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ORIGINAL ARTICLE

# Frequency of in-hospital new-onset arrhythmias and conduction blocks among patients with acute coronary syndrome

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## ABSTRACT

**Background:** Acute coronary syndrome is frequently complicated by rhythm disturbances during early admission. Local data on new-onset arrhythmias and conduction blocks remain limited, particularly during the first 24 hours of hospitalization. The purpose of the study was to determine the frequency of in-hospital new-onset arrhythmias and conduction blocks among patients admitted with acute coronary syndrome at Khyber Teaching Hospital, Peshawar.

**Methods:** A descriptive study was conducted in the Department of Cardiology, Khyber Teaching Hospital, Peshawar, from February 2026 to June 2026. Consecutive patients aged 18 to 80 years with ST-elevation myocardial infarction, non-ST-elevation myocardial infarction, or unstable angina were enrolled. Patients with previous arrhythmia or conduction block, permanent pacemaker or implantable cardioverter-defibrillator, significant electrolyte disturbance, or poor-quality ECG recordings were excluded. All patients underwent continuous cardiac monitoring for the first 24 hours. Rhythm abnormality or conduction delay was confirmed by 12-lead ECG. Data were analyzed using SPSS version 27.

**Results:** A total of 151 patients were included. The median age was 60.0 years. Males were 55.6%, and STEMI was the main presentation, seen in 78.1%. New-onset arrhythmia was detected in 88 patients, giving a frequency of 58.3%. Conduction block was detected in 63 patients, with a frequency of 41.7%. Overall, 145 patients had at least one rhythm or conduction abnormality. Ventricular tachycardia was the most frequent arrhythmia, followed by atrial fibrillation. Third-degree atrioventricular block was the commonest conduction defect.

**Conclusion:** Early rhythm and conduction abnormalities were common in acute coronary syndrome. Careful cardiac monitoring during the first 24 hours remains important.

**Keywords:** Acute Coronary Syndrome, Atrial Fibrillation, Atrioventricular Block, Cardiac Arrhythmias, Electrocardiography, Ventricular Tachycardia.

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## Introduction

Acute coronary syndrome includes ST-elevation myocardial infarction, non-ST-elevation myocardial infarction, and unstable angina. It is one of the leading causes of morbidity and mortality worldwide (1).

Despite improvements in reperfusion therapy and pharmacological management, acute coronary syndrome continues to account for high rates of hospitalization, complications, and death (2). Early recognition and aggressive management are

therefore essential in reducing the burden of disease (3).

A major complication in acute coronary syndrome is the occurrence of new-onset arrhythmias and conduction blocks. These disturbances range from premature atrial or ventricular contractions to more serious events such as ventricular tachycardia, ventricular fibrillation, and advanced atrioventricular blocks (4) . Arrhythmias can worsen ischemia, precipitate hemodynamic collapse, and in some cases lead to sudden cardiac death if not promptly addressed (5). International literature reports that approximately 20–30% of patients with acute coronary syndrome experience arrhythmias during hospitalization (6). Data from continuous Holter monitoring have shown higher detection rates, with up to 77–78% of patients developing some form of rhythm disturbance (7). Ventricular tachyarrhythmias such as ventricular tachycardia and ventricular fibrillation are reported in 3–28% of ST-elevation myocardial infarction cases. Conduction abnormalities, including atrioventricular blocks and bundle branch blocks, occur in about 15% of patients (8). These rhythm disorders are not incidental findings. Transient arrhythmias may signal a higher short-term mortality risk, while sustained ventricular tachycardia, ventricular fibrillation, or complete atrioventricular block usually require urgent intervention to prevent cardiogenic shock (9).

Despite abundant global data, evidence from Pakistan remains limited. Local hospitals, particularly in Peshawar, face challenges such as delayed presentation, high prevalence of comorbidities, socioeconomic barriers, and limited resources, all of which may influence the occurrence and outcomes of arrhythmias (10). A study conducted in Peshawar in 2022 reported that right bundle branch block was present in 14.3% of patients with acute myocardial infarction and was associated with severe coronary artery disease Click or tap here to enter text.. Comprehensive local studies describing the frequency and spectrum of arrhythmias and conduction blocks during the early in-hospital period remain limited (11).

