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Original Article

Frequency and Demographic Distribution of Atypical Presentation Among Patients with Acute Coronary Syndrome Presenting to a Tertiary Cardiac Center in Multan

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ABSTRACT

Background: Acute coronary syndrome commonly presents with chest discomfort, but a clinically important proportion of patients present with dyspnea, fatigue, epigastric discomfort, nausea, syncope, dizziness, back pain, or silent ischemia, which may delay recognition and treatment. Objective: To determine the frequency of atypical presentation among patients with acute coronary syndrome and assess its distribution across demographic and clinical groups. Methods: This descriptive cross-sectional study was conducted at Chaudhry Pervaiz Elahi Institute of Cardiology, Multan, from December 2024 to May 2025. A total of 216 adults with confirmed acute coronary syndrome were enrolled by non-probability consecutive sampling. Atypical presentation was defined as atypical chest pain, dyspnea, fatigue, abdominal or epigastric pain, back pain, dizziness, syncope, nausea or vomiting, or silent acute coronary syndrome. Data were analyzed using SPSS version 26. Results: Atypical presentation was recorded in 62 patients, giving a frequency of 28.7% (95% CI: 23.1–35.1). It was more frequent in patients aged >65 years than younger patients, 52.6% versus 23.6% ($p<0.001$), in females than males, 39.7% versus 23.1% ($p=0.016$), and in diabetic patients than non-diabetic patients, 37.5% versus 23.5% ($p=0.042$). NSTEMI had a higher atypical presentation frequency than STEMI and unstable angina, 38.3%, 21.2%, and 26.0%, respectively ($p=0.046$). In multivariable analysis, age >65 years, female gender, diabetes mellitus, and NSTEMI diagnosis remained independently associated with atypical presentation. Dyspnea was the commonest atypical symptom. Conclusion: Almost one-third of patients with acute coronary syndrome presented atypically. Older age, female gender, diabetes mellitus, and NSTEMI were independently associated with atypical presentation. Emergency cardiac assessment should maintain a low threshold for electrocardiography and troponin testing in high-risk patients even when classical chest pain is absent. Keywords: Acute coronary syndrome, atypical presentation, chest pain, NSTEMI, STEMI, dyspnea, diabetes mellitus, Pakistan.

INTRODUCTION

Acute coronary syndrome (ACS) remains one of the leading causes of emergency cardiovascular admission and preventable mortality worldwide. It includes ST-elevation myocardial infarction, non-ST-elevation myocardial infarction, and unstable angina, and timely recognition depends on the combined interpretation of symptoms, electrocardiographic findings, and cardiac biomarkers (1-3). Classical central chest pressure, heaviness, tightness, or squeezing discomfort remains the most widely recognized

clinical presentation; however, a substantial subgroup of patients presents with non-classical symptoms such as dyspnea, fatigue, nausea, vomiting, epigastric discomfort, dizziness, syncope, back pain, or silent ischemia. This variation is clinically important because diagnostic pathways in emergency settings often remain chest-pain centered, creating a risk that patients without typical chest discomfort may experience delayed electrocardiography, delayed troponin testing, under-triage, and delayed initiation of evidence-based ACS management.

Evidence from large clinical registries and observational studies indicates that atypical or non-chest pain presentation is not rare and is associated with adverse care pathways and outcomes. Canto et al. reported that nearly one-third of patients with myocardial infarction presented without chest pain and had longer prehospital delay, lower use of reperfusion therapy, and higher in-hospital mortality than patients with chest pain (4). Similarly, Brieger et al. demonstrated that ACS without chest pain represented an underdiagnosed and undertreated high-risk subgroup in the Global Registry of Acute Coronary Events (5). El-Menyar et al. further showed that atypical presentation was an independent predictor of in-hospital mortality among ACS patients, reinforcing that symptom profile is not only a diagnostic issue but also a prognostic concern (6). More recent evidence has also emphasized that non-chest pain symptoms among NSTEMI patients are associated with poorer prognosis, which is particularly relevant because NSTEMI diagnosis frequently depends on serial electrocardiography and biomarker interpretation rather than a single dramatic clinical presentation (7).

