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# Clinical profile and 30-day outcome of patients with acute coronary syndrome

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## ABSTRACT

**Background:** Acute coronary syndrome (ACS) accounts for a quarter of all-cause mortality, with substantial loss of productivity and socio-economic implications. Analyses of the clinical presentation, age- and gender-specific differences, and mortality pattern are decisive in determining the clinical outcome of a patient. **Aims and Objectives:** The primary objective was to determine the in-hospital and 30$^{th}$ day outcomes in patients with ACS. The secondary objectives were to study cardiometabolic risk factors, the clinical presentation, and the clinical course of the patients with ACS during hospitalization. **Materials and Methods:** The present study was conducted for 1-year duration involving 110 patients diagnosed with ACS. The patients' data pertaining to socio-demographic information, clinical features, details of hospitalization, and treatment modalities were collected. The outcomes based on mortality and major adverse cardiovascular events (MACE) were evaluated in two phases: (a) in-hospital and (b) at the 30$^{th}$ day from the date of hospitalization. **Results:** Out of 110 patients hospitalized with a diagnosis of ACS, the majority were male (71.82%), and their mean age was 58.45 ± 9.18 years. Hypertension, obesity, smoking, and family history of ACS were reported by 40%, 30%, 30%, and 27.27% of patients, respectively. Chest pain was the commonest symptom, followed by sweating and radiating pain. The mean duration of hospitalization was 6.345 ± 2.46 days. ST-segment elevation myocardial infarction (STEMI) was the commonest type of ACS, with a predominance of anterior wall myocardial infarction (MI). The mean door-to-needle time was 43.53 ± 7.75 min, and 29.1% of patients underwent thrombolysis. During hospitalization, improvement and MACE were observed in 73.64% and 26.36% of patients, respectively. 30-day outcome MACE was significantly higher among STEMI patients. Mortality was significantly higher in patients with < 30% left ventricular ejection fraction (LVEF), both during hospitalization and after 30 days. **Conclusion:** The present study revealed that the mean age of presentation was 58.45 ± 9.18 years. Anterior wall MI was the commonest pattern of STEMI. Thus, the type of MACE and mortality were significantly higher among patients with either LVEF < 30% or STEMI. Thus, type and severity of ACS, along with clinical presentation, existing risk factors, and access to medical care, play a determining role in the clinical outcome of a patient.

**Key words:** Acute coronary syndrome; ST segment elevation myocardial infarction; Non-ST segment elevation myocardial infarction; Unstable angina; Major adverse cardiovascular events; Clinical outcome

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## INTRODUCTION

Acute coronary syndrome (ACS) refers to the ischemic insult to the myocardium catalyzed by significant occlusion within the coronary circulation. ACS, whether ST segment elevation myocardial infarction (STEMI) or non-STEMI (NSTEMI) or Unstable angina (UA), is defined as "the presence of acute myocardial injury detected by abnormal

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cardiac biomarkers in the setting of evidence of acute myocardial ischemia" as per the 2018 Joint Task Force of the European Society of Cardiology, the American College of Cardiology Foundation, the American Heart Association (AHA), and the World Health Federation.[1] Cardiovascular disease (CVD) accounts for the leading cause of mortality globally. In 2020, an estimate of 19 million deaths were attributed to CVD globally, which showed an incremental increase of 18.7% since 2010.[2] In 2016, non-communicable diseases (NCD) accounted for 63% of total mortality in India of which CVD attributed overall 27% of all-cause mortality and 45% of premature deaths, owing to epidemiological transition from infectious diseases to NCDs, early age of incidence, accelerated progression and challenges to healthcare access.[3,4] Also, the ratio of ACS mortality to stroke mortality among Indians is comparatively higher than the global figures.[4] Premature deaths effectuate as loss of productivity with human, economic, and social implications, which can hinder poverty reduction and the achievement of sustainable development goals in any country.