Evaluating new-onset arrhythmias in the first 24 hours of hospitalization has clinical importance. This period is a high-risk window for life-threatening rhythm disturbances. Local evidence can support early identification, risk stratification, hospital protocols, and allocation of monitoring resources in busy cardiology units. Therefore, this study was conducted to determine the frequency of new-onset arrhythmias and conduction blocks among patients with acute coronary syndrome during the first 24 hours of admission at a tertiary care hospital in Peshawar.

## Methods

This descriptive study was conducted in the Department of Cardiology, Khyber Teaching Hospital, Peshawar, from February 2026 to June 2026.

The sample size was calculated using OpenEpi for a single population proportion. An expected frequency of 89% for in-hospital new-onset arrhythmias during the first 24 hours of admission was taken from a previous study on acute myocardial infarction patients undergoing primary percutaneous coronary intervention (5). With a 95% confidence level, 5% margin of error, and expected proportion of 0.89, the required sample size was 151 patients.

Consecutive non-probability sampling was used. All eligible patients admitted with acute coronary syndrome during the study

period were enrolled until the required sample size was completed.

Patients aged 18 to 80 years of either sex were included if they were admitted with acute coronary syndrome, including ST-elevation myocardial infarction, non-ST-elevation myocardial infarction, or unstable angina. Patients were excluded if they had a previous history of arrhythmia or conduction block. Patients with a permanent pacemaker or implantable cardioverter-defibrillator were also excluded. Patients with significant electrolyte disturbance at admission, including hypokalemia, hyperkalemia, hypomagnesemia, or severe calcium abnormality, were excluded. Patients with poor-quality ECG recordings that prevented accurate interpretation were also excluded.

## Operational Definitions

**Acute coronary syndrome** was defined as ST-elevation myocardial infarction, non-ST-elevation myocardial infarction, or unstable angina.

**ST-elevation myocardial infarction** was diagnosed when ischemic chest discomfort was present with new ST-segment elevation in two or more contiguous ECG leads and elevated cardiac troponin.

**Non-ST-elevation myocardial infarction** was diagnosed when ischemic symptoms were present with elevated cardiac troponin but without ST-segment elevation on ECG. ST depression or T-wave inversion could be present.

Unstable angina was defined as new or worsening ischemic chest discomfort occurring at rest or with minimal exertion. Cardiac troponin remained within the reference range. ECG findings could show ischemic changes but did not meet criteria for myocardial infarction.

New-onset arrhythmia or conduction block was defined as any rhythm disturbance or conduction abnormality identified for the first time during the first 24 hours of cardiac monitoring, with no previous documentation in medical records or prior ECGs.

**Atrial fibrillation** was defined as an irregular rhythm without distinct P waves and with an inconsistent ventricular rate.

**Atrial flutter** was defined as a uniform sawtooth pattern of atrial activity, usually between 240 and 350 beats per minute, with variable conduction to the ventricles.

**Supraventricular tachycardia** was defined as a sudden-onset narrow-complex tachycardia, usually faster than 150 beats per minute.

**Ventricular tachycardia** was defined as three or more consecutive wide QRS complexes at a rate greater than 100 beats per minute.

**Ventricular fibrillation** was defined as a disorganized rhythm with no recognizable QRS complexes and rapid chaotic electrical activity.

**Premature ventricular contractions** were defined as early widened ventricular beats not preceded by P waves, often followed by a compensatory pause.

**Premature atrial contractions** were defined as early atrial depolarizations with altered P-wave morphology, usually followed by a narrow QRS complex.

**First-degree atrioventricular block** was defined as PR interval greater than 200 ms.

**Second-degree atrioventricular block** was defined as intermittent non-conducted P waves, including Mobitz type I or Mobitz type II.