The clinical expression of ACS varies across demographic and metabolic subgroups. Older adults may present with dyspnea, fatigue, confusion, syncope, or vague discomfort rather than typical chest pain, possibly because of altered pain perception, autonomic dysfunction, multimorbidity, and delayed symptom attribution. Patients with diabetes may experience silent or non-classical ischemia due to autonomic neuropathy and impaired nociceptive signaling, while women may report a broader spectrum of accompanying symptoms, including breathlessness, nausea, fatigue, back discomfort, or epigastric symptoms, despite chest pain remaining common in both sexes. Local symptom interpretation may further modify healthcare-seeking behavior. In Pakistan, Allana et al. reported sex-related differences in symptom experience, knowledge, attribution, and perceived urgency among ACS patients in Karachi, suggesting that sociocultural and health-literacy factors may influence recognition and presentation patterns (8). Rezvani et al. reported atypical ACS symptoms in 28.1% of patients, with dyspnea, back pain, and shoulder or arm discomfort among the commonly reported manifestations, indicating that prevalence estimates depend heavily on how atypical symptoms are operationally defined (9). A systematic review and meta-analysis by van Oosterhout et al. also demonstrated sex differences in several ACS symptoms while cautioning against the misconception that women usually present without chest pain, as there is considerable overlap between men and women in symptom presentation (10).

Despite growing international evidence, contemporary data from South Punjab remain limited regarding the frequency of atypical ACS presentation and its distribution across clinically relevant demographic and cardiovascular risk groups. This gap is important because Chaudhry Pervaiz Elahi Institute of Cardiology, Multan receives emergency cardiac referrals from Multan and surrounding districts, where delays in symptom recognition, referral pathways, and patient-level interpretation of non-classical symptoms may influence early care. Locally generated evidence can support emergency triage protocols, clinician awareness, and low-threshold use of electrocardiography and troponin testing in high-risk patients who do not report classical chest pain. Therefore, this study was conducted to determine the frequency of atypical presentation among patients with confirmed ACS presenting to a tertiary cardiac center in Multan and to assess its distribution according to age, gender, body mass index, ACS subtype, cardiovascular risk factors, and symptom duration.

MATERIALS AND METHODS

This descriptive cross-sectional study was conducted at Chaudhry Pervaiz Elahi Institute of Cardiology, Multan, Pakistan, from December 2024 to May 2025. The study was designed to estimate the frequency of atypical presentation among adults with confirmed acute coronary syndrome and to examine its distribution across demographic and clinical subgroups. The cross-sectional design was appropriate because the exposure variables, symptom profile, and confirmed ACS diagnosis were assessed at the time of emergency presentation or early hospitalization, allowing estimation of the burden of atypical presentation in a real-world tertiary cardiac care setting.

Adults aged 18 years or above, of either gender, who presented to the emergency department or were referred from primary or secondary healthcare facilities with suspected ACS and were subsequently confirmed to have ACS were eligible for inclusion. ACS was confirmed through clinical assessment, electrocardiographic findings, and cardiac troponin testing, and was classified as STEMI, NSTEMI, or unstable angina according to the overall clinical, electrocardiographic, and biomarker profile. Patients presenting for another emergency complaint but subsequently diagnosed with ACS during baseline emergency evaluation were also included to capture non-classical presentations. Patients were excluded if the initial ACS diagnosis was later revised to an alternative diagnosis, if they were critically unstable and unable to provide symptom history before stabilization, if death occurred before symptom history could be obtained, if ACS protocol or thrombolytic therapy had already been completed before arrival at the study center, if consent was refused, if communication barriers prevented reliable symptom reporting, or if the patient had dialysis-dependent renal failure, significant chest trauma, or pregnancy.

Non-probability consecutive sampling was used, and eligible patients were enrolled until the required sample size was achieved. The sample size was calculated using OpenEpi for a single population proportion by taking the expected frequency of atypical ACS symptoms as 28.1%, with a 95% confidence level, 6% absolute precision, and design effect of 1. This produced a required sample size of 216 patients. Consecutive enrollment was used to reduce selection bias within the practical limits of the emergency cardiac setting, although the exclusion of patients who died before symptom history could be obtained was recognized as a potential source of underestimation because the most severe ACS presentations may have been missed.

