

Aging Hearts at Risk: Clinical Spectrum and in-Hospital Mortality in Geriatric Acute Coronary Syndrome

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Abstract: Background: Acute Coronary Syndrome (ACS) is a leading cause of morbidity and mortality worldwide, particularly among the elderly population. Aging is associated with increased cardiovascular risk factors, comorbidities and atypical presentations complicating both diagnosis and management. Aim and Objectives: This study aims to evaluate the clinical presentation, ECG, Echocardiography and outcomes of ACS in elderly patients. Material and Methods: This prospective observational study was conducted at a tertiary care center from October 2021 to September 2022. A total of 50 elderly patients (aged ≥ 65 years) diagnosed with ACS were included. Statistical analysis was conducted using Student's t-test and the chi-square test, considering $p < 0.05$ as significant. **Results:** Among the 50 patients 62% were male and 38% were female. The majority (42%) were aged 65-69 years with a mean age of 71.78 ± 5.13 years. The most common presenting symptom was epigastric pain (82%), followed by breathlessness (64%). Hypertension (62%) and tachycardia (44%) were the most common clinical findings. ECG findings revealed ST elevation in 42% and T-wave inversion in 38%. On 2D echocardiography inferior wall involvement was most frequent (24%) followed by anterior wall involvement and global LV hypokinesia (22%) each. Anterolateral and posterior wall involvement were seen in 14% and 12% of patients respectively. 80.9% of STEMI patients had an ejection fraction (EF) of 21-40% followed by 14.3% with EF $> 40\%$. Among NSTEMI patients 75.86% had an EF of 21-40% while 24.14% had an EF $> 40\%$. Overall mortality was 26% (13 of 50 patients). Mortality was notably higher among patients presenting with cardiogenic shock and congestive heart failure. Conclusion: ACS is a major public health concern in the elderly with rising incidence and frequent atypical presentations that delay diagnosis and treatment. Early intervention and individualized management are essential to improve outcomes. There is a need for elderly-specific clinical trials to optimize treatment strategies, address age-related variability and bridge gaps in acute and invasive care while ensuring safety and efficacy in this population.

Keywords: Acute Coronary Syndrome, Elderly, Risk Factors, Coronary Artery Disease, Clinical Profile, Dyslipidemia, Hypertension, Mortality

1. Introduction

Coronary artery disease (CAD) is now the most common cause of death worldwide and among which most of deaths occurs due to ACS. It represents a spectrum of ischemic myocardial events that share similar pathophysiology, these include unstable angina/non-ST-segment elevation myocardial infarction (UA/NSTEMI), ST-segment elevation myocardial infarction (STEMI) and sudden cardiac death. STEMI is defined as patients with persistent symptoms > 20 min with evidence of ST segment elevation in two contiguous leads on the presenting electrocardiogram (ECG) and elevated cardiac biomarkers. NSTEMI is defined as patients with persistent symptoms > 20 min without evidence of ST segment elevation in two contiguous leads on the presenting ECG and elevated cardiac biomarkers. The patients with symptoms and without evidence of persistent ST segment elevation in two contiguous leads on the presenting ECG and without elevated cardiac biomarkers as evidence of myocardial necrosis are said to have UA [1].

In the United States, the average age of the first episode of an ACS is 65 years in men and 72 years in women. Age is the strongest risk factor for poor outcomes following an ACS. The importance of age as a prognostic marker is reflected in

the majority of ACS risk scores, including the Evaluation of the Methods and Management of Acute Coronary Events (EMMACE) and the Global Registry of Acute Coronary Events (GRACE). Although ACS involves predominantly men in their middle years, the numbers and proportion of women with ACS increase in old age. Mortality rates are higher in older women than men with ACS. NSTEMI-ACS is far more prevalent than STEMI in the older population. Elderly patients with acute coronary syndrome are less likely to present with classic ischemic chest pain and more often exhibit atypical or autonomic symptoms such as dyspnoea, diaphoresis, nausea and vomiting, presyncope or syncope, generalized weakness and altered mental status or confusion. Age and estrogen deficiency are together the most important cause of cardiovascular risk in elderly male and female population respectively [1].