**Third-degree atrioventricular block** was defined as complete atrioventricular dissociation.

**Bundle branch block** was defined as QRS duration of 120 ms or more with typical ECG features of right or left bundle branch block.
After ethical approval from the Institutional Review Board of Khyber Medical College and Khyber Teaching Hospital, Peshawar, under reference number 1077/DME/KMC, eligible patients were recruited consecutively. Written informed consent was obtained from each patient. Where the patient was clinically unstable or unable to provide consent, consent was obtained from the attendant according to hospital ethical practice. The study procedures followed the ethical principles of the Declaration of Helsinki.
Data were collected on a structured data sheet. Baseline demographic information included age, gender, marital status, education level, occupation, and place of residence. Residence was recorded as urban or rural.
Anthropometric measurements were taken at admission. These included height, weight, and body mass index.
Clinical information included presenting symptoms, type of acute coronary syndrome, and duration of chest pain before arrival. Cardiovascular risk factors were recorded, including hypertension, diabetes mellitus, dyslipidemia, smoking status, family history of ischemic heart disease, and lifestyle pattern.
Laboratory and diagnostic findings were also documented. These included cardiac troponin I and baseline ECG findings.
After recruitment, each patient underwent continuous cardiac monitoring for the first 24 hours using bedside cardiac monitors, in line with hospital electrocardiographic monitoring standards (2). Any rhythm abnormality or conduction delay detected during monitoring was confirmed by 12-lead ECG. The recorded rhythm disturbances included supraventricular rhythms, ventricular rhythms, and conduction abnormalities.
Supraventricular rhythms included atrial fibrillation, atrial flutter, supraventricular tachycardia, and premature atrial contractions. Ventricular rhythms included premature ventricular contractions, ventricular tachycardia, and ventricular fibrillation. Conduction abnormalities included all grades of atrioventricular block and bundle branch blocks. Patient management continued according to routine hospital practice and was not altered by study procedures. All information was recorded on a structured data sheet and then entered into SPSS for statistical analysis.
The main outcome was the frequency of new-onset arrhythmias and conduction blocks detected during the first 24 hours of cardiac monitoring. Baseline ECG findings were recorded separately. The type of arrhythmia or conduction block was documented for each patient.
Data were analyzed using SPSS version 27. Continuous variables, including age, and body mass index were assessed for normality using the Shapiro-Wilk test. Normally distributed variables were reported as mean ± standard deviation. Skewed variables were reported as median with interquartile range. Categorical variables were summarized as frequency and percentage. These included gender, residence, type of acute coronary syndrome, cardiovascular risk factors, new-onset arrhythmias, and conduction blocks. 95 % confidence intervals were calculated for the principal outcome frequencies.
Stratified analysis was performed for age, gender, body mass index, residence, and common cardiovascular risk factors. After

stratification, the chi-square test or Fisher's exact test was applied where appropriate. A p-value of less than 0.05 was considered statistically significant. Findings were presented in tables and graphs for clarity.

## Results

A total of 151 patients with acute coronary syndrome were included in the final analysis. The data were checked against the study codebook before analysis. Continuous variables were assessed for normality using the Shapiro-Wilk test. Age and body mass index were not normally distributed, so median and interquartile range were used for these variables.

The median age was 60.0 years. Most patients were aged 41–60 years, followed by those older than 60 years. Male patients were slightly more frequent than female patients, and urban residence was more common than rural residence. Hypertension and diabetes mellitus were the leading cardiovascular risk factors. STEMI was the main ACS subtype in this cohort (Table 1; Figure 1).

**Table 1. Baseline characteristics of patients with acute coronary syndrome**

| Variable | Value |
|---|---|
| Age, years | 60.0 (50.0-68.5) |
| ≤40 years | 16 (10.6) |
| 41-60 years | 73 (48.3) |
| >60 years | 62 (41.1) |
| Male | 84 (55.6) |
| Female | 67 (44.4) |
| Urban residence | 87 (57.6) |
| Rural residence | 64 (42.4) |
| Active lifestyle | 61 (40.4) |
| Sedentary lifestyle | 90 (59.6) |
| BMI, kg/m2 | 23.8 (21.4-25.7) |
| Normal BMI (<25 kg/m2) | 101 (66.9) |
| Overweight (25.0-29.9 kg/m2) | 43 (28.5) |
| Obese (≥30 kg/m2) | 7 (4.6) |
| Diabetes mellitus | 106 (70.2) |
| Hypertension | 123 (81.5) |
| Dyslipidemia | 14 (9.3) |
| Non-smoker | 119 (78.8) |
| Current smoker | 27 (17.9) |
| Former smoker | 5 (3.3) |
| Family history of CAD | 37 (24.5) |
| STEMI | 118 (78.1) |
| NSTEMI | 29 (19.2) |
| Unstable angina | 4 (2.6) |

