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*Original Article*

# Pattern of Coronary Disease Burden in Patients With STEMI Versus Other ACS Modalities i.e., NSTEMI and Unstable Angina

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## ABSTRACT

Background: Acute coronary syndrome (ACS) includes ST-elevation myocardial infarction (STEMI), non-ST-elevation myocardial infarction (NSTEMI), and unstable angina. Coronary angiography helps define the anatomical burden of disease and supports clinical decision-making. Objective: To determine the pattern of coronary disease burden among patients presenting with STEMI and other ACS modalities, including NSTEMI and unstable angina. Methods: This descriptive cross-sectional study was conducted in the Department of Cardiology, Bolan Medical College/Hospital, Quetta, from March 5, 2024, to November 19, 2024. A total of 145 patients with ACS underwent clinical assessment and coronary angiography. Data were analyzed using SPSS version 23.0. Continuous variables were reported as mean ± standard deviation, while categorical variables were reported as frequencies and percentages. Results: The mean age was 56.08 ± 5.41 years, mean body mass index was 26.94 ± 1.58 kg/m², and mean symptom duration was 5.11 ± 1.72 hours. STEMI was the most frequent presentation, observed in 84 patients (57.9%), followed by unstable angina in 43 (29.7%) and NSTEMI in 18 (12.4%). Double-vessel disease was the most common angiographic pattern, seen in 68 patients (46.9%), followed by single-vessel disease in 28 (19.3%), multiple-vessel disease in 23 (15.9%), triple-vessel disease in 22 (15.2%), and left main coronary disease in 4 (2.8%). Conclusion: STEMI was the most common ACS presentation, and double-vessel disease was the predominant angiographic pattern. The findings indicate a substantial burden of coronary involvement beyond isolated single-vessel disease among ACS patients. Keywords: Acute Coronary Syndrome; ST Elevation Myocardial Infarction; Non-ST Elevated Myocardial Infarction; Angina, Unstable; Coronary Angiography; Coronary Artery Disease; Myocardial Ischemia; Percutaneous Coronary Intervention; Cardiovascular Risk Factors; Pakistan.

## INTRODUCTION

Acute coronary syndrome (ACS) represents a spectrum of acute myocardial ischemic conditions that includes ST-elevation myocardial infarction (STEMI), non-ST-elevation myocardial infarction (NSTEMI), and unstable angina. These entities differ in electrocardiographic pattern, biomarker profile, clinical urgency, and expected angiographic burden, but all remain major contributors to cardiovascular morbidity and mortality worldwide. Recent global evidence shows that ACS mortality remains unevenly distributed across regions, with a greater burden in lower-income and many Asian settings, while contemporary definitions emphasize the integration of symptoms, electrocardiographic findings, and cardiac biomarkers for accurate myocardial infarction classification (1,2). Current ACS guidelines also emphasize early risk stratification and appropriate invasive evaluation because coronary anatomy strongly influences prognosis and revascularization planning (3).

Coronary angiography remains central to defining the anatomical burden of coronary artery disease in ACS. The identification of single-vessel disease, double-vessel disease, triple-vessel disease, multivessel disease, and left main coronary involvement provides clinically meaningful information for treatment selection, procedural planning, and long-term secondary prevention. This is particularly important in patients with NSTEMI and unstable angina, where the clinical presentation may be less dramatic than STEMI but the underlying coronary disease burden may still be extensive. Previous literature indicates that NSTEMI patients frequently have comorbid conditions and a high likelihood of multivessel disease, while the optimal management strategy for non-culprit disease in NSTEMI remains less clearly established than in STEMI (4). Real-world data also show that NSTEMI with multivessel disease is common and clinically important, reinforcing the need for population-specific angiographic data (5).

Despite increasing international evidence, local data describing the angiographic pattern of coronary disease burden among ACS patients in Pakistan, particularly in Balochistan, remain limited. This gap is important because regional differences in risk-factor distribution, healthcare access, delayed presentation, referral pathways, and catheterization availability may influence the observed pattern of coronary involvement. The present study was therefore designed to determine the pattern of coronary disease burden among patients presenting with ACS at a tertiary care hospital in Quetta. In response to peer-review feedback, the study objective has been refined to match the available descriptive dataset: the aim is to describe the overall angiographic distribution of coronary disease burden among ACS patients, rather than to claim unsupported subgroup comparison between STEMI, NSTEMI, and unstable angina.