In a patient with STEMI, either pharmacological (fibrinolysis) and/or mechanical primary percutaneous coronary intervention (PCI) is recommended for prompt and complete coronary reperfusion.[5] In ACS, "door-to-needle time" plays a crucial role in determining a patient's outcome. It is recommended to initiate fibrinolysis within 30 min (door-to-needle time) and to achieve intracoronary balloon inflation within 90 min (door-to-balloon time) on first medical contact.[5] In India, health care services are highly concentrated in urban areas, with inadequate attention in rural settings. The challenges of a visit to a healthcare facility are often affordability, lack of empowerment, physical impairments, and transportation access.[6] Also limited facilities for timely PCI and its expenditure further aggravates the problem. Studies conducted by Subramanian et al. and Jeemon et al. have highlighted the role of social determinants like socio-economic status, educational qualification, occupation, out-of-pocket expenditure, access to the healthcare system, etc., in determining the clinical outcomes after an ACS event.[7,8] The heterogeneity of the prevalence of cardiometabolic risks among different regions in India can be attributed to diversity in culture and culinary practices as well as economic development.

ACS can have profound repercussions in the social and economic spheres of an individual and his family, later effectuating on the community and national status. India's National Health Policy 2017 targets "Universal access to good quality health care services," which relies on the recognition of disparities in the utilization of healthcare facilities and finding tailored solutions for attaining sustainable development goals.[9] Improving equity of ACS care and shared decision-making as a combination of either medications and/or anti-thrombolytic therapy and/or early myocardial reperfusion is the crux of reducing ACS-related morbidity and mortality. Jorhat Medical College and Hospital (JMCH) provides healthcare facilities for Jorhat and the surrounding areas, with a population of approximately 40 lakh. Analyses of the clinical presentation, age- and gender-specific differences, and mortality pattern vary in different geographical locations. It can aid in the redistribution of health services and capacity building for the most vulnerable groups. With the following background, the present study has been performed systematically to evaluate the clinical profile and outcome of patients with ACS at JMCH.

### Aims and objectives

The primary objective was to determine the in-hospital and 30$^{th}$ day outcomes of patients with ACS. The secondary objectives were to study cardiometabolic risk factors, the clinical presentation, and the clinical course of the patients with ACS during hospitalization.

## MATERIALS AND METHODS

This was a hospital-based, observational, cross-sectional study conducted for a 1-year duration from July 1$^{st}$, 2020, to June 30$^{th}$, 2021, in the Department of Medicine and Cardiology. The patients diagnosed and hospitalized with ACS constituted the study participants. Approval for the study protocol was obtained from the Institutional Ethical Committee reference number: SMEJ/JMCH/MEU/841/Pt-1/2011/5497, dated June 30$^{th}$, 2020. Participation was voluntary. Written informed consent was obtained with confidentiality assurance from the patient or legally acceptable representative. No incentives or rewards were offered for study participation. The study was conducted as per the guidelines of the Declaration of Helsinki and human subject protection.

### Case definition

The ACS patients were those with either STEMI, NSTEMI, or UA as per the definitions of AHA.[10,11] The diagnosis of ACS was made based on symptomatology and evidence based on 12-lead electrocardiography (ECG) and elevation of cardiac biomarkers.

The clinical features compatible with ACS included:[12]

1. Sudden onset of symptoms at rest (or with minimal exertion) that lasts at least 10 min unless treated promptly
2. Severe pain, pressure, or discomfort in the chest and
3. An accelerating pattern of angina that develops more frequently, with greater severity, or that awakens the patient from sleep.

The following standard operational definitions were considered during patient selection:

a. Hypertension (HTN): Self-reporting of physician-diagnosed HTN and/or under pharmacotherapy for HTN or systolic blood pressure ≥140 mm of Hg or diastolic blood pressure ≥90 mm of Hg[13]
b. Diabetes mellitus (DM): self-reporting of physician-diagnosed DM and/or under pharmacotherapy for DM, fasting blood glucose >126 mg/dL, or glycosylated hemoglobin >6.5 mg%[14]
c. Dyslipidemia: self-reporting of physician-diagnosed dyslipidemia and/or under pharmacotherapy for dyslipidemia, serum total cholesterol >200 mg/dL, triglyceride level >150 mg/dL, high-density lipoprotein cholesterol level <40 mg/dL (men) or <50 mg/dL (women), or low-density lipoprotein cholesterol level >130 mg/dL[15]
d. Obesity: Patients were categorized as overweight, or obese if they had a body mass index (BMI) of 23–24.9 kg/m$^2$ and ≥25 kg/m$^2$, respectively[16,17]
e. Past history of ischemic heart disease (IHD): Physician's diagnosis of IHD, history of symptoms suggestive of typical angina, history of hospitalization for ACS, history of PCI, or coronary artery bypass surgery
f. Smoking: Patients were categorized as smokers with a history of smoking or consumption of tobacco within the last 1 year of enrollment in the study.

