Research Article

Insights into Acute Coronary Syndrome: A Study of Patient Characteristics in Dr. Rivai Abdullah Public Hospital

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Received 02 July 2025; Accepted 05 January 2026
https://doi.org/10.23886/ejki.13.1163.1

Abstract

Acute Coronary Syndrome (ACS) remains a leading cause of morbidity and mortality worldwide, with variations in patient characteristics and risk factors across regions. In Indonesia, especially in resource-limited settings, data on the demographic and clinical features of ACS are limited. Such information is crucial for guiding management strategies. This study analyzed secondary data from medical records of 86 ACS patients admitted to Dr. Rivai Abdullah Public Hospital between January and December 2023. This cross-sectional study included new and existing patients with acute coronary syndrome who had complete demographic, clinical, and electrocardiographic data. In contrast, patients with incomplete data or congenital heart disease were excluded. The research was conducted between July and September 2024. Of these patients, 64% were male, and 51.16% were aged 41 to 60 years. Nearly half (46.51%) had only primary education, and 25.58% were farmers or housewives. Hypertension was the most common comorbidity (66.28%), followed by diabetes mellitus (25.58%), obesity (18.60%), and dyslipidemia (5.81%). Electrocardiographic findings showed that 55.81% had ST-elevation myocardial infarction (STEMI), mainly involving the anteroseptal region. Meanwhile, 44.19% had non-ST-elevation myocardial infarction (NSTEMI), with T-wave inversion present in 42.11% of these cases. These results indicate that ACS mainly affects middle-aged males with low education and informal occupations. Hypertension was the leading risk factor, and STEMI was the most common presentation. Targeted prevention and early detection are vital to improving outcomes in this population.
***Keywords**: Electrocardiography, ECG, STEMI, NSTEMI.*

Kajian Sindrom Koroner Akut: Studi Karakteristik Pasien di Rumah Sakit Umum Dr. Rivai Abdullah

Abstrak

Sindrom Koroner Akut (SKA) tetap menjadi salah satu penyebab utama morbiditas dan mortalitas di seluruh dunia, dengan variasi karakteristik pasien dan faktor risiko di berbagai wilayah. Di Indonesia, khususnya pada daerah dengan keterbatasan sumber daya, data mengenai fitur demografis dan klinis SKA masih terbatas. Informasi tersebut sangat penting untuk memandu strategi penatalaksanaan. Penelitian ini bertujuan menganalisis data sekunder dari rekam medis 86 pasien SKA yang dirawat di Rumah Sakit Umum Dr. Rivai Abdullah antara Januari hingga Desember 2023. Studi potong lintang ini mencakup pasien baru maupun lama dengan sindrom koroner akut yang memiliki data demografis, klinis, dan elektrokardiografi lengkap. Pasien dengan data tidak lengkap atau penyakit jantung bawaan dikeluarkan dari penelitian. Penelitian dilakukan antara Juli hingga September 2024. Dari pasien tersebut, 64% berjenis kelamin laki-laki, dan 51,16% berusia 41 hingga 60 tahun. Hampir setengahnya (46,51%) hanya berpendidikan dasar, dan 25,58% bekerja sebagai petani atau ibu rumah tangga. Hipertensi merupakan komorbiditas paling umum (66,28%), diikuti oleh diabetes melitus (25,58%), obesitas (18,60%), dan dislipidemia (5,81%). Temuan elektrokardiografi menunjukkan bahwa 55,81% mengalami infark miokard dengan elevasi segmen ST (STEMI), terutama pada daerah anteroseptal. Sementara itu, 44,19% mengalami infark miokard tanpa elevasi segmen ST (NSTEMI), dengan inversi gelombang T pada 42,11% kasus tersebut.Hasil ini menunjukkan bahwa SKA terutama memengaruhi laki-laki paruh baya dengan tingkat pendidikan rendah dan pekerjaan informal. Hipertensi merupakan faktor risiko utama, dan STEMI adalah presentasi yang paling sering ditemukan. Pencegahan yang terarah serta deteksi dini sangat penting untuk meningkatkan luaran pada populasi ini.
***Kata kunci**: Elektrokardiografi, EKG, STEMI, NSTEMI.*