## MATERIALS AND METHODS

This descriptive cross-sectional observational study was conducted in the Department of Cardiology, Bolan Medical College/Hospital, Quetta, from 05 March 2024 to 19 November 2024. The study was designed to evaluate the angiographic pattern of coronary disease burden among patients presenting with acute coronary syndrome and was reported in accordance with core recommendations for transparent observational research reporting (6). The study setting was a tertiary care cardiology unit receiving patients from both emergency and outpatient pathways, including urban and rural catchment areas.

Patients presenting with a clinical diagnosis of ACS were assessed for eligibility and enrolled after informed consent was obtained from the patient or attendant. ACS was categorized as STEMI, NSTEMI, or unstable angina according to the treating cardiology team's clinical diagnosis based on symptoms, electrocardiographic findings, and available cardiac biomarker assessment. Participants underwent detailed clinical examination followed by coronary angiography in a single catheterization laboratory session. All angiographic procedures were performed at the hospital cath lab under the supervision of a consultant interventional cardiologist with at least seven years of post-fellowship experience, which helped standardize procedural assessment and reduce inter-operator variability.

Data were collected using a predesigned structured proforma. The recorded variables included age, gender, body mass index, duration of symptoms, residence, occupation status, social class, educational status, lifestyle, smoking status, hypertension, dyslipidemia, type of ACS, family history of ACS, and angiographic pattern of coronary disease burden. Coronary disease burden was recorded according to angiographic involvement as single-vessel disease, double-vessel disease, triple-vessel disease, multiple-vessel disease, or left main coronary disease. To improve internal consistency after peer-review feedback, the revised analysis treats the study as a descriptive angiographic burden study because the available results do not provide cross-tabulated subgroup data comparing coronary disease burden separately across STEMI, NSTEMI, and unstable angina.

Data were entered and analyzed using SPSS version 23.0. Continuous variables, including age, body mass index, and duration of symptoms, were summarized as mean and standard deviation. Categorical variables, including gender, hypertension, residence, social class, lifestyle, dyslipidemia, smoking status,

type of ACS, family history of ACS, and angiographic disease-burden category, were summarized as frequencies and percentages. Where appropriate, 95% confidence intervals may be added for proportions to improve interpretability. Although the original analysis plan mentioned stratification and post-stratification chi-square testing, inferential subgroup comparisons should only be reported if complete cross-tabulated data and valid p-values are available. In the absence of those subgroup results, the revised manuscript should avoid claiming statistically tested differences between ACS subtypes. Ethical approval was obtained from the hospital ethical committee before data collection. Participants or their attendants were informed about the purpose of the study before consent was obtained. Data integrity was supported by use of a uniform data-collection proforma, single-center procedural documentation, consultant-supervised angiographic assessment, and analysis using a predefined statistical software platform.

## RESULTS

A total of 145 patients with acute coronary syndrome were included in the study. The mean age was 56.08 ± 5.41 years, the mean body mass index was 26.94 ± 1.58 kg/m², and the mean duration of symptoms before presentation was 5.11 ± 1.72 hours. Most patients were younger than 60 years, comprising 126 participants (86.9%), while 19 patients (13.1%) were older than 60 years.

*Table 1. Continuous study variables among patients with acute coronary syndrome*

| Variable | Mean ± SD |
|---|---|
| **Age, years** | 56.08 ± 5.41 |
| **Body mass index, kg/m²** | 26.94 ± 1.58 |
| **Duration of symptoms, hours** | 5.11 ± 1.72 |

*Table 2. Baseline demographic and clinical characteristics of the study population*

| Variable | Frequency | Percentage |
|---|---|---|
| **Age <60 years** | 126 | 86.9 |
| **Age >60 years** | 19 | 13.1 |
| **Male** | 87 | 60.0 |
| **Female** | 58 | 40.0 |
| **Hypertension present** | 54 | 37.2 |
| **Hypertension absent** | 91 | 62.8 |
| **Urban residence** | 41 | 28.3 |
| **Rural residence** | 104 | 71.7 |
| **Poor social class** | 21 | 14.5 |
| **Middle social class** | 80 | 55.2 |
| **Rich social class** | 44 | 30.3 |
| **Sedentary lifestyle** | 58 | 40.0 |
| **Active lifestyle** | 87 | 60.0 |
| **Dyslipidemia present** | 57 | 39.3 |
| **Dyslipidemia absent** | 88 | 60.7 |
| **Smoker** | 49 | 33.8 |
| **Non-smoker** | 96 | 66.2 |
| **Family history of ACS present** | 60 | 41.4 |
| **Family history of ACS absent** | 85 | 58.6 |

Male patients constituted the majority of the cohort, with 87 cases (60.0%), while 58 patients (40.0%) were female. Hypertension was present in 54 patients (37.2%), dyslipidemia in 57 patients (39.3%), smoking history in 49 patients (33.8%), and a positive family history of acute coronary syndrome in 60 patients (41.4%). Rural residence was common, reported in 104 patients (71.7%), compared with 41 patients (28.3%) from urban areas. Regarding socioeconomic status, 21 patients (14.5%) belonged to the poor social class, 80 (55.2%) to the middle social class, and 44 (30.3%) to the rich social class. An active lifestyle was reported by 87 patients (60.0%), while 58 patients (40.0%) had a sedentary lifestyle.

