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Original Research Article

# STUDY OF ARRHYTHMIAS IN THE FIRST WEEK OF ACUTE MYOCARDIAL INFARCTION

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ABSTRACT

**Background:** Cardiac arrhythmias are quite common in the setting of acute myocardial infarction. Ninety percent of patients with acute myocardial infarction (AMI) have some cardiac rhythm abnormality, and 25% have cardiac conduction disturbance within 24 hours of infarct onset. These are tachyarrhythmias, ventricular arrhythmias, and atrioventricular block. A good correlation exists between the site of infarct and type of arrhythmias. Sinus bradycardia, sinoatrial escape rhythms, Wenkebach type and complete heart block are usually associated with inferior wall myocardial infarction (IWMI). Atrial premature contraction (APC) and ventricular premature contraction (VPC) are usually seen in anterior wall myocardial infarction (AWMI).

**Materials and Methods:** This observational study included 100 AMI patients over 2 years, diagnosed based on clinical signs, ECG changes, and elevated troponins or CK-MB. Patients were monitored for arrhythmias within 48 hours, and data were analyzed.

**Results:** The result of this study of 100 AMI patients (68 males, 32 females) found the highest incidence in the 51–60 age group. Anteroseptal and lateral infarctions were most common (24% each), and 80% of arrhythmias occurred within the first 12 hours—primarily sinus tachycardia (24%) and bradycardia (20%)

**Conclusion:** This study conclude that arrhythmias commonly occur early in AMI, often within the first hour, with sinus tachycardia and bradycardia being most frequent. Continuous early cardiac monitoring is crucial, especially in males aged 51–60 and those with anterior infarctions, to promptly detect and manage life-threatening arrhythmias.

**Keywords:** Myocardial infarction, Arrhythmias, Bradycardia, Tachycardia

## INTRODUCTION

Cardiac arrhythmias are frequently observed in the context of acute myocardial infarction (AMI). Approximately 90% of patients with AMI experience some form of rhythm disturbance, and about 25% develop conduction abnormalities within the first 24 hours following infarction onset. The occurrence of serious arrhythmias such as ventricular fibrillation (VF), reported at around 4.5%, is most prevalent during the first hour of AMI and rapidly decreases thereafter.[1] Arrhythmic complications during myocardial infarction remain a leading cause of sudden cardiac death, with ventricular arrhythmias—particularly VF—accounting for nearly 60% of deaths associated with AMI within the first hour.[2]

Numerous studies have demonstrated a clear association between arrhythmias and poorer outcomes in AMI patients.[3-8] The type of arrhythmia is often linked to the infarction site: for example, inferior wall infarctions are commonly associated with sinus bradycardia, sinoatrial escape rhythms, complete heart block, and Wenckebach-type AV blocks, while anterior wall infarctions are more likely to be accompanied by atrial and ventricular premature contractions.[9]

Life-threatening arrhythmias such as ventricular tachycardia and ventricular fibrillation can be the initial presentation of myocardial ischemia, contributing significantly to sudden cardiac deaths in acute coronary syndromes. These arrhythmias have been reported in up to 20% of AMI cases, with the risk of arrhythmic death being highest during the first six months post-infarction and remaining elevated for up to two years.[10]

Supraventricular arrhythmias, though less common—affecting less than 10% of AMI patients—are typically not directly caused by ischemia. Their presence is often indicative of more severe ventricular dysfunction and correlates with poorer clinical outcomes. Sinus tachycardia may arise due to pain, anxiety, or medications, while atrial fibrillation (AF) is a recognized marker of adverse prognosis, contributing to increased short- and long-term mortality rates even in unselected patient populations.[11,12] Sinus bradycardia, observed in 9–25% of cases, is particularly common within the first hour of inferior infarctions and may be due to vagal stimulation, ischemia, or drug effects.[13]

This study was therefore undertaken to assess the incidence, types, and timing of cardiac arrhythmias occurring during the first week of hospitalization in patients presenting with acute myocardial infarction.

## MATERIALS AND METHODS

This observational study was conducted on 100 patients admitted with acute myocardial infarction (AMI) in a tertiary care hospital over a 2 years study period. This study was conducted in Department of Medicine at Shree Jagannath Pahadia (SJP) Medical College & RBM Hospital Bharatpur, Rajasthan. Patients included in the study were those diagnosed with AMI based on clinical features, electrocardiographic changes, and elevated cardiac biomarkers such as troponins levels.