## Sample size calculation

Based on a study by Prabhakaran et al., the prevalence of ACS among the Indian population was 7%.[4] Based on the central limit theorem, the minimum sample size for the study was calculated as 101 using the following formula:

$$n \geq \frac{Z^2_{1-\frac{\alpha}{2}} \times p\ (1-p)}{d^2}$$

Where,

n: Sample size

Z: Standard normal variate,

d: Absolute error or precision

p: Estimated proportion depending on previous studies.

For our present study, Z=1.96 [at 5% type 1 error (P<0.05)], d=0.05, and P=0.07.

## Data collection

The sampling method was purposive and non-randomized to maximize recruitment of all patients with ACS. Initial screening of the patients was done to determine their participation in the study.

## Inclusion criteria

They were: (a) age ≥18 and <80 years; (b) confirmed diagnosis of ACS.[10-12]

## Exclusion criteria

They were (a) patients with a history of cardiomyopathy, congenital heart disease, pericardial disease, or concomitant valvular heart disease; (b) known cases of terminal illness like chronic liver disease, chronic kidney disease, or malignancy; (c) patients who refused to participate; and (d) patients with missing data.

The socio-demographic information included age, gender, area of residence (urban or rural), marital status, educational qualification, past medical history and family history pertaining to cardiovascular and non-cardiovascular risk factors, details of current pharmacotherapy, and history of substance abuse. The clinical information obtained at the time of hospital admission included presenting complaints, vital signs, and anthropometric measurements.

The blood samples of the patients were collected with all aseptic precautions and processed in the Institutional Central Laboratory on the same day. Cardiac biomarkers included creatine kinase-myoglobin binding (CK-MB) and Troponin I, which were estimated by the immunometric immunoassay technique and the chemiluminescence method, respectively.

A 12-lead ECG (Contec Digital twelve-channel ECG machine) was obtained to diagnose STEMI, NSTEMI, or UA based on either ST segment elevation or depression, T-wave inversion, appearance of new Q waves, or bundle branch block.[10,11] A transthoracic 2-dimensional echocardiogram (2D-ECHO) (Philips Affiniti 70) was done at the time of admission to capture the cause, location, and severity of myocardial ischemia (MI), left ventricular ejection fraction (LVEF), size of the atria and ventricles, presence of valvular diseases, and assessment of wall motion.[18]

All patients were subjected to the standard management protocol as per the ACC/AHA and hospital facilities.[10] The outcomes were determined based on mortality and major adverse cardiovascular events (MACEs). MACE included heart failure, atrial fibrillation, ventricular tachycardia, reinfarction, stroke, cardiogenic shock, major bleeding, and mortality.[19] The outcome was evaluated in two phases: (a) in-hospital and (b) on the 30$^{th}$ day from the date of hospitalization. The patient's follow- up of the patient was maintained either via telephone conversation or hospital visit.

## Data analysis

The patients' data pertaining to socio-demographic information, clinical features, details of hospitalization, treatment modalities, and outcome were collected and organized with the help of Microsoft Excel, assuring their completeness and accuracy. The data was subjected to statistical analysis using SPSS (version 24). The patients

were categorized into STEMI, NSTEMI, and UA groups based on their diagnosis. Continuous variables were calculated as mean and standard deviation (SD) and subjected to an independent "t" test. Categorical variables were expressed as frequencies (n) and percentages (%) and were compared using the Fisher exact test or the Chi-square test, depending on the distribution of data. The value of the $P<0.05$ was considered statistically significant for all statistical analyses.