STEMI was the most frequent clinical presentation, observed in 84 patients (57.9%), followed by unstable angina in 43 patients (29.7%) and NSTEMI in 18 patients (12.4%). On coronary angiography, double-

vessel disease was the most common angiographic pattern, identified in 68 patients (46.9%). Single-vessel disease was observed in 28 patients (19.3%), multiple-vessel disease in 23 patients (15.9%), triple-vessel disease in 22 patients (15.2%), and left main coronary disease in 4 patients (2.8%). These findings indicate that coronary involvement beyond isolated single-vessel disease was common in this ACS cohort.

*Table 3. Clinical presentation and angiographic disease burden*

| Variable | Frequency | Percentage |
|---|---|---|
| **STEMI** | 84 | 57.9 |
| **NSTEMI** | 18 | 12.4 |
| **Unstable angina** | 43 | 29.7 |
| **Single-vessel disease** | 28 | 19.3 |
| **Double-vessel disease** | 68 | 46.9 |
| **Triple-vessel disease** | 22 | 15.2 |
| **Multiple-vessel disease** | 23 | 15.9 |
| **Left main coronary disease** | 4 | 2.8 |

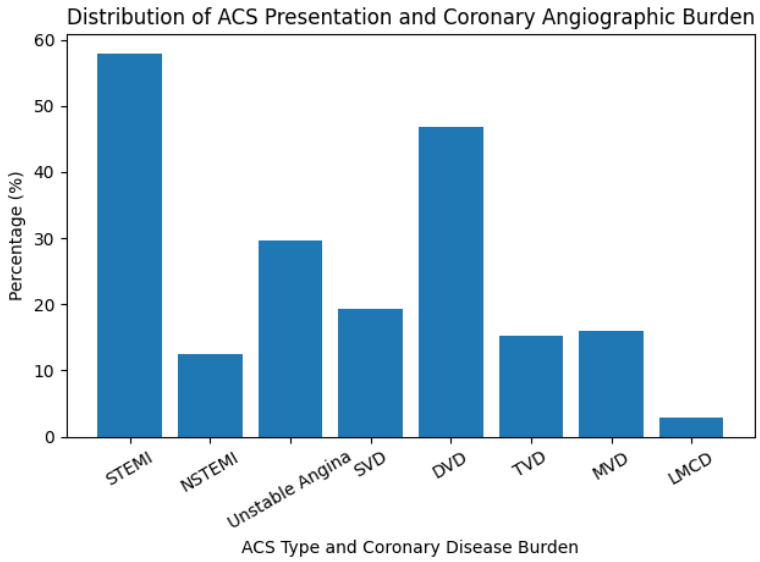


*Figure 1 Distribution of ACS Presentation and Coronary Angiographic Burden*

Bar chart showing the distribution of acute coronary syndrome (ACS) subtypes and angiographic coronary disease burden among the study population (n = 145). STEMI was the most frequent clinical presentation (57.9%), while double-vessel disease (DVD) was the most common angiographic finding (46.9%). SVD = single-vessel disease, TVD = triple-vessel disease, MVD = multivessel disease, LMCD = left main coronary disease.

## DISCUSSION

The present study describes the clinical presentation and angiographic coronary disease burden among patients presenting with acute coronary syndrome at a tertiary care hospital in Quetta. The principal finding was that STEMI was the most frequent ACS presentation, while double-vessel disease was the most common angiographic pattern. This indicates that a substantial proportion of patients in this cohort presented with coronary involvement beyond isolated single-vessel disease, emphasizing the clinical value of angiographic assessment in defining disease extent and guiding subsequent management.

The mean age of the cohort was 56.08 years, and most patients were younger than 60 years. This suggests that ACS in this setting commonly affects middle-aged adults, which has important socioeconomic implications because this age group often represents an active working population. The predominance of male patients is consistent with the established pattern of higher clinically apparent coronary artery disease burden among men, although the 40.0% female representation also confirms that ACS remains a clinically important problem among women. The mean BMI of 26.94 kg/m² indicates that the average

patient was overweight, which may contribute to the clustering of cardiometabolic risk factors observed in the study.