Introduction

Acute Coronary Syndrome (ACS) is a life-threatening cardiovascular condition that includes unstable angina (UA), non-ST-elevation myocardial infarction (NSTEMI), and ST-elevation myocardial infarction (STEMI).[1] ACS results from acute myocardial ischemia due to sudden reduction or occlusion of coronary blood flow, most commonly caused by thrombus formation following plaque rupture or erosion.[1] Common clinical manifestations include chest pain, dyspnea, diaphoresis, and hemodynamic instability.[1] Diagnosis and risk stratification are primarily based on electrocardiographic (ECG) findings and cardiac biomarkers.[1,2] STEMI is defined by persistent ST-segment elevation indicating transmural infarction, NSTEMI by elevated biomarkers without ST elevation, and UA by ischemic symptoms without biomarker elevation.[1–3] Early ECG evaluation is essential for diagnosis, infarct localization, and risk stratification to guide timely management. [1,3,4]

Globally, ACS remains a leading cause of death and disability. According to the World Health Organization (WHO), cardiovascular diseases accounted for 31% of all deaths worldwide in 2019, with ACS contributing approximately 7.4 million deaths.[5] Projections estimate that this number will rise to over 23 million deaths annually by 2030.[5] In the United States, heart disease accounted for 1 in every five deaths in 2020.[6] In Indonesia, based on the 2018 National Basic Health Research, the prevalence of heart disease diagnosed by a physician was 1.5%, or approximately 1,017,290 individuals.[7] Regional disparities exist; for instance, Papua reported a prevalence of 0.9%, while North Kalimantan had the highest at 2.2%.[7] Despite these figures, comprehensive regional data on ACS patient characteristics remain limited.

Understanding the demographic and clinical trends among ACS patients is essential for multiple reasons. First, patient characteristics such as age, sex, occupation, and comorbidities (e.g., hypertension, diabetes, dyslipidemia) influence both the presentation and prognosis of ACS.[8] Second, differences in infarct types (STEMI vs. NSTEMI), infarct location, and time to hospital presentation directly affect treatment decisions, such as whether to administer fibrinolytic therapy or proceed to percutaneous coronary intervention (PCI).[2,9] Third, studying these patterns can help identify at-risk populations and assess the effectiveness of public health interventions, emergency response systems, and regional healthcare infrastructure.[10–12] However, despite the clinical importance of these data, such information remains limited in South Sumatra and similar resource-limited settings. Given the regional and sociodemographic variability in ACS presentation, hospital-based descriptive studies play a critical role in informing clinical and public health strategies.[13,14] This study aims to characterize the demographic, clinical, and echocardiographic profiles of ACS patients at a hospital in South Sumatra, Indonesia.

Methods

This cross-sectional study was conducted between July and September 2024 using secondary data from medical records of patients diagnosed with acute coronary syndrome (ACS) who were admitted to the inpatient unit of Dr. Rivai Abdullah Public Hospital, South Sumatra, Indonesia, between January 1 and December 31, 2023. The inclusion criteria comprised both newly diagnosed and previously diagnosed patients with acute coronary syndrome who had complete data on age, sex, educational level, socioeconomic status, body weight, height, body mass index (BMI), risk factors, and electrocardiographic findings. Exclusion criteria include patients with incomplete data on these variables and those with congenital heart disease. A total sampling method was used, yielding 86 eligible patient records. In cases of multiple hospital visits, only data from the initial admission were included to avoid duplication. Data were collected retrospectively from hospital medical records and included sociodemographic characteristics, clinical profiles, and electrocardiographic findings. Ethical approval was obtained from the Medical and Health Research Ethics Committee of the Faculty of Medicine, Universitas Sriwijaya (Certificate No. 155-2024). Data were processed and analyzed descriptively using Microsoft Excel and IBM SPSS

Statistics version 27. Body mass index (BMI) was calculated as body weight in kilograms divided by height in meters squared (kg/m²). Descriptive statistics included frequencies and percentages for categorical variables and means and standard deviations for continuous variables, with results presented in tables and in narrative form.

