-QUIK randomized controlled trial,[16] PCI was done in 49.3%. Single vessel involvement was seen in 42.2% patients while triple vessel disease was seen in 21.3% cases. Our data represents the outcomes of the patients who underwent angioplasty with significant delay in presentation. Most of the patients received fibrinolysis and a predominant pharmacoinvasive strategy was adopted. Primary PCI was done in a small number of patients due to delayed presentation.

4.2. Comparison with western ACS registries

The mean age of our cohort was lesser as compared to western registries and we had higher proportion of males in our cohort when compared to registries like ACTION ACS registry from USA,[19,20] Euro Heart Survey ACS I[21] and II,[22] and GRACE[23] registries from Europe. The rates of angiography and angioplasty were comparable to rates in ACTION and Euro Heart Survey ACS I and II. The percentage of patients with cardiogenic shock at admission in our study was 18% which was higher than in GRACE[23] (3.3%) and Euro Heart Survey ACS I[21] (7.5%).

In-hospital mortality rates for STEMI patients in our study was 8.9% which was higher than GRACE[23] (7%), Euro Heart Survey ACS II[22] (6%), and ACTION[20] (4.3%). The mortality rate of NSTEACS patients was 4.7% which was comparable to registries like GRACE (6%), Euro Heart Survey ACS II (3%) and ACTION (3.9%). The median duration from the onset of symptoms to hospital admission was significantly higher with delay of 600 min in our cohort when compared to GRACE[23] (140 min) and Euro Heart Survey ACS I[21] (170 min) and ACS II[22] (140 min). The high percentage of cardiogenic shock at admission (18%) along with delayed presentation accounts for higher mortality in our cohort when compared to western cohorts.

5. Limitations

First this being a single center study, the results cannot be generalized to the general population as the outcomes of ACS patients were influenced by access to health care, level of education, socioeconomic status, geographical characteristics and cultural practices. Second, ours center is a tertiary referral center, referral bias led to sicker patients with CS and higher mortality, hence the data may not be representative of prevalence and outcomes in general population. Third, post discharge follow-up were not captured to evaluate long term major adverse cardiovascular events, the analyses were limited to in-hospital mortality. Fourth, system of care measures, including mode of emergency transport, reasons for delayed hospital admission have not been studied.

6. Conclusions

In our study, STEMI is the most common ACS presentation with a significant delay in seeking health support, only half of them received thrombolysis. STEMI was associated with higher mortality. A very high percentage of patients with ACS had cardiogenic shock compared to contemporary registries. Female sex, severe MR, AKI on presentation, higher Killip's class, cardiogenic shock at presentation, AF, CHB, and q RBBB are predictors of high in-hospital mortality on multivariable analysis.

Declaration of competing interest

None declared.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ihj.2020.11.149.

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