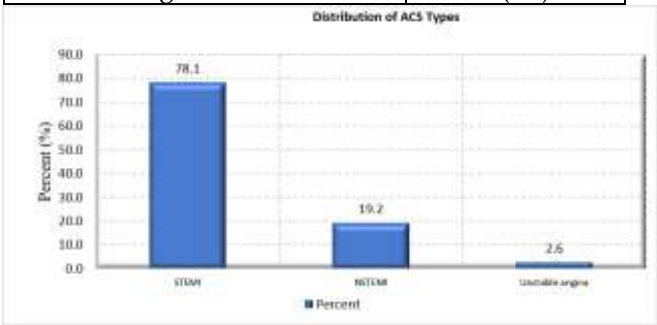



**Figure 1. Distribution of acute coronary syndrome subtypes.**

Values are presented as n (%) or median (IQR). BMI, body mass index; CAD, coronary artery disease; STEMI, ST-elevation myocardial infarction; NSTEMI, non-ST-elevation myocardial infarction; IQR, interquartile range.

Chest pain was the leading presenting symptom and was reported by nearly all patients. Shortness of breath was also frequent. The baseline ECG findings were consistent with the ACS distribution, with ST elevation as the most common pattern. ST depression and T-wave inversion occurred less often (Table 2).

**Table 2. Clinical presentation and baseline ECG findings**

| Variable | Value |
|---|---|
| Chest pain | 145 (96.0) |
| Shortness of breath | 103 (68.2) |
| Sweating | 74 (49.0) |
| Nausea/vomiting | 52 (34.4) |
| Syncope | 35 (23.2) |
| ST elevation | 117 (77.5) |
| ST depression | 35 (23.2) |
| T-wave inversion | 17 (11.3) |
| Pathological Q waves | 7 (4.6) |
| LBBB at admission | 5 (3.3) |

Values are presented as n (%). LBBB, left bundle branch block.

New-onset arrhythmia was detected in 88 patients, giving a frequency of 58.3% (95% CI 50.3–65.8). Conduction block was detected in 63 patients, with a frequency of 41.7% (95% CI 34.1–49.7). Overall, 145 patients had at least one rhythm or conduction abnormality during the first 24 hours of monitoring. Both outcomes were present in 6 patients, giving a frequency of 4.0% (Table 3; Figure 2).

**Table 3. Frequency of arrhythmias, conduction blocks, and interventions during the first 24 hours**

| Variable | n (%) |
|---|---|
| Any new-onset arrhythmia | 88 (58.3) |
| Any conduction block | 63 (41.7) |
| Either arrhythmia or conduction block | 145 (96.0) |
| Both arrhythmia and conduction block | 6 (4.0) |
| Atrial fibrillation | 23 (15.2) |
| Atrial flutter | 3 (2.0) |
| Supraventricular tachycardia | 5 (3.3) |
| Ventricular tachycardia | 38 (25.2) |
| Ventricular fibrillation | 20 (13.2) |
| Premature ventricular contractions | 15 (9.9) |
| Premature atrial contractions | 4 (2.6) |
| First-degree AV block | 9 (6.0) |
| Mobitz I | 3 (2.0) |
| Mobitz II | 14 (9.3) |
| Third-degree AV block | 29 (19.2) |
| LBBB | 2 (1.3) |
| RBBB | 10 (6.6) |
| SA block | 0 (0.0) |
| Antiarrhythmic drugs | 9 (6.0) |
| Cardioversion | 63 (41.7) |
| Temporary pacemaker | 40 (26.5) |
| No intervention | 46 (30.5) |

Patients could have more than one rhythm abnormality, conduction block, or intervention; therefore, the category percentages do not total 100%. AV, atrioventricular; LBBB, left bundle branch block; RBBB, right bundle branch block; SA, sinoatrial.

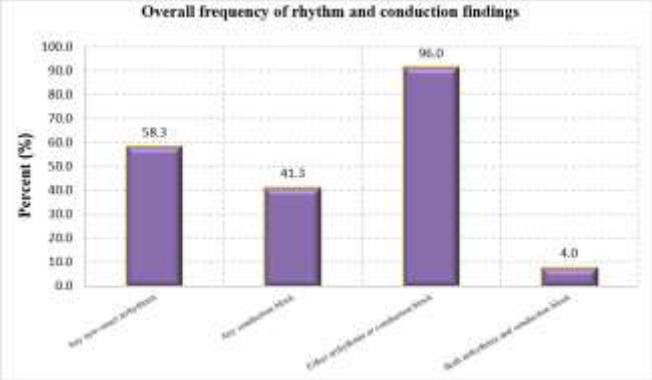



**Figure 2. Overall frequency of rhythm and conduction findings during the first 24 hours.**

Ventricular tachycardia was the most frequent arrhythmia, while atrial fibrillation was the leading supraventricular rhythm disturbance. Third-degree atrioventricular block was the most common conduction abnormality. Cardioversion was the most frequently recorded intervention, followed by temporary pacemaker insertion.