Results

Overall, patients with ACS in this study were predominantly male and middle-aged, with most cases occurring in the 41–60-year age group (Table 1). An increasing proportion of female patients was observed with advancing age (Figure 1). Most participants had a low to moderate level of education and were engaged primarily in informal or domestic occupations (Table 1). Variations in body mass index were evident, with most patients falling within the normal category (Table 1).

Age- and sex-stratified analyses revealed distinct presentation patterns between STEMI and NSTEMI (Figure 1). While both conditions were most frequently observed in the 51–60-year age group, STEMI predominated at younger ages, whereas NSTEMI showed a relative shift toward older age groups (Figure 1A). A clear sex-related difference was also evident, with STEMI occurring more frequently in males and NSTEMI being relatively more common among females (Figure 1B). When age and sex were examined simultaneously, STEMI incidence in males increased from younger age groups to a peak at 51–60 years, then declined. In contrast, NSTEMI showed a progressive increase with advancing age (Figure 1C). In females, both STEMI and NSTEMI followed a similar age-related pattern, peaking in the 51-60 year age group and decreasing thereafter (Figure 1C). Notably, the onset of both STEMI and NSTEMI occurred later in females than in males, with no cases observed before 41–50 years in women, whereas men presented with ACS from early adulthood (Figure 1C). These findings indicate sex-related differences in the age of onset and age-specific distribution of ACS subtypes.

Table 1. Characteristics of Patients with ACS

Sociodemographic Characteristic	Frequency (n)	Percentage (%)
Sex		
Male	55	63.95
Female	31	36.05
Age (years)		
18-40	9	10.47
41-60	44	51.16
>60	33	38.37
Education		
No education	8	9.30
Primary school	40	46.51
Middle school	10	11.63
High school	23	26.74
University	5	5.81
Occupation		
Unemployed	9	10.47
Housewife	22	25.58
Farmer	22	25.58
Laborer	17	19.77
Self-employed	10	11.63
Government worker	6	6.97
Body mass index		
Severe underweight	0	0
Mild underweight	2	2.33
Normal weight	55	63.95
Mild overweight	13	15.12
Severe overweight (obesity)	16	18.60