## RESULTS

In the present study, a total of 110 patients hospitalized with a diagnosis of ACS were included. The majority were males (n=79 [71.82%]) (Table 1). The age of the patients ranged from 34 to 91 years, with a mean age of 58.45±9.18 years. The majority (n=50 [45.45%]) belonged to the age group of 51–60 years, followed by 61–70 years (n=34 [30.9%]). The average BMI was 24.08±2.83 kg/m$^2$, with 30% of patients being obese. Smoking was reported by 30% (n=33) patients, and family history of ACS was confirmed by 27.27% (n=30) patients.

Chest pain was the commonest symptom reported by patients (n=95 [86.63%]), followed by sweating (n=17 [15.45%]) and radiation of pain (n=15 [13.64%]), as seen in Table 2. HTN was the commonest co-morbidity associated with ACS and was present in 40% (n=44), followed by DM (n=41 [37.27%]) and obesity (n=33 [30%]). The mean duration of hospitalization was 6.345±2.46 days, with the majority hospitalized for 7–9 days (n=48 [43.64%]), followed by 4–6 days (n=42 [38.18%]). Among the types of ACS, STEMI was the most common in 73.64% (n=81) patients, followed by NSTEMI in 19.09% (n=21). Anterior wall MI was most prevalent (n=41 [50.62%]), followed by inferior wall MI (n=33 [40.74%]).

Out of 110 patients diagnosed with ACS, 29.1% (n=32) underwent thrombolysis (Table 3). The mean

**Table 1: Sociodemographic characteristics of the patients with ACS**

| Variables | Categories | n (%) |
|---|---|---|
| Age (in years) | 31–40 | 2 (1.82) |
| | 41–50 | 14 (12.73) |
| | 51–60 | 50 (45.45) |
| | 61–70 | 34 (30.9) |
| | >70 | 10 (9.1) |
| Average age (in years) | - | 58.45±9.18* |
| Gender | Male | 79 (71.82) |
| | Female | 31 (28.18) |
| BMI (kg/m$^2$) | 18.5–22.9 | 36 (32.73) |
| | 23–24.9 | 41 (37.27) |
| | 25–29.9 | 30 (27.27) |
| | ≥30 | 3 (2.73) |
| Mean BMI (kg/m$^2$) | - | 24.08±2.83 * |
| Residence | Urban | 68 (61.82) |
| | Rural | 42 (38.18) |
| History of smoking | Present | 33 (30) |
| | Absent | 77 (70) |
| Family history of IHD | Present | 30 (27.27) |
| | Absent | 80 (72.73) |

ACS: Acute coronary syndrome, BMI: Body mass index, IHD: Ischemic heart disease, *Expressed as Mean±standard deviation

**Table 2: Clinical profile of patients with ACS**

| Variables | Categories | *n* (%) |
|---|---|---|
| Symptoms in ACS patients (n=110) | Chest pain | 95 (86.36) |
| | Sweating | 17 (15.45) |
| | Palpitation | 13 (11.82) |
| | Radiation of pain to arm/jaw | 15 (13.64) |
| | Dyspnoea | 7 (6.36) |
| | Vomiting | 4 (3.64) |
| | Syncope | 2 (1.82) |
| | Diarrhoea | 1 (0.91) |
| | Abdominal pain | 1 (0.91) |
| Co-morbidities (n=110) | Hypertension | 44 (40) |
| | Diabetes mellitus | 41 (37.27) |
| | Dyslipidemia | 32 (29.1) |
| | Obesity | 33 (30) |
| Duration of hospitalization (in days) (n=110) | 1–3 | 12 (10.91) |
| | 4–6 | 42 (38.18) |
| | 7–9 | 48 (43.64) |
| | ≥10 | 8 (7.27) |
| Average duration of hospitalization (in days) | - | 6.345±2.46 * |
| Types of ACS (n=110) | STEMI | 81 (73.64) |
| | NSTEMI | 21 (19.09) |
| | Unstable angina | 8 (7.27) |
| Electrocardiographic profile of STEMI (n=81) | Anterior wall MI | 41 (50.62) |
| | Inferior wall MI | 33 (40.74) |
| | Antero-septal MI | 4 (4.94) |
| | Lateral wall MI | 3.70 |

STEMI: ST segment elevation myocardial infarction, NSTEMI: Non-ST segment elevation myocardial infarction, ACS: Acute coronary syndrome, MI: Myocardial infarction, *Expressed as Mean±standard deviation