The type-wise distribution showed that ventricular rhythm disturbances formed the largest part of the arrhythmia burden. Ventricular tachycardia was detected in one-quarter of the study population. Third-degree atrioventricular block was also common among conduction abnormalities (Figure 3).

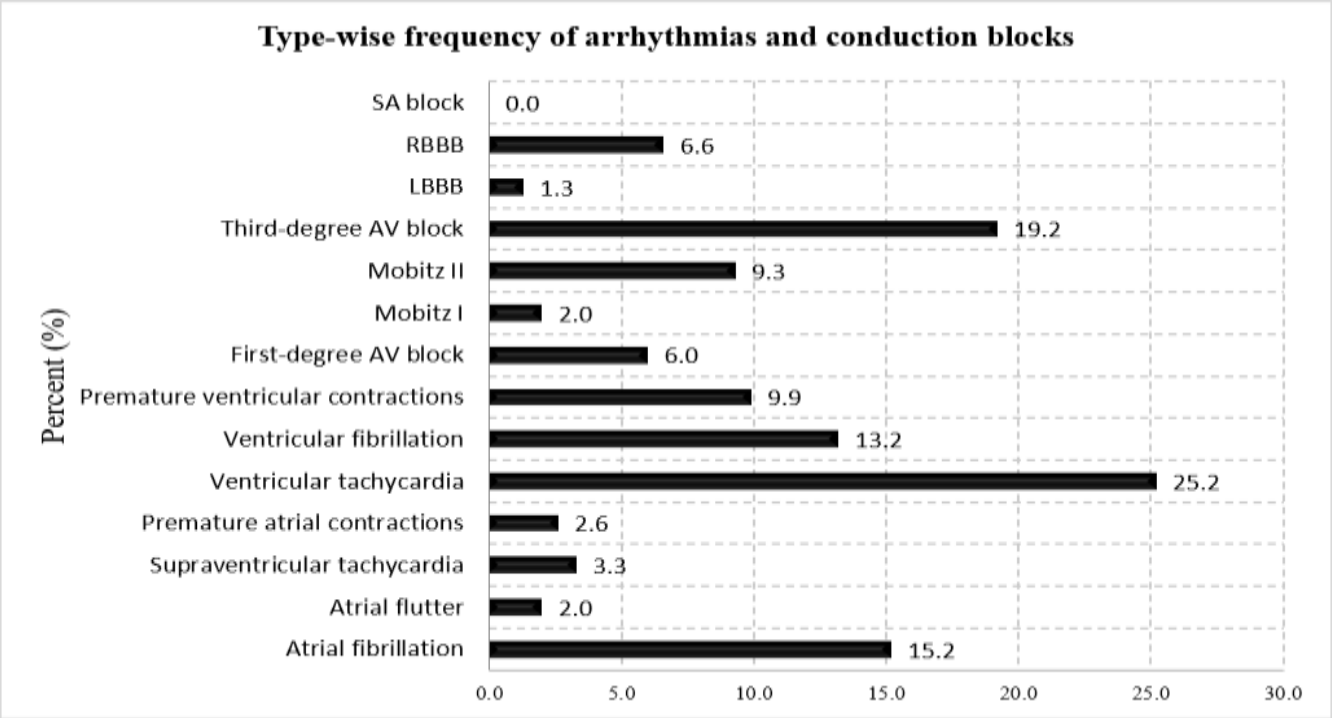



**Figure 3. Type-wise distribution of arrhythmias and conduction blocks.**

Stratified analysis showed significant differences for selected cardiovascular risk factors. Arrhythmia was more frequent among patients without diabetes mellitus, those without hypertension, and current or former smokers. Conduction block was more frequent among patients with hypertension. No statistically significant association was observed with age group, gender, body mass index, residence, ACS subtype, dyslipidemia, family history of coronary artery disease, or lifestyle ((Table 4; Figure 4