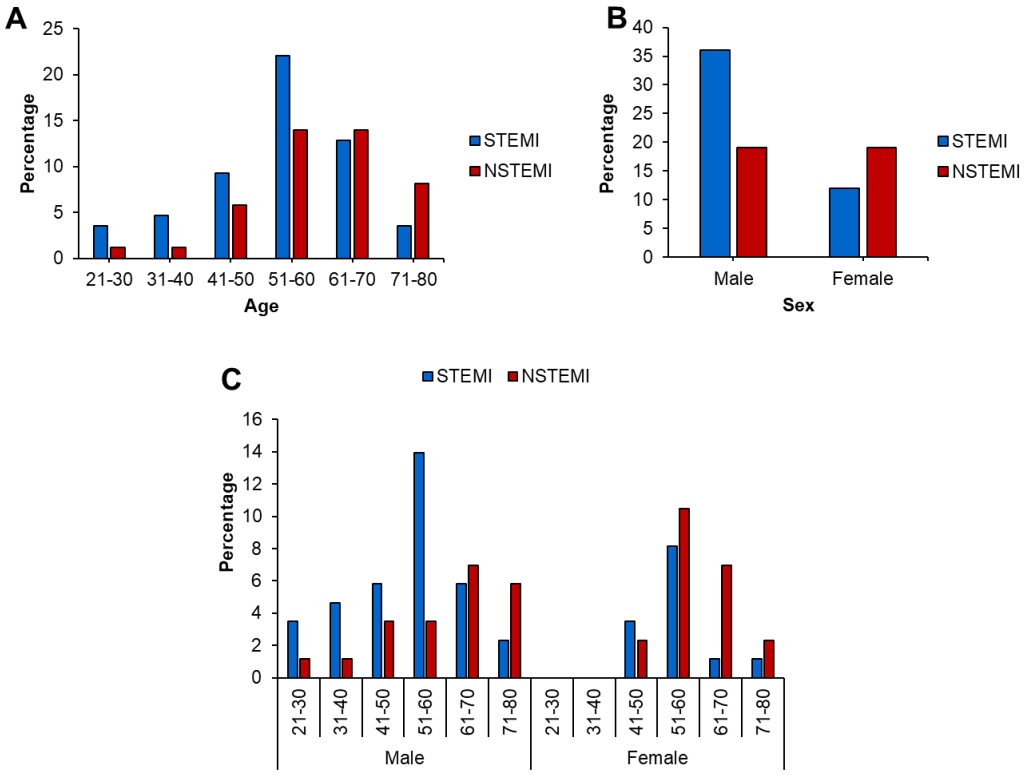

Figure 1. Distribution of ACS Stratified by (A) Age, (B) Sex, as well as (C) Age and Sex

The distribution of cardiovascular risk factors varied by age and sex (Figure 2). Hypertension became more common with increasing age and was the dominant risk factor in middle-aged and older patients (Figure 4A). In younger patients, metabolic risk factors such as dyslipidemia and obesity were more frequently observed (Figure 2A). Sex-based clustering showed that dyslipidemia, obesity, and hypertension were more prevalent in males, whereas diabetes mellitus occurred at a similar frequency in both sexes (Figure 2B).

Our study also observed that electrocardiographic patterns differed between patients with STEMI and NSTEMI (Table 2). STEMI was consistently characterized by ST-segment elevation and was mainly associated with involvement of the anterior myocardial region (Table 2). In contrast, NSTEMI showed a more varied ECG presentation, including normal findings and various types of ischemic changes. The distribution of infarct locations in NSTEMI was also more diverse compared with STEMI, which tended to affect specific myocardial regions. Overall, these results indicate that STEMI presents with more uniform ECG findings and infarct locations, whereas NSTEMI shows greater variability (Table 2).

