

## Gender Differences in Acute Coronary Syndrome Presentation

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### Abstract-

**Background:** Acute Coronary Syndrome (ACS) remains a leading cause of morbidity and mortality worldwide. Previous studies have demonstrated significant gender-based differences in clinical presentation, diagnosis, treatment, and outcomes among patients with ACS. **Objective:** To evaluate gender differences in the clinical presentation of Acute Coronary Syndrome and assess associated demographic and clinical characteristics. **Methods:** A hospital-based observational study was conducted among 200 patients diagnosed with ACS. Patients were categorized into male and female groups. Demographic characteristics, cardiovascular risk factors, presenting symptoms, electrocardiographic findings, and laboratory parameters were compared between the groups. Statistical analysis was performed using appropriate descriptive and inferential methods. **Results:** Of the 200 patients, 130 (65%) were males and 70 (35%) were females. Females were older at presentation ( $64.8 \pm 10.2$  years) compared to males ( $58.6 \pm 9.8$  years). Typical chest pain was more common in males (84.6%) than females (61.4%), whereas atypical symptoms such as dyspnea, fatigue, nausea, and epigastric discomfort were more frequently reported among females. Hypertension and diabetes mellitus were significantly more prevalent among women. ST-elevation myocardial infarction (STEMI) was more common in men, while non-ST-elevation ACS presentations predominated among women. **Conclusion:** Significant gender differences exist in ACS presentation. Women tend to present at an older age with atypical symptoms and a higher prevalence of comorbidities, which may contribute to delays in diagnosis and treatment. Increased awareness of these differences may improve early recognition and management of ACS in women.

**Keywords:** Acute Coronary Syndrome, Gender Differences, Myocardial Infarction, Women, Clinical Presentation.

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### INTRODUCTION

Acute Coronary Syndrome (ACS) encompasses a spectrum of clinical conditions resulting from acute myocardial ischemia, including ST-elevation myocardial infarction (STEMI), non-ST-elevation myocardial infarction (NSTEMI), and unstable angina (UA). Despite significant advances in diagnosis and management, ACS remains one of the leading causes of mortality worldwide and represents a major public health burden. According to the World Health Organization, cardiovascular diseases account for approximately 17.9 million deaths annually, with ischemic heart disease being the predominant contributor to cardiovascular mortality worldwide (1).

Historically, coronary artery disease (CAD) has been considered predominantly a male disease. However, increasing evidence suggests that women experience substantial morbidity and mortality from ACS and often have poorer outcomes than men (2). Gender differences in ACS are evident across multiple domains, including risk factor profiles, symptom presentation, diagnostic evaluation, treatment strategies, and clinical outcomes (3).

The classic symptom of ACS is central or substernal chest pain radiating to the arm, neck, jaw, or back. However, several studies have demonstrated that women frequently present with atypical symptoms such as dyspnea, fatigue, nausea, vomiting, dizziness, weakness, palpitations, and epigastric discomfort (4,5). These atypical manifestations often result in delayed recognition by patients and healthcare providers, leading to delayed hospital presentation and initiation of appropriate therapy (6).

Differences in cardiovascular risk factors also contribute to variations in ACS presentation. Women presenting with ACS are generally older than men and have a higher prevalence of hypertension, diabetes mellitus, obesity, and metabolic syndrome (7). Diabetes mellitus, in particular, has been shown to confer a greater relative risk of coronary artery disease in women compared with men (8).

Biological mechanisms underlying gender differences in ACS are complex and multifactorial. Hormonal influences, endothelial dysfunction, coronary microvascular disease, and plaque erosion have been implicated as important contributors to ischemic heart disease in women (9). Furthermore, women are more likely to have non-obstructive coronary artery disease and microvascular dysfunction, which may influence symptom patterns and diagnostic findings (10).