**Table 4. Stratified analysis of any arrhythmia and any conduction block**

| Variable | Category | Any arrhythmia n/N (%) | P value | Any conduction block n/N (%) | P value |
|---|---|---|---|---|---|
| **Age group** | ≤60 years | 54/89 (60.7) | 0.474 | 34/89 (38.2) | 0.293 |
| | >60 years | 34/62 (54.8) | | 29/62 (46.8) | |
| **Gender** | Male | 53/84 (63.1) | 0.179 | 31/84 (36.9) | 0.179 |
| | Female | 35/67 (52.2) | | 32/67 (47.8) | |
| **BMI group** | BMI <25 kg/m² | 60/101 (59.4) | 0.690 | 40/101 (39.6) | 0.453 |
| | BMI ≥25 kg/m² | 28/50 (56.0) | | 23/50 (46.0) | |
| **Residence** | Urban | 52/87 (59.8) | 0.665 | 35/87 (40.2) | 0.665 |
| | Rural | 36/64 (56.3) | | 28/64 (43.8) | |
| **ACS type** | STEMI | 65/118 (55.1) | 0.132 | 54/118 (45.8) | 0.057 |
| | NSTEMI/UA | 23/33 (69.7) | | 9/33 (27.3) | |
| **Diabetes mellitus** | No | 33/45 (73.3) | **0.015** | 14/45 (31.1) | 0.085 |
| | Yes | 55/106 (51.9) | | 49/106 (46.2) | |
| **Hypertension** | No | 22/28 (78.6) | **0.016** | 7/28 (25.0) | **0.047** |
| | Yes | 66/123 (53.7) | | 56/123 (45.5) | |
| **Dyslipidemia** | No | 80/137 (58.4) | 0.928 | 55/137 (40.1) | 0.219 |

| | | | | | |
|---|---|---|---|---|---|
| | Yes | 8/14 (57.1) | | 8/14 (57.1) | |
| **Smoking status** | Non-smoker | 64/119 (53.8) | **0.031** | 53/119 (44.5) | 0.176 |
| | Current/former smoker | 24/32 (75.0) | | 10/32 (31.3) | |
| **Family history of CAD** | No | 69/114 (60.5) | 0.325 | 46/114 (40.4) | 0.549 |
| | Yes | 19/37 (51.4) | | 17/37 (45.9) | |
| **Lifestyle** | Active | 36/61 (59.0) | 0.880 | 28/61 (45.9) | 0.391 |
| | Sedentary | 52/90 (57.8) | | 35/90 (38.9) | |

P values were calculated using Pearson's chi-square test. A p value <0.05 was considered statistically significant. Significant p values are shown in bold. BMI, body mass index; CAD, coronary artery disease; STEMI, ST-elevation myocardial infarction; NSTEMI, non-ST-elevation myocardial infarction; UA, unstable angina.

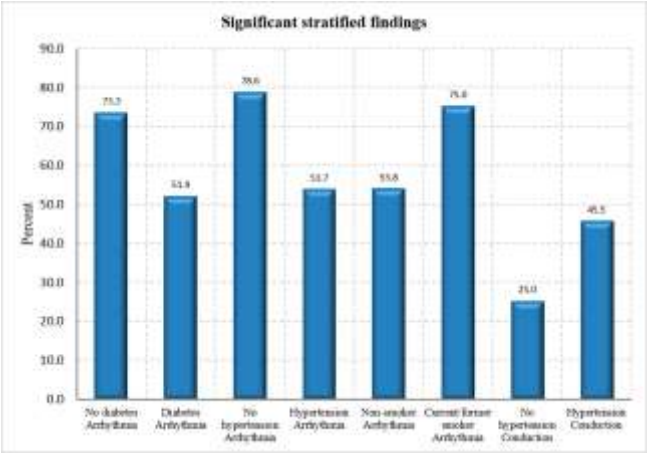



**Figure 4. Stratified findings that reached statistical significance.**

Overall, the findings showed a high frequency of early rhythm and conduction abnormalities among patients admitted with acute coronary syndrome. The burden was mainly driven by ventricular tachycardia, atrial fibrillation, and third-degree atrioventricular block during the first 24 hours of monitoring.