**Table 3: In-hospital management of patients diagnosed with ACS**

| Variables | Categories | n (%) |
|---|---|---|
| Treatment modalities used (n=110) | Thrombolysis | 32 (29.1) |
| | Aspirin | 107 (97.27) |
| | Clopidogrel | 105 (95.45) |
| | Statins | 103 (93.64) |
| | Beta-blockers | 85 (77.27) |
| | Nitrates | 71 (64.55) |
| | ACE inhibitors/ARB | 80 (72.73) |
| | Heparin | 98 (89.1) |
| Door-to-needle time for thrombolysed patients (in minutes) (n=32) | 20–30 | 3 (9.37) |
| | 31–40 | 11 (34.38) |
| | 41–50 | 15 (46.88) |
| | 51–60 | 3 (9.38) |
| Mean door-to-needle time (in minutes) | - | 43.53±7.75* |
| Thrombolytic agents used (n=32) | Alteplase | 6 (18.75) |
| | Reteplase | 25 (78.12) |
| | Tenecteplase | 1 (3.1) |

ACE: Angiotensin converting enzyme, ARB: Angiotensin receptor blocker, *Expressed as Mean±standard deviation

door-to-needle time was 43.53±7.75 min. Reteplase was the most commonly used thrombolytic agent (n=25 [78.12%]), followed by Alteplase. Aspirin, Clopidogrel, and statins were given to 97.27%, 95.45%, and 93.64% of patients, respectively. Subcutaneous Heparin was administered to 89.1% (n=98).

During hospitalization, improvement and MACE were observed in 73.64% (n=81) and 26.36% (n=29) respectively (Table 4). Heart failure, cardiogenic shock, and death were seen in 9.09%, 6.36%, and 6.36%, respectively. There was no significant difference observed in clinical course during hospitalization among thrombolyzed and non- thrombolyzed patients. In the 30day outcome, cardiogenic shock was observed to be significantly higher among thrombolyzed as compared to non- thrombolyzed patients.

Depending on the diagnosis of ACS during hospitalization, clinical outcome did not vary significantly among STEMI, NSTEMI, and UA patients (Table 5). However, 30-day outcome MACE was significantly higher among STEMI patients as compared to NSTEMI and UA patients.

Depending on the status of LVEF, mortality was significantly higher in patients with <30% LVEF both during hospitalization and after 30 days (Table 6). Death was seen in 6.36% (n=7) and 5.82% (n=6) patients during hospitalization and 30-day outcomes with heart failure being the commonest cause (Figure 1).

## DISCUSSION

The present study offered an opportunity to explore the determinants of ACS and analyze the clinical profile and course of patients with ACS. Early diagnosis and timely interventions, either pharmacological or invasive, are cornerstones in determining a patient's outcome.

In the present study, the age group 51–60 years showed a higher predilection for ACS, similar to the study by Sidhu et al.[20] There was a prevalence of around 15% of ACS in the age group <50 years. Males and females constituted 71.82% and 28.18% of the cases, respectively, similar to observations by the INTERHEART study,[21] the ACCESS registry,[22] and the CREATE registry.[23] The mean age of the ACS patients in our study was 58.45±9.18 years. The findings are similar to studies among the Indian population by Sharma et al.,[24] (58.4±12.5 years), Sidhu et al.,[20] (56.06±11.29 years), Sharma et al.,[22] (54.70±19.90 years), and CREATE registry[23] (56±13 years). As per the INTERHEART study, the median age for the first episode of MI is 53 years among South Asians, as compared to 63 years in other population globally.[21] The prevalence of an ACS event a decade earlier and 10% cases with first MI at <40 years among Indians can have direful consequences in terms of substantial loss of health, economy, and productivity.