The American Heart Association (AHA) estimates a person has a heart attack every 41 seconds. Ischemic heart disease (IHD) is the greatest single cause of mortality and loss of disability-adjusted life years (DALYs) worldwide, Accounting for roughly 7 million deaths and 129 million DALYs annually [2, 3]. Acute coronary syndromes present major public health and clinical problems in India.

The Million Death Study (India) and the Global Burden of Disease (GBD) Study have reported that ischaemic heart disease (IHD) is the most prevalent cause of mortality and morbidity in the country. Comparative Epidemiological data suggest that India has one of the highest IHD burdens in the world which lead to 1.54 million deaths and 36.99 million DALYs. Mortality at least three-fold higher in patients older than 85 Years compared with the younger than 65 years of age group [4].

2. Materials and Methods

This prospective observational study was conducted at the tertiary care center of Civil Hospital, B.J. Medical College, Ahmedabad, Gujarat, India, from October 2023 to September 2024, following approval from the institutional ethics committee.

A total of 50 elderly patients (aged ≥ 65 years) presenting with acute coronary syndrome (ACS), as defined by the American College of Cardiology (ACC) guidelines were enrolled. Patients with valvular heart disease, congenital cardiac anomalies, coagulation disorders, collagen vascular diseases, thyroid disorders, chronic kidney disease, or those who were critically ill were excluded from the study.

The diagnosis of ACS was established if any two of the following criteria were met:

- 1) Typical chest pain lasting >20 minute
- 2) Classical electrocardiographic (ECG) changes suggestive of ACS
- 3) Elevated cardiac enzyme levels

A comprehensive patient evaluation was performed including demographic details and socioeconomic status assessed by the Kuppaswamy scale along with assessment of clinical outcomes detailed history of presenting complaints thorough examination of vital parameters and mandatory cardiac investigations including cardiac markers ECG echocardiography and coronary angiography.

Data Analysis

All the details were recorded in standard case record form and all this data was entered in Microsoft Excel sheet. Continuous variables were analysed for normalization and compared using the student t test. Inter group comparisons were made using chi-square test. A cut-off value of $p < 0.05$ was considered statistically significant.

3. Observation and Results

A prospective observational study of 50 cases of acute coronary syndrome admitted at tertiary care hospital were studied. The cases had been analysed as follows:

Table 1: Age wise distribution of ACS study subjects (n=50)

Age group	Total no.	Percentage (%)
65-69	21	42.0
70-74	12	24.0
75-79	15	30.0
>80	2	4.0

In this study maximum number of ACS patients (42%) were belong to the age group 65-69 years followed by 24% of cases in the age group of 70-74 years. Mean age was 71.78 ± 5.13 years. Range was 65-87 years. Out of 50 subjects 31 (62%) were male and 19 (38%) were female.

Table 2: Distribution of cases according to clinical features

Clinical features	Number of cases	Percentage (%)
Epigastric pain with nausea and vomiting	41	82.0
Breathlessness	32	64.0
Palpitation	20	40.0
Chest pain	18	36.0
Tachycardia (HR >100)	22	44.0
Bradycardia (HR <60)	3	6.0
Hypertension (BP >140)	31	62.0
Hypotension (BP <90)	3	6.0

Epigastric pain was the commonest symptom (82%) followed by breathlessness in 64%. 36% of patients presented with complain of chest pain. Hypertension (62%) was commonest clinical finding followed by tachycardia in 44%, palpitation was experienced by 40% of patients while Bradycardia and hypotension were found in 6% of patients.