## Discussion

This study found a high frequency of early rhythm and conduction abnormalities among patients admitted with acute coronary syndrome. New-onset arrhythmia was detected in 58.3% of patients, while conduction block was present in 41.7%. Overall, 96.0% had at least one rhythm or conduction abnormality during the first 24 hours. This combined frequency should be interpreted according to the study definition, which included arrhythmias and conduction blocks detected during the first 24 hours of cardiac monitoring. Premature ventricular and atrial contractions were also counted as arrhythmias. The combined outcome therefore represents the overall rhythm burden rather than life-threatening events alone. Ventricular tachycardia was the most frequent arrhythmia, atrial fibrillation was the leading supraventricular disturbance, and third-degree atrioventricular block was the most common conduction defect.

The arrhythmia frequency in this study was higher than several previous reports. Winkler et al. used continuous 12-lead Holter monitoring in patients with acute coronary syndrome and found frequent premature ventricular contractions in about 22% and non-sustained ventricular tachycardia in 15%. Malignant arrhythmias were uncommon (12). In Pakistan, Majid et al. reported arrhythmias in 46.17% of acute coronary syndrome patients during the first 24 hours, with premature ventricular contractions as the most frequent rhythm disturbance (13). The higher frequency in the present cohort may be related to the large proportion of STEMI patients, early rhythm detection, and the severity of cases managed at a tertiary referral hospital.

Lower frequencies have been reported in large international registries. The Saudi SPACE registry documented ventricular arrhythmias in 3.3% of hospitalized acute coronary syndrome patients, most of whom had STEMI (14). The China Acute Myocardial Infarction registry reported cardiac arrhythmias in 8.35% of patients and ventricular tachyarrhythmias in 3.4% (15). Rymer et al. found VT or VF after primary PCI in 8.9% of STEMI patients, while late VT or VF occurred in only 2.4% (16). These studies mainly recorded sustained, post-PCI, or clinically significant events. In contrast, the present study included abnormalities found on admission ECG and throughout the first 24 hours of monitoring. Differences in case definition, timing of assessment, reperfusion status, and patient severity may therefore account for the higher observed frequency.

Severe rhythm disturbances were uncommon in the NSTE-ACS cohort studied by Wilmé et al., occurring in 2.3% of patients during the first 48 hours (17) . The present cohort differed because STEMI accounted for most admissions. A greater ischemic burden and more unstable early presentation may have contributed to the higher frequency of ventricular arrhythmias and conduction abnormalities.

Conduction abnormalities also formed a substantial part of the early clinical burden. Third-degree atrioventricular block was detected in 19.2% of patients. Sumerkan et al. reported that third-degree block was the dominant conduction abnormality among ACS patients with AV block, and more than half required temporary pacing (18). Velásquez-Rodríguez et al. found high-degree AV block in 8.6% of STEMI patients and reported a strong relationship with right coronary artery involvement (19). The present study did not record infarct location or culprit artery. It is therefore not possible to determine whether the high rate of advanced block was related to inferior infarction or right coronary artery disease.

Atrial fibrillation was detected in 15.2% of patients and was the most frequent supraventricular rhythm disturbance. PCI-based studies have reported new-onset atrial fibrillation in 8.1% and 7.9% of patients with ACS or acute myocardial infarction (20,21). The higher rate in this cohort may reflect early ECG detection, acute ischemic stress, and the predominance of STEMI.

**Limitations and closing statement**

This was a single-center descriptive study with consecutive non-probability sampling. The sample size was modest. Sustained and non-sustained ventricular tachycardia were not analyzed separately. Mortality, cardiogenic shock, reperfusion timing, culprit artery, infarct location, and long-term outcomes were not assessed. Future multicenter studies should include infarct location, reperfusion status, rhythm severity, and clinical outcomes to better define predictors and prognostic impact. Despite these limits, the study adds local evidence that rhythm and conduction abnormalities are common during the first 24 hours of ACS admission and supports close early cardiac monitoring in high-risk patients

## Conclusion

New-onset arrhythmias and conduction blocks were common during the first 24 hours of hospitalization among patients with acute coronary syndrome. Ventricular tachycardia, atrial fibrillation, and third-degree atrioventricular block were the main findings. The high early rhythm burden supports careful cardiac monitoring during

the initial admission period, especially in patients with high-risk ACS presentations.

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