**Inclusion Criteria:** comprised patients aged above 30 years presenting within 24 hours of onset of chest pain and showing ECG evidence of myocardial infarction.

**Exclusion Criteria:** included patients with known arrhythmia history, prior pacemaker implantation, electrolyte imbalances, or those on antiarrhythmic medications prior to admission.

All enrolled patients underwent continuous cardiac monitoring using bedside multiparameter monitors for the first 24–48 hours. Standard 12-lead electrocardiograms (ECGs) were recorded on admission and repeated periodically or as clinically indicated. Arrhythmias were identified through ECG findings and classified into supraventricular, ventricular, bradyarrhythmias, and conduction blocks. The timing of arrhythmia onset was noted, specifically whether it occurred during the first hour or within 1–12 hours of hospitalization.

Patient demographic data, including age, sex, and infarction site (determined via ECG), were recorded and analyzed. The collected data were entered into Microsoft Excel and analyzed using descriptive statistics. Results were presented as frequencies and percentages.

## RESULTS

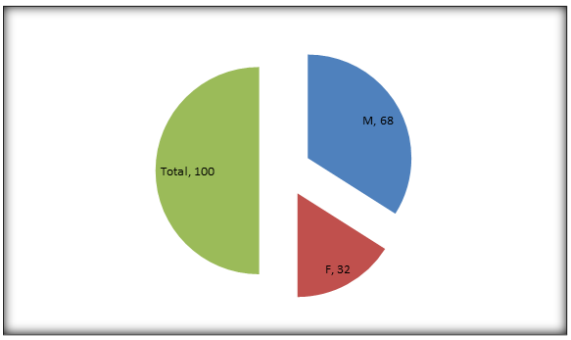


**Chart 1: Gender distribution**

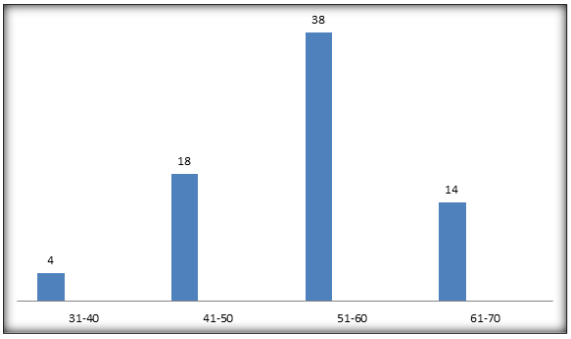


**Chart 2: Age Distribution**

This study included 100 patients diagnosed with acute myocardial infarction (AMI). Among them, 68 were male and 32 were female, indicating a male predominance. The most affected age group was 51–60 years, comprising 38% of the cases, followed by those aged over 70 years (26%), 41–50 years (18%), 61–70 years (14%), and 31–40 years (4%).

Regarding the anatomical site of infarction, anteroseptal and lateral wall infarctions were the most common, each observed in 24% of patients. This was followed by anterolateral infarction in 18%, inferior infarction in 14%, inferolateral in 10%, and anterior wall involvement in 10% of cases.

Arrhythmias were recorded in the early stages of hospitalization. Notably, 46% of patients developed arrhythmias within the first hour of admission, while 34% experienced arrhythmias between 1 to 12 hours of hospitalization, underscoring the critical risk window in the early phase of AMI.

The most frequently observed arrhythmia was sinus tachycardia, present in 24% of patients, followed closely by sinus bradycardia in 20%. Ventricular tachycardia was seen in 6% of cases, while ventricular fibrillation occurred in 2%. Other arrhythmias included supraventricular tachycardia

(2%), atrial fibrillation (4%), atrial ectopics (1%), first-degree AV block (4%), second-degree AV block (4%), and bundle branch block (4%). Additionally, some patients presented with combinations of arrhythmias, including sinus tachycardia with ventricular premature complexes (VPCs) in 2%, left bundle branch block (LBBB) with VPCs in 4%, and right bundle branch block (RBBB) with VPCs in 2%.