In the present study, the ACS cohort had the highest prevalence for HTN (44%), followed by DM (41%),

**Table 4: Distribution of in-hospital and 30-days outcome among patients of ACS depending on their thrombolysis status**

| In-hospital outcome | | | | |
|---|---|---|---|---|
| **Clinical outcome** | **Total patients (n=110)** | **Thrombolysed patients (n=32)** | **Non-thrombolysed patients (n=78)** | **P-value** |
| Improved | 81 (73.64) | 24 (75) | 57 (73.08) | 1 |
| Atrial fibrillation | 5 (4.54) | 1 (3.12) | 4 (1.13) | 1 |
| Ventricular tachycardia | 2 (1.81) | 0 | 2 (2.56) | - |
| Cardiogenic shock | 7 (6.36) | 2 (6.25) | 5 (6.41) | 1 |
| Bleeding | 3 (2.72) | 1 (3.12) | 2 (2.56) | 1 |
| Heart failure | 10 (9.09) | 2 (6.25) | 8 (10.25) | 0.7207 |
| CVA | 1 (0.91) | 1 (3.12) | 0 | - |
| Reinfarction | 1 (0.91) | 1 (3.12) | 0 | - |
| Death | 7 (6.36) | 3 (9.38) | 4 (5.17) | 0.4127 |
| Composite MACE | 29 (26.36) | 8 (25) | 21 (26.92) | 1 |
| **30–days outcome after ACS** | | | | |
| **Clinical outcome** | **Total patients (n=103)** | **Thrombolysed patients (n=29)** | **Non-thrombolysed patients (n=74)** | **P-value** |
| Improved | 78 (75.73) | 20 (68.97) | 58 (78.38) | 0.3196 |
| Atrial fibrillation | 7 (6.8) | 3 (10.34) | 4 (5.41) | 0.3988 |
| Ventricular tachycardia | 3 (2.91) | 0 | 3 (4.05) | - |
| Cardiogenic shock | 5 (4.85) | 4 (13.8) | 1 (1.35) | 0.024* |
| Bleeding | 1 (0.97) | 0 | 1 (1.35) | - |
| Heart failure | 7 (6.8) | 1 (3.45) | 6 (8.11) | 0.6699 |
| CVA | 0 | 0 | 0 | - |
| Reinfarction | 2 (1.94) | 1 (3.45) | 1 (1.35) | 0.4858 |
| Death | 6 (5.82) | 3 (10.34) | 3 (4.05) | 0.3466 |
| Composite MACE | 25 (24.27) | 9 (31.03) | 16 (21.62) | 0.3196 |

ACS: Acute coronary syndrome, CVA: Cerebrovascular accident, MACE: Major adverse cardiovascular events, *P<0.05 statistically significant

**Table 5: Distribution of in-hospital and 30-days outcome among patients of ACS depending on their diagnosis**

| In-hospital outcome | | | | | |
|---|---|---|---|---|---|
| **Clinical outcome** | **Total patients (n=110)** | **STEMI (n=81)** | **NSTEMI (n=20)** | **UA (n=9)** | **P-value** |
| Improved | 81 (73.64) | 57 (70.37) | 17 (85) | 7 (77.78) | 0.3955 |
| Atrial fibrillation | 5 (4.54) | 3 (3.7) | 1 (5) | 1 (11.11) | 0.5957 |
| Ventricular tachycardia | 2 (1.81) | 2 (2.47) | 0 | 0 | - |
| Cardiogenic shock | 7 (6.36) | 5 (6.17) | 2 (10) | 0 | 0.6226 |
| Bleeding | 3 (2.72) | 2 (2.47) | 0 | 1 (11.11) | 0.2735 |
| Heart failure | 10 (9.09) | 10 (12.35) | 0 | 0 | - |
| CVA | 1 (0.91) | 1 (1.23) | 0 | 0 | - |
| Reinfarction | 1 (0.91) | 1 (1.23) | 0 | 0 | - |
| Death | 7 (6.36) | 7 (8.64) | 0 | 0 | - |
| Composite MACE | 29 (26.36) | 24 (29.63) | 3 (15) | 2 (22.22) | 0.3955 |
| **30–days outcome after ACS** | | | | | |
| **Clinical outcome** | **Total patients (n=103)** | **STEMI (n=74)** | **NSTEMI (n=20)** | **UA (n=9)** | **P-value** |
| Improved | 78 (75.73) | 51 (68.92) | 19 (95) | 8 (88.89) | 0.03411* |
| Atrial fibrillation | 7 (6.8) | 7 (9.46) | 0 | 0 | - |
| Ventricular tachycardia | 3 (2.91) | 3 (4.05) | 0 | 0 | |
| Cardiogenic shock | 5 (4.85) | 5 (6.75) | 0 | 0 | - |
| Bleeding | 1 (0.97) | 1 (1.35) | 0 | 0 | - |
| Heart failure | 7 (6.8) | 6 (8.12)) | 0 | 1 (11.11) | 0.5666 |
| CVA | 0 | 0 | 0 | 0 | - |
| Reinfarction | 2 (1.94) | 1 (1.35) | 1 (5) | 0 | 0.3821 |
| Death | 6 (5.82) | 5 (6.75) | 1 (5) | 0 | 1 |
| Composite MACE | 25 (24.27) | 23 (31.08) | 1 (5) | 1 (11.11) | 0.03411* |