Several international registries and observational studies have reported that women are less likely to receive guideline-directed therapies, invasive procedures, and timely reperfusion treatment compared to men (11). Consequently, women often experience higher rates of complications, recurrent ischemic events, and mortality following ACS (12).

Recognition of gender-specific differences in ACS presentation is crucial for improving early diagnosis and treatment. Increased awareness among healthcare professionals may facilitate timely intervention and reduce adverse outcomes. Therefore, the present study was conducted to evaluate gender differences in the clinical presentation of ACS and compare demographic characteristics, cardiovascular risk factors, and presenting symptoms between male and female patients.

## **MATERIALS AND METHODS**

A hospital-based observational cross-sectional study was conducted in the Department of Cardiology of a tertiary care teaching hospital over a period of 12 months.

### **Study Population**

Patients admitted with a diagnosis of Acute Coronary Syndrome, including STEMI, NSTEMI, and unstable angina, were enrolled consecutively during the study period.

### **Sample Size**

A total of 200 patients diagnosed with ACS were included in the study.

### **Inclusion Criteria**

1. Age  $\geq 18$  years.
2. Patients diagnosed with ACS based on:
  - Clinical symptoms suggestive of myocardial ischemia.
  - Electrocardiographic changes.
  - Elevated cardiac biomarkers.
3. Patients willing to participate and provide informed consent.

### **Exclusion Criteria**

1. Patients with non-cardiac chest pain.
2. Previous history of congenital heart disease.
3. Severe valvular heart disease.
4. Patients unwilling to participate.

### **Data Collection**

Data were collected using a structured questionnaire and review of medical records.

### **Variables Studied**

#### **Demographic variables**

- Age
- Gender

#### **Cardiovascular risk factors**

- Hypertension
- Diabetes mellitus
- Smoking
- Dyslipidemia
- Family history of CAD

#### **Clinical presentation**

- Typical chest pain
- Dyspnea
- Nausea/vomiting
- Fatigue

- Epigastric discomfort
- Palpitations
- Syncope

#### Diagnostic parameters

- ECG findings
- Cardiac biomarkers (Troponin I/T)
- Echocardiographic findings

#### Diagnostic Criteria

##### STEMI

Persistent ST-segment elevation in two contiguous leads with elevated cardiac biomarkers.

##### NSTEMI

Elevated cardiac biomarkers without persistent ST-segment elevation.

##### Unstable Angina

Symptoms suggestive of myocardial ischemia without biomarker elevation.

#### Statistical Analysis

Data were entered into Microsoft Excel and analyzed using SPSS version 25. Continuous variables were expressed as mean  $\pm$  standard deviation (SD), while categorical variables were expressed as frequencies and percentages. Student's t-test was used to compare continuous variables. Chi-square test was used for categorical variables. A p-value  $<0.05$  was considered statistically significant.

#### Ethical Considerations

The study protocol was approved by the Institutional Ethics Committee. Written informed consent was obtained from all participants before enrollment. Confidentiality and anonymity were maintained throughout the study.

## RESULTS

**Table 1. Demographic Characteristics**

Variable	Male (n=130)	Female (n=70)	p-value
Mean Age (years)	58.6 $\pm$ 9.8	64.8 $\pm$ 10.2	0.001
Age >65 years	42 (32.3%)	36 (51.4%)	0.008

Females presented at a significantly older age compared to males. More than half of the female patients were older than 65 years, highlighting delayed manifestation of coronary artery disease among women.

**Table 2. Distribution of Cardiovascular Risk Factors**

Risk Factor	Male (%)	Female (%)	p-value
Hypertension	60 (46.2)	45 (64.3)	0.01
Diabetes Mellitus	42 (32.3)	35 (50.0)	0.02
Smoking	70 (53.8)	8 (11.4)	$<0.001$
Dyslipidemia	48 (36.9)	30 (42.9)	0.40

Hypertension and diabetes were significantly more prevalent among women, whereas smoking was predominantly observed among men.