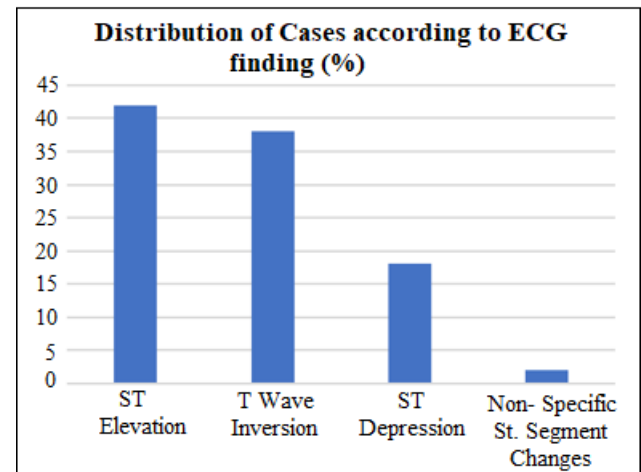


Figure 1: Distribution of cases according to ECG finding

On ECG ST elevation and T wave inversion were the most common finding seen in 42% and 38% subjects respectively. While ST depression was seen in 18% subjects. In 1 patient, Non-specific ST segment changes were seen.

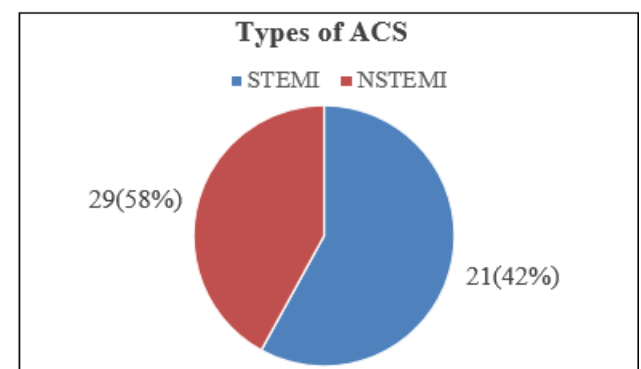


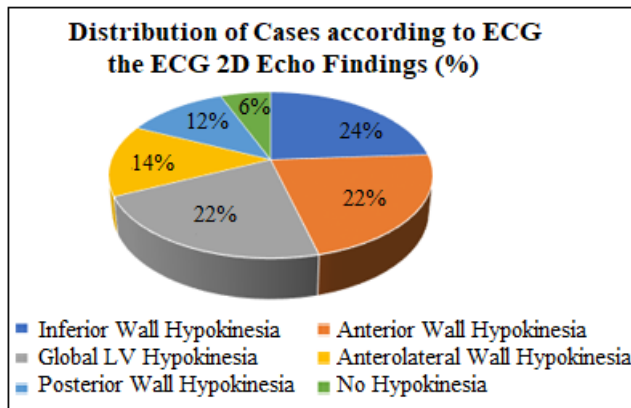
Figure 2: Distribution of cases according to types of ACS

In our study out of 50 patients 21 (42%) developed STEMI and 29 (58%) had NSTEMI.

Table 3: Distribution of cases according to ECG finding

Abnormality in ECG	Number of cases	Percentage (%)
Inferior Wall MI	10	47.5
Anterior Extensive Wall MI	8	37.6
Posterior Wall MI	3	14.9

In this study, inferior wall involvement was the most frequent ECG finding (47.5%) followed by anterior wall involvement (37.6%) while posterior wall involvement was the least frequent occurring in 14.9% of patients.

**Figure 3:** Distribution of cases according to 2D ECHO findings

The above graph showed that inferior wall involvement was the most common finding on 2D echocardiography (24%) whereas posterior wall involvement was the least common (12%). Other findings included anterior wall involvement and global LV hypokinesia each present in 22% of patients and anterolateral wall involvement observed in 14% of patients.