**Table 1: Distribution of cases according to involvement of site**

| Site involved | No. of cases |
|---|---|
| Anteroseptal | 24 |
| Lateral | 24 |
| Anterolateral | 18 |
| Inferior | 14 |
| Inferolateral | 10 |
| Anterior | 10 |
| Total | 100 |

**Table 2: Time of Appearance of Arrhythmias**

| Arrhythmias occurred | No. of cases |
|---|---|
| During the first hour | 46 |
| 1-12 hours of hospitalization | 34 |

**Table 3: Distribution of cases according to Type of arrhythmia occurred**

| Type of arrhythmia | No. of cases |
|---|---|
| Supraventricular tachyacardia | 2 |
| Atrial fibrillation | 4 |
| Atrial ectopics | 1 |
| 1st degree AV block | 4 |
| 2nd degree AV block | 4 |
| Bundle branch block | 4 |
| Ventricular tachycardia | 6 |
| Ventricular fibrillation | 2 |
| VPC | 4 |
| Sinus tachycardia | 24 |
| Sinus bradycardia | 20 |
| sinus tachycardia + VPC | 2 |
| LBBB + VPC | 4 |
| RBBB + VPC | 2 |

## DISCUSSION

In this study involving 100 patients with acute myocardial infarction (AMI), arrhythmias were found to be common, particularly during the first hour of hospitalization (46%), followed by the 1–12-hour window (34%). This early onset reflects the critical period of electrical instability following myocardial injury. Our findings are in agreement with Bhatia et al. (2004),[14] who reported that nearly 60% of arrhythmias in AMI patients occur within the first 24 hours, underscoring the importance of intensive early cardiac monitoring.

Among all types of arrhythmias, sinus tachycardia (24%) and sinus bradycardia (20%) were the most prevalent. These rhythm changes are often physiological responses to myocardial ischemia, pain, sympathetic stimulation, and hemodynamic compromise. Similar patterns were observed in a study by Ghosh et al. (2012),[15] where sinus arrhythmias were the most common type detected during early AMI.

More serious arrhythmias such as ventricular tachycardia (6%) and ventricular fibrillation (2%) were less frequent but clinically significant. These are well-recognized markers of poor prognosis and have been reported in the literature with an incidence of 5–10% (Behar et al., 1990; Killip & Kimball, 1967).[16-17] Early detection and immediate management, including defibrillation and antiarrhythmic therapy, are essential to reduce mortality.

Supraventricular arrhythmias, such as atrial fibrillation (4%), though less common, remain important due to their association with increased stroke risk and adverse outcomes in AMI patients. Our results are consistent with Kundu et al. (2017),[17] who reported an atrial fibrillation incidence of approximately 3–7% in myocardial infarction cases.

Conduction abnormalities, including first-degree AV block (4%), second-degree AV block (4%), and bundle branch blocks (4%), were found in our study, most commonly in patients with anterior or anteroseptal infarctions. Norris et al. (1977),[18] demonstrated a higher incidence of AV blocks in anterior wall MI due to the close proximity of the infarct zone to the conduction system, particularly the His-Purkinje network.

Comparatively, Sethi et al. (2018),[19] observed a higher rate of severe arrhythmias like ventricular fibrillation (4%) and complete heart block (6%). The lower incidence in our cohort may reflect early

presentation, improved reperfusion therapy, or regional population differences in comorbidities.

Analysis of infarct sites showed an even distribution across anteroseptal (24%), lateral (24%), and anterolateral (18%) locations. While no single site predominated in arrhythmic complications, anterior wall infarctions are classically associated with higher arrhythmic risk (Zimetbaum & Josephson, 2003),[20-21] particularly for conduction disturbances and ventricular arrhythmias.

Male predominance (68%) in our study aligns with broader epidemiological data, including findings from the Framingham Heart Study, which indicate that men have a higher incidence of AMI than women, particularly in middle age (Lloyd-Jones et al., 2009).[22]

In conclusion, this study highlights that arrhythmias are frequent in the early stages of AMI, especially within the first 12 hours. Sinus arrhythmias are most common, but life-threatening ventricular arrhythmias and conduction blocks require close monitoring and prompt intervention. Comparisons with similar studies validate our findings and underscore the need for continuous ECG surveillance, particularly in patients with anterior infarcts or those aged above 50 years.

## CONCLUSION

This study highlights that arrhythmias are a common and early complication of acute myocardial infarction (AMI), with nearly half of the cases occurring within the first hour of hospital admission. Sinus tachycardia and sinus bradycardia were the most frequently observed arrhythmias, while potentially life-threatening arrhythmias such as ventricular tachycardia, ventricular fibrillation, and atrioventricular blocks were also present, particularly in patients with anterior or anteroseptal infarctions. The majority of affected individuals were male and within the 51–60-year age group. These findings emphasize the importance of continuous cardiac monitoring during the early phase of AMI and underscore the need for prompt identification and management of arrhythmias to improve clinical outcomes and reduce mortality.

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