After eligibility assessment and initial clinical stabilization, written informed consent was obtained from each participant. Data were collected through structured patient interview and medical record review using a predefined proforma. Demographic variables included age, gender, and body mass index. Age was categorized as 18-45 years, 46-65 years, and >65 years, while body mass index was categorized as normal weight, overweight, and obese. Cardiovascular risk factors included diabetes mellitus, hypertension, dyslipidemia, smoking history, obesity, family history of cardiovascular disease, and relevant comorbidities. Clinical variables included ACS subtype, electrocardiographic findings, cardiac enzyme status, symptom duration, chest pain category, and associated symptoms. Symptom duration was categorized as ≤6 hours or >6 hours before hospital arrival to evaluate delayed presentation in relation to symptom pattern.

Typical chest pain was operationally defined as substernal or left-sided pressure, heaviness, tightness, or squeezing discomfort lasting more than a few minutes or occurring intermittently, with or without radiation to the arm, jaw, neck, back, or epigastrium. Atypical presentation was defined as the presence of atypical chest pain, dyspnea, fatigue, abdominal or epigastric pain, back pain, dizziness, syncope, nausea or vomiting, or silent ACS. Atypical chest pain included burning, sharp, pleuritic, positional, reproducible, pinpoint, or non-classical discomfort, or discomfort in the arm, shoulder, neck, back, or epigastrium that did not match the usual ischemic pattern. Because atypical presentation represented a clinically heterogeneous composite, individual symptom categories were also recorded separately to allow descriptive analysis of symptom patterns.

To improve reproducibility and reduce information bias, symptom data were collected after initial stabilization using the same structured proforma for all participants, and clinical variables were cross-checked against emergency records, electrocardiography reports, and cardiac biomarker results. Data forms were reviewed for completeness before entry, and inconsistent entries were verified from source records where possible. The primary outcome was atypical presentation among confirmed ACS patients. Secondary outcomes included the frequency of individual atypical symptoms and the association of atypical presentation with age group, gender, BMI category, diabetes mellitus, hypertension, dyslipidemia, smoking history, family history of cardiovascular disease, ACS subtype, and symptom duration.

Data were entered and analyzed using SPSS version 26.0. Quantitative variables such as age and body mass index were summarized as mean and standard deviation after assessment of distribution, while categorical variables were summarized as frequencies and percentages. The frequency of atypical presentation was calculated by dividing the number of patients with atypical presentation by the total number of confirmed ACS patients. Chi-square test or Fisher exact test was used, as appropriate, to compare atypical presentation across demographic and clinical groups. Independent-samples t-test was used for normally distributed continuous variables when comparing typical and atypical presentation groups. Binary logistic regression was used to identify independent factors associated with atypical presentation. Clinically relevant variables and variables showing meaningful association in univariable analysis were entered into the multivariable model, and adjusted odds ratios with 95% confidence intervals were reported. Multicollinearity was assessed before final model interpretation, and model fit was evaluated using standard logistic regression diagnostics. A p-value of ≤0.05 was considered statistically significant.

The study was conducted after institutional ethical approval from Chaudhry Pervaiz Elahi Institute of Cardiology, Multan. Written informed consent was obtained from all enrolled patients before data collection. Patient confidentiality was maintained by using de-identified data for analysis, and access to study data was restricted to the research team. No external funding was received, and the authors declared no conflict of interest.

RESULTS

A total of 216 patients with confirmed acute coronary syndrome were included. The mean age was 56.8 ± 12.7 years, and 143 patients (66.2%) were male. Atypical presentation was recorded in 62 patients, giving an overall frequency of 28.7% (95% CI: 23.1–35.1), while 154 patients (71.3%) presented with typical symptoms.

Table 1. Baseline Demographic Characteristics According to Presentation Pattern

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Variable	Total (n=216)	Typical (n=154)	Atypical (n=62)	Effect Estimate	p-value
Age, years, mean ± SD	56.8 ± 12.7	54.8 ± 12.1	61.5 ± 12.7	Mean difference: 6.7 years; 95% CI: 3.0–10.4	<0.001
18–45 years	45 (20.8)	38 (24.7)	7 (11.3)		0.001
46–65 years	133 (61.6)	98 (63.6)	35 (56.5)		—
>65 years	38 (17.6)	18 (11.7)	20 (32.3)	OR: 3.60; 95% CI: 1.74–7.43	<0.001
Male gender	143 (66.2)	110 (71.4)	33 (53.2)	Reference	0.016
Female gender	73 (33.8)	44 (28.6)	29 (46.8)	OR: 2.20; 95% CI: 1.19–4.04	0.016
BMI, kg/m², mean ± SD	27.1 ± 4.2	26.7 ± 4.1	28.0 ± 4.3	Mean difference: 1.3 kg/m²; 95% CI: 0.04–2.56	0.038
Normal weight	54 (25.0)	43 (27.9)	11 (17.7)		0.095
Overweight	93 (43.1)	68 (44.2)	25 (40.3)		—
Obese	69 (31.9)	43 (27.9)	26 (41.9)	OR: 1.86; 95% CI: 1.01–3.45	0.095