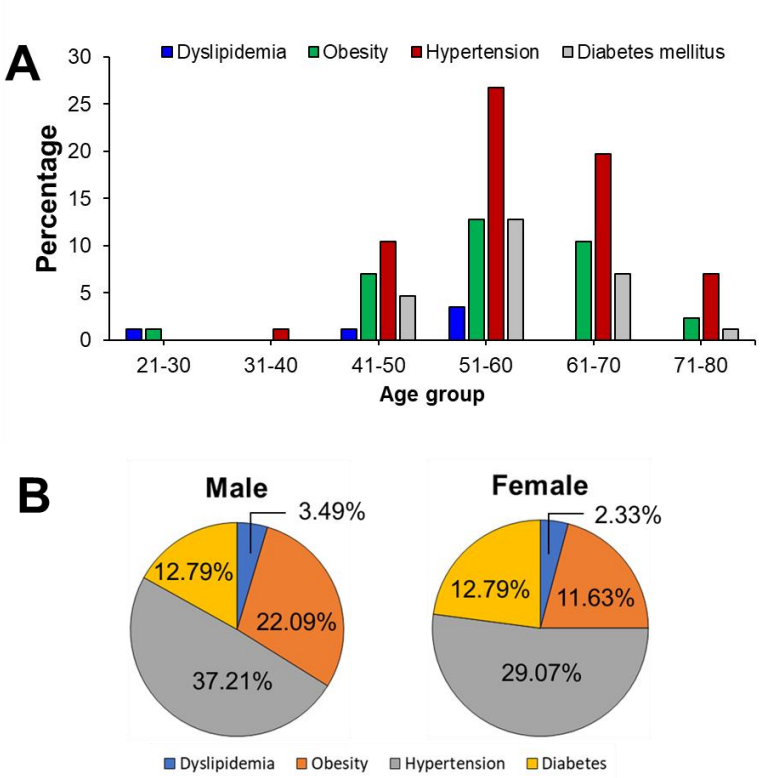

Figure 2. Distribution of Risk Factor based on (A) Age and (B) Sex

Table 2. ECG Findings and Infarct Location

	Diagnosis	Category	Frequency	Percentage* (%)
ECG finding	**STEMI**	ST elevation	48	100
	NSTEMI	Normal	10	26.32
		ST depression	2	31.58
		T inversion	16	42.11
Infarct location	**STEMI**	Anterior	6	12.5
		Anterior extensive	3	6.25
		Anteroseptal	29	60.42
		Inferior	10	20.83
	NSTEMI	Anterior	2	5.26
		Anterior extensive	4	10.53
		Anteroseptal	4	10.53
		Anterolateral	4	10.53
		Lateral	5	13.16
		Inferior	9	23.68

*Calculated based on the total number of patients diagnosed with STEMI (n=48) or NSTEMI (n=38)

Discussion

In this study, more than 60% of patients with ACS had a normal body mass index (BMI), which contrasts with previous reports identifying overweight and obesity (BMI >23 kg/m²) as the most important risk factors for ACS (>60%).[15,16] In contrast, our study found that most patients had normal BMI (>60%). This discrepancy may be explained by limitations of BMI as a marker of cardiovascular risk, as it does not reflect fat distribution. Individuals with normal BMI may still have excess visceral fat, which is strongly associated with cardiovascular risk.[17,18] Studies have shown that normal-weight individuals with central obesity have a higher risk of mortality than those with similar BMI but without central fat accumulation.[19] In addition, low muscle mass, underdiagnosis or undertreatment of risk factors such as hypertension and dyslipidemia, systemic inflammation, metabolic abnormalities, and genetic predisposition may further increase cardiovascular risk independent of BMI.[20,21] Therefore, reliance on BMI alone may underestimate true cardiovascular risk, highlighting the need for more comprehensive assessments, including waist circumference, inflammatory markers, and metabolic profiles.[17,18,20]

A previous study reported that despite males having an overall higher risk of STEMI, females aged 30-49 years had a higher risk of anterior STEMI than males.[22] The underlying mechanisms contributing to gender disparities in outcomes following STEMI remain incompletely understood, but are thought to involve differences in the coagulation–fibrinolytic system, inflammatory response, platelet function, extracellular matrix remodeling, and endothelial physiology, as well as variations in cardiovascular risk factors and lifestyle behaviors.[23–25] ACS in males, particularly STEMI, is strongly associated with inflammatory markers.[24,26] In females, however, ACS appears more closely linked to coagulation-related processes, especially in NSTEMI.[24,26] Females with metabolic syndrome have also been reported to have a higher cardiovascular risk than males, possibly due to differences in adiposity and insulin resistance.[27] Supporting this, previous studies have described sex-related differences in platelet, metabolic, and biomarker profiles, with females showing greater involvement of inflammatory and metabolic pathways and males showing stronger platelet-related signaling.[27–29] These differences appear to diminish after menopause, which may contribute to the increased cardiovascular risk in older females. [26,29]

In our study, we found that females presenting with ACS for the first time are generally older than males, with the youngest cases occurring at 46 and 48 years, which corresponds to the typical age of menopause.[30] This finding is consistent with a previous study reporting that women develop ACS approximately 10 years later than men.[31] Although menopause has been suggested to contribute to this delay, a definitive association between estradiol levels and ACS has not been established, and hormone replacement therapy has not been shown to reduce cardiovascular risk.[31] Females are more likely to exhibit plaque erosion and coronary microvascular dysfunction, which may partly explain the higher occurrence of NSTEMI compared to males.[31] Despite a lower overall incidence of STEMI, women with STEMI often present with more severe disease and have higher in-hospital mortality, particularly in cases of anterior STEMI.[16,32,33] Delays in symptom recognition and treatment, as well as sex-related differences in symptom presentation, may contribute to this disparity.[16]