**Table 3. Presenting Symptoms**

Symptom	Male (%)	Female (%)	p-value
Typical Chest Pain	110 (84.6)	43 (61.4)	$<0.001$
Dyspnea	30 (23.1)	35 (50.0)	$<0.001$
Fatigue	18 (13.8)	28 (40.0)	$<0.001$
Nausea/Vomiting	15 (11.5)	22 (31.4)	0.001
Epigastric Discomfort	10 (7.7)	18 (25.7)	0.001

Typical chest pain was significantly more common among men. Women frequently presented with atypical symptoms including dyspnea, fatigue, nausea, and epigastric discomfort.

**Table 4. Types of ACS**

Diagnosis	Male (%)	Female (%)	p-value
STEMI	75 (57.7)	25 (35.7)	0.004

NSTEMI	35 (26.9)	28 (40.0)	0.05
Unstable Angina	20 (15.4)	17 (24.3)	0.12

STEMI was significantly more common among men, while women showed a higher frequency of NSTEMI and unstable angina presentations.

## DISCUSSION

The present study evaluated gender differences in the clinical presentation of Acute Coronary Syndrome and demonstrated significant variations in demographic characteristics, cardiovascular risk factors, symptomatology, and ACS subtype distribution between men and women.

Women in the present study presented at a significantly older age than men. Similar findings have been reported in the Global Registry of Acute Coronary Events (GRACE), where women with ACS were approximately 7–10 years older than their male counterparts (13). The delayed onset of coronary artery disease in women has been attributed partly to the protective effects of estrogen before menopause (14).

Hypertension and diabetes mellitus were more prevalent among women in this study. Previous investigations have consistently shown that these comorbidities exert a stronger adverse cardiovascular effect in women than in men (8,15). Diabetes has been reported to increase the risk of coronary artery disease disproportionately in women, contributing significantly to adverse cardiovascular outcomes.

One of the most important findings of the present study was the difference in symptom presentation. Typical chest pain was observed more frequently in men, whereas women commonly presented with atypical symptoms such as dyspnea, fatigue, nausea, vomiting, and epigastric discomfort. These findings are consistent with studies by Canto et al. and DeVon et al., who reported higher rates of atypical symptom presentation among women with myocardial infarction (5,16).

Atypical presentations often contribute to diagnostic delays. Women may not immediately recognize symptoms as cardiac in origin, and healthcare providers may initially attribute symptoms to non-cardiac conditions. Such delays can reduce opportunities for timely reperfusion therapy and worsen outcomes (17).

In the present study, STEMI occurred more frequently in men, while NSTEMI was more common among women. Similar observations have been reported in several large registries (18). Women often exhibit plaque erosion, microvascular dysfunction, and non-obstructive coronary artery disease, which may contribute to different ACS manifestations compared with men (9,10).

Emerging evidence suggests that biological and pathophysiological differences between genders influence both disease development and clinical presentation. Women are more likely to have coronary microvascular dysfunction, endothelial abnormalities, and diffuse atherosclerotic disease rather than focal obstructive lesions (19). These differences may explain variations in symptom patterns and diagnostic findings.

The findings of the present study emphasize the importance of maintaining a high index of suspicion for ACS among women presenting with atypical symptoms. Early recognition and prompt diagnostic evaluation are essential to improve clinical outcomes. Educational initiatives targeting both healthcare providers and the general population may help reduce gender disparities in ACS diagnosis and management.

## CONCLUSION

Significant gender differences exist in the presentation of Acute Coronary Syndrome. Women present at an older age and frequently exhibit atypical symptoms such as dyspnea, fatigue, nausea, and epigastric discomfort, whereas men more commonly report typical chest pain. Women also have a higher prevalence of hypertension and diabetes mellitus. Awareness of these gender-specific differences is essential for timely diagnosis, appropriate treatment, and improved clinical outcomes in ACS patients.

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