Values are presented as mean ± SD or n (%). OR: odds ratio; CI: confidence interval; BMI: body mass index. p-values compare typical and atypical presentation groups.

Patients with atypical presentation were older than those with typical presentation, with a mean age difference of 6.7 years. The frequency of atypical presentation increased from 15.6% among patients aged 18–45 years to 52.6% among those aged >65 years, and patients aged >65 years had approximately 3.6-fold higher odds of atypical presentation than younger patients. Females also showed a higher burden of atypical presentation than males, 39.7% versus 23.1%, with more than twofold higher unadjusted odds. Mean BMI was modestly higher in the atypical group; however, the categorical BMI comparison did not reach statistical significance, suggesting that the continuous BMI difference should be interpreted cautiously.

Table 2. Cardiovascular Risk Factors and ACS Type According to Presentation Pattern

Variable	Total (n=216)	Typical (n=154)	Atypical (n=62)	Effect Estimate	p-value
Diabetes mellitus	80 (37.0)	50 (32.5)	30 (48.4)	OR: 1.95; 95% CI: 1.07–3.56	0.042
Hypertension	101 (46.8)	66 (42.9)	35 (56.5)	OR: 1.73; 95% CI: 0.95–3.16	0.097
Dyslipidemia	73 (33.8)	53 (34.4)	20 (32.3)	OR: 0.91; 95% CI: 0.49–1.70	0.885
Smoking history	73 (33.8)	60 (39.0)	13 (21.0)	OR: 0.42; 95% CI: 0.21–0.83	0.018
Family history of CVD	48 (22.2)	36 (23.4)	12 (19.4)	OR: 0.79; 95% CI: 0.38–1.65	0.644
STEMI	85 (39.4)	67 (43.5)	18 (29.0)	Reference	0.046
NSTEMI	81 (37.5)	50 (32.5)	31 (50.0)	OR: 2.08; 95% CI: 1.14–3.80	0.046
Unstable angina	50 (23.1)	37 (24.0)	13 (21.0)	—	
Symptom duration >6 hours	84 (38.9)	51 (33.1)	33 (53.2)	OR: 2.30; 95% CI: 1.26–4.19	0.010

Diabetes mellitus was significantly associated with atypical presentation, with atypical symptoms occurring in 37.5% of diabetic patients compared with 23.5% of non-diabetic patients. NSTEMI showed the highest atypical presentation frequency among ACS subtypes, with 31 of 81 NSTEMI patients (38.3%) presenting atypically, compared with 18 of 85 STEMI patients (21.2%) and 13 of 50 unstable angina patients (26.0%). Symptom duration greater than 6 hours was also more frequent in the atypical group, affecting 53.2% of atypical presenters compared with 33.1% of typical presenters. Smoking history showed an inverse association with atypical presentation in unadjusted analysis; however, this finding should be interpreted cautiously because it may reflect confounding by age, sex, or clinical presentation pattern rather than a true protective effect.

Table 3. Pattern of Symptoms among Patients with Atypical Presentation (n=62)

Atypical Symptom	Frequency	Percentage
Dyspnea	30	48.4
Nausea or vomiting	19	30.6
Abdominal or epigastric pain	17	27.4
Atypical chest pain	15	24.2
Fatigue	14	22.6
Back pain	12	19.4
Dizziness	8	12.9
Syncope	5	8.1
Silent ACS	4	6.5

Percentages exceed 100 because more than one atypical symptom could be present in the same patient.