Table 4: Distribution of cases according to ejection fraction

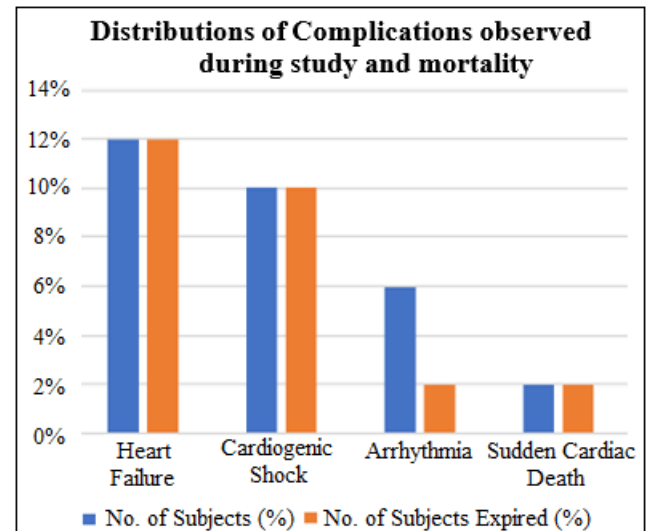
Ejection fraction (%)	Type of ACS	
	NSTEMI	STEMI
≤20	0	1 (4.76%)
21-40	22 (75.86%)	17 (80.9%)
>40	7 (24.14%)	3 (14.3%)

In present study 80.9% of STEMI patients had ejection fraction of 21-40% followed by 14.3 % of patients who had ejection fraction >40%. Among NSTEMI patients 75.86% had ejection fraction between 21-40% followed by 24.14 % of cases with >40% ejection fraction

Table 5: Association of type of intervention with mortality in study subjects

Type of intervention	No of subjects	Alive	Expired	P value
CABG	22 (44%)	20 (90.9%)	2 (9.1%)	0.02
PTCA	28 (56%)	7 (60.7%)	11 (39.3%)	

In our study 28 patients (56%) underwent PTCA whereas the rest underwent CABG. Mortality was significantly higher in subjects in which PTCA was done (39.3%) compared to subjects in which CABG was done (9.1%). The difference was statistically significant (p value = 0.02).

**Figure 4:** Distributions of Complications observed during study and mortality

Complications was developed in 15(30%) subjects. Common complications were Heart failure seen in 6(12%) subjects followed by cardiogenic shock in 5 subjects (10%), arrhythmia (6%) and sudden cardiac death in (2%). Out of 50 subjects 13 (26%) subjects were expired. Death occurs because of complications of ACS. Maximum death occur because of the heart failure (12%) and cardiogenic shock (10%) followed by arrhythmia (2%) and sudden cardiac death (2%)

4. Discussion

Coronary artery disease (CAD) is a multifactorial condition with its incidence increasing significantly with age primarily due to the cumulative effects of both traditional and non-traditional risk factors that accelerate the process of coronary atherosclerosis.

The present study, conducted at a tertiary care center evaluated clinical presentations and outcome of elderly patients presenting with ACS. The mean age of the study population was 71.78 ± 5.13 years which is comparable to the findings of Paudel et al., who reported a mean age of 73.47 ± 5.13 years. In our cohort 62% of the patients were male and 38% female closely aligning with the gender distribution in Paudel et al.'s study (53.8% male, 46.2% female) [5]. The higher proportion of male patients (62%) may be attributed to a greater prevalence of behavioral risk factors such as smoking, alcohol use and dietary habits. Limited representation of individuals above 80 years of age may be due to the small sample size.