Patients presenting with ACS were more often found with hypertension and diabetes mellitus, both peaking at 51-60 years old. In general, dyslipidemia, hypertension, and obesity are more often found in males. However, the number of patients with diabetes mellitus is equal in both sexes. Although diabetes mellitus presents equal risk for coronary artery disease in both sexes, it has been reported to be a strong risk factor for females.[26,27] These findings are consistent with previous Indonesian and regional studies.[33] However, interpretation of risk factor patterns in this study is limited by incomplete medical record documentation, especially for smoking status and family history of coronary artery disease.[16]

The anterior septal region is the most frequently affected area in STEMI due to its primary blood supply from the left anterior descending (LAD) artery, which is the first major branch of the left coronary artery supplying the anterior wall of the left ventricle.[34] In this study, the anterior septal region of the heart was the most frequent site of STEMI, consistent with existing evidence that occlusion of the left anterior descending artery, which is most commonly involved in STEMI, typically results in infarctions in this area.[35] In contrast, NSTEMI is diagnosed primarily on the basis of elevated cardiac biomarkers rather than characteristic ECG changes.[2] Accordingly, our study relies heavily on retrospective review of medical records, and ECG findings alone may not fully capture the presence or pattern of myocardial injury in NSTEMI patients. This likely explains why most NSTEMI cases in our cohort did not show apparent ECG abnormalities. Our study did not identify ECG abnormalities in most NSTEMI patients, consistent with previous studies.[4] In this study, the inferior region of the heart, which is primarily supplied by the right coronary artery, was the second most common site of infarction in NSTEMI patients.[34] This contrasts with previous studies suggesting that the left circumflex coronary artery is the most frequently involved vessel in NSTEMI.[36,37] Culprit lesions of most NSTEMI patients with normal ECGs (78.1%) are often unidentifiable on coronary angiography, whereas a fair percentage (51.5%) exhibit normal ECG despite the presence of an identifiable culprit lesion on coronary angiography, thus highlighting the limited sensitivity of ECG.[4]

One important limitation of this study is its dependence on medical record data, which resulted in incomplete documentation of several cardiovascular risk factors, particularly smoking status and family history of coronary artery disease.[17] In addition, laboratory biomarkers and imaging data were not available for all patients, limiting further assessment of underlying pathophysiological mechanisms. These limitations should be considered when interpreting the findings and may affect the generalizability of the results.

Conclusion

This study highlights that ACS predominantly affects middle-aged males, individuals with low education, and individuals in non-professional occupations, such as housewives and farmers. Hypertension was the most prevalent risk factor, followed by diabetes mellitus, obesity, and dyslipidemia. STEMI was more common than NSTEMI, with anteroseptal infarction as the predominant site. These findings emphasize the need for targeted prevention and early detection strategies to improve cardiovascular outcomes in similar populations.

Ethics Statement

This study was approved by the ethics committee of the Faculty of Medicine, Universitas Sriwijaya, with ethical clearance certificate No. 155-2024.

Consent for Publication

Not applicable.

Conflict of Interest

None.

Authors' Contributions

ZZ contributed to the study's conception and design, data collection, data analysis, and manuscript drafting. EA was involved in data collection, data interpretation, and manuscript drafting. AAR contributed to data analysis, result interpretation, and manuscript editing. All authors reviewed and approved the final version of the manuscript.

Funding

The authors received no funding for this study.

Acknowledgement

The authors thank Dr. Rivai Abdullah Public Hospital for granting permission to conduct this research.

Availability of Data and Materials

Data are available upon request.

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