Among the 62 patients with atypical presentation, dyspnea was the most frequent symptom, reported by 30 patients (48.4%). Gastrointestinal symptoms were also common, with nausea or vomiting in 19 patients (30.6%) and abdominal or epigastric pain in 17 patients (27.4%). Atypical chest pain was reported in 15 patients (24.2%), while fatigue and back pain were present in 22.6% and 19.4%, respectively. Less frequent but clinically important presentations included dizziness, syncope, and silent ACS, highlighting that ACS may present without classical ischemic chest discomfort in a substantial subset of patients.

Table 4. Frequency of Atypical Presentation in Key Patient Groups

Group	Atypical / Total	Frequency (%)	95% CI	p-value
Overall ACS patients	62 / 216	28.7	23.1–35.1	—
Age 18–45 years	7 / 45	15.6	7.7–28.8	0.001
Age 46–65 years	35 / 133	26.3	19.6–34.4	
Age >65 years	20 / 38	52.6	37.3–67.5	<0.001

Group	Atypical / Total	Frequency (%)	95% CI	p-value
Male gender	33 / 143	23.1	16.9–30.6	0.016
Female gender	29 / 73	39.7	29.3–51.2	0.016
Diabetes mellitus	30 / 80	37.5	27.7–48.5	0.042
NSTEMI	31 / 81	38.3	28.4–49.2	0.046
STEMI	18 / 85	21.2	13.8–31.0	0.046
Unstable angina	13 / 50	26.0	15.9–39.6	0.046
Symptoms >6 hours	33 / 84	39.3	29.5–50.0	0.010

The highest atypical presentation frequency was observed among patients aged >65 years, where more than half presented atypically. Females, diabetic patients, NSTEMI patients, and those presenting after more than 6 hours of symptom onset also showed higher atypical frequencies than their comparison groups. These patterns suggest that atypical presentation clustered in clinically high-risk subgroups in whom reliance on classical chest pain alone may delay recognition.

Table 5. Multivariable Logistic Regression for Factors Associated with Atypical Presentation

Factor	Adjusted Odds Ratio	95% CI	p-value
Age >65 years	2.94	1.38–6.26	0.005
Female gender	1.91	1.02–3.58	0.043
Diabetes mellitus	1.86	1.01–3.44	0.047
NSTEMI diagnosis	1.88	1.00–3.53	0.049
Obesity	1.54	0.80–2.97	0.194
Smoking history	0.58	0.28–1.18	0.131

CI: confidence interval. The model included age group, gender, diabetes mellitus, obesity, smoking history, and ACS type.

In multivariable analysis, age >65 years remained the strongest independent predictor of atypical presentation, with nearly threefold higher adjusted odds. Female gender, diabetes mellitus, and NSTEMI diagnosis also remained independently associated with atypical presentation, although the associations for diabetes mellitus and NSTEMI were borderline and should be interpreted with appropriate caution. Obesity and smoking history were not independently associated with atypical presentation after adjustment, suggesting that their crude associations were likely influenced by other demographic or clinical factors.