Epigastric pain accompanied by nausea and vomiting were the most frequent presenting complaint observed in 82% of cases followed by breathlessness in 64%. In contrast, Paudel et al. reported dyspnea as the most common symptom (49%) followed by nausea and vomiting (24%). This variation may be due to differences in comorbidities, population characteristics and timing of hospital presentation. Notably elderly patients more often presented with atypical symptoms such as epigastric pain which can delay diagnosis and treatment adversely affecting prognosis [6]. According to the data from National Registry of Myocardial Infarction, women, older individuals and diabetics have atypical

symptoms of myocardial ischemia and infarction [7]. The loss of estrogen's cardioprotective effect in postmenopausal women contributes to increased atherosclerosis and ACS risk. However, this association was not reflected in our study possibly due to the limited sample size and higher behavioral risk factors in males. Hypertension and tachycardia were the most commonly observed clinical findings consistent with that of the LADIES ACS study in which 77.9% were hypertensive [8]. NSTEMI was more prevalent (58%) than STEMI (42%), suggesting a trend toward non-ST elevation presentations in the elderly which was comparable with 59% of NSTEMI and 41% of STEMI in Morici et al study [9]. This likely reflects the tendency of older adults to have diffuse, multivessel coronary artery disease rather than a single acute occlusion. Atypical symptom presentation, along with the use of medications such as antiplatelets or anticoagulants for comorbid conditions may further reduce the severity of occlusion, contributing to NSTEMI being the more frequently observed presentation.[9] The most frequent myocardial infarction subtype was inferior wall MI followed by anterior wall and posterior wall which was comparable with PAUDEL R et al study.

Echocardiographic evaluation revealed inferior wall involvement as the most commonly affected region in both STEMI (16%) and NSTEMI (28%) patients, followed by anterior wall involvement (12% in STEMI and 22% in NSTEMI). In contrast, Jacob et al. reported anterior wall myocardial infarction as the predominant pattern in 38% of their study population. Since a major proportion of the myocardium is supplied by the left coronary artery its occlusion is typically associated with a higher incidence of anterior wall myocardial infarction. The variation in infarct distribution observed in the present study may be due to differences in study population characteristics and the relatively small sample size [10].

All patients included in the present study underwent coronary intervention during the index hospitalization. Invasive management of elderly patients with NSTEMI-ACS has been shown to reduce major adverse cardiovascular events, including mortality. In the present study 56% of patients underwent percutaneous transluminal coronary angioplasty (PTCA), while the remaining patients underwent coronary artery bypass grafting (CABG). The overall survival rate was 74%, which is comparable to the outcomes reported by Morici et al. [9] supporting the benefit of early coronary intervention in elderly ACS patients. However, mortality was significantly higher in the PTCA group (39.3%) compared to the CABG group (9.1%) with a statistically significant difference ($p = 0.02$). This difference is likely attributable to selection bias, as PTCA is often performed as a rescue or palliative procedure in elderly patients who are hemodynamically unstable or considered unfit for major surgery. Therefore, the PTCA group likely consisted of higher-risk patients who were already in critical condition, whereas the CABG group included patients who were stable enough to undergo a planned operation. Complications were observed in 30% of patients with heart failure being the most common complication followed by cardiogenic shock which was comparable to those reported by Paudel R et al.

Overall mortality was 26% (13 of 50 patients) with deaths primarily resulting from ACS-related complications. Most fatalities were due to heart failure and cardiogenic shock consistent with the observations of Paudel R et al., mortality was notably higher among patients presenting with cardiogenic shock and congestive heart failure.

5. Conclusion

In conclusion, ACS is a significant public health issue with its incidence and impact increasing in the elderly population. Atypical symptom presentation further complicates timely diagnosis and treatment. Given the high prevalence of ACS in the elderly, early intervention and personalized treatment approaches are crucial for improving outcomes. Elderly-specific clinical trials are essential to enhance treatment strategies and address age-related physiological variability. Additionally it is essential to overcome limitations in acute and invasive care to ensure older patients consistently receive safe, effective and high-quality interventions targeted to their specific needs.

6. Study Limitations

As this was an observational study, the choice between PTCA and CABG was at the discretion of the treating physician based on clinical status. This lack of randomization means the PTCA group may have carried a higher baseline risk, which contributes to the observed mortality gap.

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