Conventional cardiovascular risk factors were common in this cohort. Hypertension was present in 37.2% of patients, dyslipidemia in 39.3%, smoking in 33.8%, and family history of ACS in 41.4%. These findings are clinically relevant because they reinforce the continuing contribution of modifiable and non-modifiable risk factors to ACS presentation. Dyslipidemia and hypertension are central drivers of atherosclerotic cardiovascular disease, while smoking remains strongly associated with endothelial dysfunction, thrombosis, plaque instability, and acute ischemic events. The presence of a positive family history in more than two-fifths of patients further supports the role of inherited susceptibility and shared environmental risk exposure in coronary disease presentation.

STEMI was the most frequent clinical subtype in the present study, accounting for 57.9% of ACS cases. This may reflect the tendency of patients with more dramatic symptoms and acute electrocardiographic changes to present to tertiary care facilities, but it may also be influenced by local referral pathways, emergency access, and care-seeking behavior. Since this was a hospital-based study, the observed distribution should not be interpreted as the community prevalence of ACS subtypes. Nevertheless, the high proportion of STEMI highlights the need for efficient emergency triage, rapid electrocardiographic diagnosis, timely reperfusion planning, and coordinated catheterization services.

The most important angiographic finding was the predominance of double-vessel disease, which was observed in 46.9% of patients. This suggests that many patients presenting with ACS in this setting have a broader atherosclerotic burden rather than disease limited to one coronary territory. Single-vessel disease accounted for 19.3% of cases, while triple-vessel disease, multiple-vessel disease, and left main coronary disease collectively represented a clinically important burden of more extensive coronary involvement. Left main coronary disease was uncommon, but its presence in even a small proportion of patients remains clinically significant because of its association with higher-risk anatomy and more complex management decisions.

The findings must be interpreted in light of the descriptive nature of the available data. Although the original manuscript framing suggested comparison of coronary disease burden between STEMI, NSTEMI, and unstable angina, the provided results do not include subgroup-wise angiographic distributions by ACS type. Therefore, it would not be methodologically appropriate to claim that any specific ACS subtype had a significantly greater burden of single-vessel, double-vessel, triple-vessel, or left main disease. The revised manuscript therefore presents the study as a descriptive angiographic burden analysis, which is more consistent with the available dataset and avoids unsupported inferential claims.

The study has several limitations. First, the cross-sectional design limits causal interpretation and does not allow assessment of clinical outcomes such as mortality, recurrent myocardial infarction, heart failure, or need for repeat revascularization. Second, the single-center setting may limit generalizability to other hospitals or regions. Third, the available analysis is descriptive and lacks subgroup-wise angiographic comparison between STEMI, NSTEMI, and unstable angina. Fourth, the category “multiple-vessel disease” overlaps conceptually with double-vessel and triple-vessel disease; future studies should define multivessel disease more explicitly, preferably as involvement of two or more major epicardial coronary arteries, while separately reporting two-vessel and three-vessel disease. Finally, the study does not report lesion-specific details, culprit artery distribution, stenosis severity, or revascularization strategy, all of which would strengthen future analyses.

Despite these limitations, the study provides useful local evidence regarding the angiographic burden of coronary artery disease among ACS patients in Quetta. The predominance of double-vessel disease and the substantial frequency of conventional cardiovascular risk factors support the need for integrated preventive cardiology, early risk-factor detection, and structured ACS care pathways. Future research

should include larger multicenter samples, standardized angiographic definitions, subgroup-wise comparison across ACS phenotypes, and follow-up data to assess how angiographic burden influences treatment strategy and clinical outcomes.

## CONCLUSION

In this cohort of 145 patients presenting with acute coronary syndrome, STEMI was the most common clinical presentation, and double-vessel disease was the most frequent angiographic pattern. Coronary involvement beyond isolated single-vessel disease was common, suggesting a substantial burden of anatomically significant coronary artery disease among ACS patients managed at this tertiary care center in Quetta. The findings support the importance of early coronary angiographic assessment in appropriately selected ACS patients and highlight the need for stronger risk-factor prevention strategies targeting hypertension, dyslipidemia, smoking, overweight status, and family-risk awareness. However, because subgroup-wise angiographic data by ACS subtype were not available in the reported results, the study should not claim statistically significant differences in coronary disease burden between STEMI, NSTEMI, and unstable angina. Future studies should be designed as multicenter analytical investigations with predefined angiographic definitions, subgroup-wise comparison across ACS types, culprit-vessel identification, stenosis severity grading, revascularization details, and short- and long-term clinical outcomes. Such data would allow more robust evaluation of how ACS subtype relates to coronary disease burden and treatment planning in the local population.

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