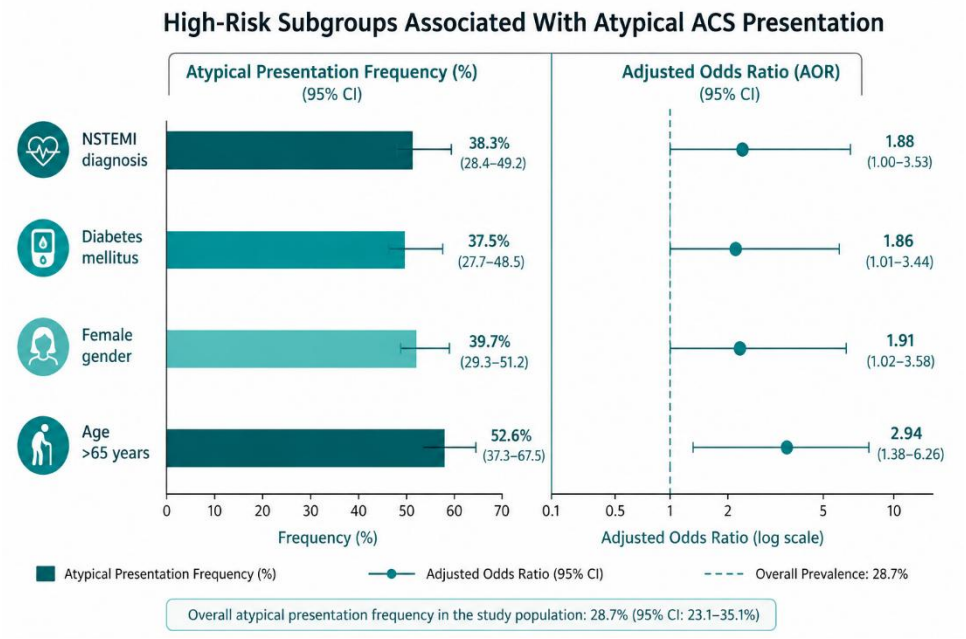

Figure 1 High-Risk Subgroups Associated with Atypical ACS Presentation.

The figure demonstrates that patients aged >65 years had the highest atypical presentation frequency, 52.6% (95% CI: 37.3–67.5), and the strongest adjusted association with atypical ACS presentation, AOR 2.94 (95% CI: 1.38–6.26). Female gender, NSTEMI diagnosis, and diabetes mellitus also showed higher-

than-overall atypical presentation frequencies of 39.7%, 38.3%, and 37.5%, respectively, with adjusted odds ratios ranging from 1.86 to 1.91. All highlighted subgroups exceeded the overall study prevalence of 28.7%, supporting the need for low-threshold ECG and troponin testing in high-risk ACS patients even when classical chest pain is absent.

DISCUSSION

This study found that 28.7% of patients with confirmed acute coronary syndrome presented with atypical symptoms, indicating that nearly one in three ACS patients in this tertiary cardiac center did not follow the classical symptom pattern usually associated with emergency cardiac triage. Dyspnea was the most frequent atypical symptom, followed by nausea or vomiting, abdominal or epigastric pain, atypical chest pain, fatigue, and back pain. Atypical presentation was independently associated with age >65 years, female gender, diabetes mellitus, and NSTEMI diagnosis, while symptom duration greater than 6 hours was more frequent among atypical presenters in unadjusted analysis. These findings reinforce the clinical concern that reliance on classical chest pain alone may delay recognition of ACS in high-risk patients.

The overall frequency observed in this study is closely aligned with the 28.1% reported by Rezvani et al., who identified dyspnea and non-classical pain locations among common atypical ACS manifestations (9). It is slightly lower than the 33% prevalence of myocardial infarction without chest pain reported by Canto et al., but higher than the 8.4% reported in the Global Registry of Acute Coronary Events by Brieger et al. (4,5). These differences are likely explained by variation in operational definitions, as some studies define atypical presentation strictly as absence of chest pain, whereas others include atypical chest pain, dyspnea, gastrointestinal symptoms, fatigue, syncope, or silent ischemia. A recent pooled analysis also showed considerable heterogeneity in atypical ACS prevalence across studies, emphasizing that symptom classification and study population strongly influence reported estimates (20).

Older age emerged as the strongest independent predictor of atypical presentation, with patients aged >65 years showing almost threefold higher adjusted odds of atypical presentation. This finding is consistent with earlier evidence showing that older adults with ACS are more likely to present with dyspnea, syncope, fatigue, or vague symptoms rather than typical ischemic chest discomfort (16). Age-related changes in pain perception, autonomic function, comorbidity burden, and delayed symptom attribution may all contribute to this pattern. Björck et al. reported that absence of chest pain among acute myocardial infarction patients was associated with higher complication rates and increased short-term and long-term mortality, highlighting the prognostic importance of recognizing non-classical presentations in older patients (19).

Female gender was also independently associated with atypical presentation. This finding agrees with previous Pakistani evidence showing sex-related differences in symptom experience, symptom attribution, and perceived urgency among ACS patients in Karachi (8). It is also consistent with systematic review evidence indicating that women with ACS have higher probabilities of several accompanying symptoms, although chest pain remains common in both men and women (10). Therefore, the present findings should not be interpreted as suggesting that women usually present without chest pain, but rather that women may report a broader symptom profile and may require careful evaluation when non-classical symptoms coexist with cardiovascular risk factors. McSweeney et al. similarly emphasized that shortness of breath, weakness, fatigue, and other early warning symptoms may be important in women with acute myocardial infarction (12).