STEMI: ST segment elevation myocardial infarction, NSTEMI: Non-ST segment elevation myocardial infarction, UA: Unstable angina, ACS: Acute coronary syndrome, CVA: Cerebrovascular accident, MACE: Major adverse cardiovascular events, *P<0.05 statistically significant

**Table 6: Comparison of mortality during clinical course as per LVEF among patients with ACS**

| Clinical course | LVEF (%) | Total | Improved | Mortality observed | P-value |
|---|---|---|---|---|---|
| In-hospital (n=110) | <30 | 20 (18.18) | 16 (80) | 4 (20) | 0.0172* |
| | 30–49 | 36 (32.73) | 34 (94.44) | 2 (5.55) | |
| | ≥50 | 54 (49.09) | 53 (98.15) | 1 (1.85) | |
| 30 days outcome (n=103) | <30 | 16 (15.53) | 13 (81.25) | 3 (23) | 0.04136* |
| | 30–49 | 34 (33.01) | 32 (94.12) | 2 (5.88) | |
| | ≥50 | 53 (51.46) | 52 (98.11) | 1 (1.92) | |

LVEF: Left ventricular ejection fraction, ACS: Acute coronary syndrome, *P<0.05 statistically significant

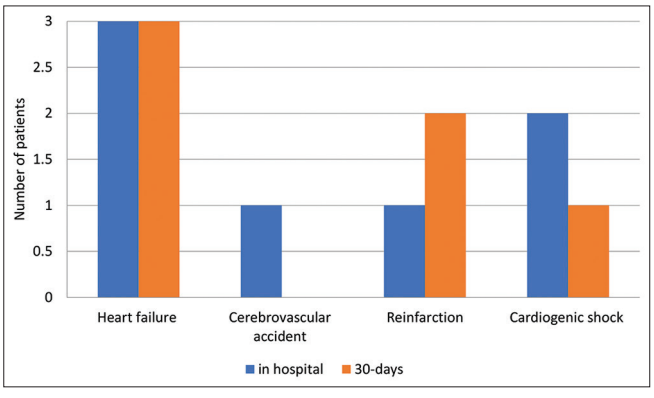


**Figure 1:** Causes of mortality during hospitalization and 30-days after acute coronary syndrome

and obesity (33%), consistent with studies by Sidhu et al.,[20] Sharma et al.,[25] and the CREATE registry.[23] The INTERHEART study conducted in 52 countries highlighted the association of risk factors for ACS as odds ratios, (OR) and population-attributable risks (PAR).[21] The associations were summarized as history of HTN (OR: 1.91, PAR: 17.9%), history of DM (OR: 2.37, PAR: 9.9%), abdominal obesity (OR: 2.87, PAR: 35.7%), and smoking (OR: 1.91, PAR: 17.9%).

In the present study, the average duration of hospitalization was 6.345±2.46 days. Spencer et al., in their population-based study between 1986 and 1999, observed a marked decline in average stay from 11.7 days (1986–1988) to 5.9 days (1997–1999), which can be attributed to better diagnostic aids, an aggressive approach to coronary revascularization, and early rehabilitation.[26] Our majority of patients had STEMI (73.64%), followed by NSTEMI (19.09%). Similar findings were observed by Sidhu et al.[20] Sharma et al.,[24], and the CREATE registry.[23] The electrocardiographic profile revealed anterior wall MI

as the commonest presentation, followed by inferior wall MI, consistent with findings by Sidhu et al.,[20] and Jose and Gupta et al.[27] However, Singh et al. reported a similar frequency of anterior and inferior wall MI among 492 patients in a tertiary care center in Uttarakhand.[28]