Diabetes mellitus remained independently associated with atypical presentation after adjustment. This finding is clinically plausible because diabetic autonomic neuropathy, impaired nociceptive signaling, and altered ischemic pain perception may reduce the likelihood of classical chest pain. The Fourth Universal Definition of Myocardial Infarction emphasizes that myocardial injury and infarction should be interpreted through clinical evidence, electrocardiographic changes, imaging findings, and

biomarkers rather than symptoms alone, which is particularly important in diabetic patients where silent or non-classical ischemia is more likely (13). In emergency practice, diabetic patients presenting with dyspnea, epigastric discomfort, nausea, unexplained fatigue, dizziness, or syncope should therefore undergo early cardiac assessment even when typical anginal pain is absent.

NSTEMI diagnosis was also associated with atypical presentation, although the adjusted association was borderline and should be interpreted cautiously. This finding remains clinically meaningful because NSTEMI may present without dramatic ST-segment elevation and often requires serial electrocardiography, high-sensitivity troponin testing, and risk stratification. Kim et al. reported adverse prognostic significance of non-chest pain symptoms among patients with NSTEMI, supporting the importance of early recognition in this subgroup (7). Contemporary ESC and AHA guidance similarly emphasizes rapid ECG acquisition, biomarker-based evaluation, and structured clinical pathways in suspected ACS, particularly when initial symptoms are not classical (2,3,14,15).

Smoking history showed an inverse crude association with atypical presentation but did not remain independently associated after multivariable adjustment. This pattern should not be interpreted as a protective effect. It may reflect confounding by age, sex, ACS subtype, or presentation behavior, as smokers in ACS cohorts are often younger and more likely to present with typical ischemic symptoms. The disappearance of this association after adjustment supports the interpretation that smoking was not an independent determinant of atypical presentation in this dataset. Similarly, obesity showed a higher crude burden in the atypical group but was not independently associated with atypical presentation after adjustment, suggesting that its apparent effect may have been mediated or confounded by age, sex, diabetes, or ACS subtype.

The clinical implications of these findings are directly relevant to emergency cardiac care. Patients presenting with dyspnea, nausea, vomiting, epigastric discomfort, fatigue, dizziness, syncope, or vague chest discomfort may initially be routed toward non-cardiac diagnostic pathways, particularly in busy emergency departments. The present study suggests that older adults, women, diabetic patients, and NSTEMI patients require a lower diagnostic threshold for ECG and troponin testing. Incorporating structured symptom checklists and risk-factor prompts into triage may improve recognition of atypical ACS, as symptom-based tools have been proposed to support earlier identification of ACS in diverse patient groups (17). Public health messaging should also avoid portraying ACS exclusively as crushing central chest pain, because such narrow symptom framing may delay presentation among patients with non-classical symptoms.

This study has limitations. It was conducted at a single tertiary cardiac center using non-probability consecutive sampling, which may limit generalizability to other regions or healthcare settings. Symptom classification relied on patient interview and medical record review after stabilization, so recall bias and reporting bias cannot be excluded. Patients who died before symptom history could be obtained were excluded, which may have underestimated atypical presentation among the most severe cases. The study assessed frequency and associated factors but did not evaluate angiographic findings, reperfusion timing, treatment delays, in-hospital complications, or post-discharge outcomes. Interaction effects such as age by sex or diabetes by age were not explored, and the borderline adjusted associations for diabetes mellitus and NSTEMI require cautious interpretation. Despite these limitations, the study provides locally relevant evidence from South Punjab and identifies clinically important groups in whom ACS may present without classical chest pain.

CONCLUSION

Atypical presentation was observed in almost one-third of patients with confirmed acute coronary syndrome presenting to a tertiary cardiac center in Multan. Dyspnea, nausea or vomiting, epigastric discomfort, atypical chest pain, fatigue, and back pain were the most common atypical symptoms. Older age, female gender, diabetes mellitus, and NSTEMI diagnosis were independently associated with

atypical presentation, while delayed presentation was more frequent among patients with atypical symptoms. These findings support a low threshold for electrocardiography and troponin testing in high-risk patients with non-classical symptoms, particularly older adults, women, diabetic patients, and suspected NSTEMI cases. Multicenter studies with outcome follow-up are recommended to validate these findings and determine whether improved recognition of atypical ACS presentation reduces diagnostic delay and adverse clinical outcomes.

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