In the present study, the majority of the patients were administered dual anti-platelet therapy and statins, similar to studies by Sidhu et al.,[20] the CREATE registry,[23] and the ACCESS study.[22] Only 29.1% of our patients underwent thrombolysis, as per European Society of Cardiology 2017 guidelines.[29] Reteplase was the fibrinolytic agent administered to the majority of patients. The average door-to-needle time was 43.53±7.75 min, which represented a potential blind spot in the access to medical care. The recommended time is 30 min or less for fibrinolytic administration in STEMI patients.[29] De Luca et al. analyzed the association between time to treatment and mortality in 1791 STEMI patients treated with primary angioplasty and concluded that there was a relative risk of 1.075 for 1-year mortality with respect to each 30 min of delay.[30]

In the present study, in-hospital MACE did not vary significantly among the STEMI and NSTEMI groups. However, Sidhu et al. observed significantly higher composite MACE in the STEMI subgroup.[20] Heart failure and cardiogenic shock were seen in 9.09% and 6.36% of patients, respectively, findings consistent with those of Sidhu et al.,[20] the ACCESS study,[22] and the CREATE registry.[23] The overall 30-day mortality rate in the present study was 5.82%, which was significantly lower as compared to a study by Fanta et al.[31] The present study showed higher composite MACE in the STEMI subgroup in the 30-day outcome, similar to findings in the CREATE registry, which attributed poverty, affordability of treatment, and delayed access to hospitals to ACS-associated morbidity and mortality.[23]

In the present study, the mortality rate was significantly higher among ACS patients with severe LV dysfunction (LVEF <30%), as observed in both in-hospital and 30-day outcomes. The findings are consistent with studies by Brezinov et al.,[32] and Yahud et al.,[33] who concluded that LVEF at admission could be an independent predictor of long-term prognosis in ACS. During 5-year follow-up in a single-centric study, Owan et al. observed that patients with preserved LVEF had a higher survival rate as compared to those with reduced LVEF (HR: 0.96; CI: 0.92–1.0, P=0.005).[34] Hence, cardiac function-specific evaluation and risk stratification are critical for a better approach and management of ACS patients. Treatment modalities directed to prevent LVEF reduction seem to prolong survival.[35]

Escalation in ACS incidence and prevalence needs to be addressed with better governance and surveillance systems to capture the disease epidemiology and extrapolate the contribution of cardiometabolic risk factors in ACS.[4] Studies in Western countries on population-based strategies targeting behavioral changes, awareness, capacity building, and quality of cardiovascular care were associated with a substantial decline in cardiovascular mortality and morbidity.[36,37] Thus, it is critical to contemplate health policies and priorities for appropriate implementation of evidence-based tailored interventions taking into consideration the multi-faceted nature of the drivers and determinants of ACS. In India, Ayushman Bharat Health Wellness Centre scheme focuses on preventive aspects of NCDs through comprehensive primary healthcare, health promotion and targeted community participation to achieve 25% reduction in overall mortality from NCDs by 2025.[38]

### Limitations of the study

The present study is subject to a few limitations owing to its observational and cross-sectional design. The data collection was limited to a single hospital, and the sampling method was non-randomized and purposive, which challenged adequate control of confounding factors. This limits the extrapolation of results to the general population. A larger sample size and data collection from multiple centers shall aid in a better study design to quest into the cause and consequences of ACS and implement a comprehensive approach to reduce premature mortality and morbidity from ACS.

## CONCLUSION

The present study revealed that the mean age of presentation was 58.45±9.18 years, a lesser age as compared to Western countries. The mean door-to-needle time was 43.53±7.75 min, representing a significant delay in access to medical care. Anterior wall MI was the commonest pattern of STEMI. Mortality was significantly higher among patients with LVEF <30%. MACE was seen in 1/3$^{rd}$ of patients and was predominantly present in STEMI patients. Thus, the type and severity of ACS, along with clinical presentation, existing risk factors, and access to medical care, play a determining role in the clinical outcome of a patient.

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