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Original Research Article

A Study on Arrhythmic Manifestations During the Acute Stage of Myocardial Infarction

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Abstract

Background: Acute Myocardial Infarction (AMI) remains a major cause of morbidity and mortality worldwide. Cardiac arrhythmias are among the most frequent and potentially life-threatening complications occurring during the acute phase of myocardial infarction. Early identification and management of these rhythm disturbances are essential to improve patient outcomes.

Objective: To study the arrhythmic manifestations occurring during the acute stage (first week) of myocardial infarction and to evaluate their clinical significance and impact on patient outcomes.

Methods: This prospective observational study was conducted at Teritary care Hospital, Vijayawada, Andhra Pradesh, including 50 patients diagnosed with AMI (both STEMI and NSTEMI) admitted within 24 hours of symptom onset between January 2025 and January 2026. Patients were monitored clinically and with electrocardiography for the occurrence of arrhythmias during hospitalization. The incidence, type, and timing of arrhythmias were recorded and correlated with the type of infarction and in-hospital outcomes.

Results: Arrhythmias were observed in 60% of patients during the acute phase of AMI. The majority occurred within the first 24 hours of admission. The most common arrhythmia was ventricular premature complexes (33.3%), followed by atrial fibrillation (20%), ventricular tachycardia (16.7%), and ventricular fibrillation (10%). Arrhythmias were more frequent in ST-elevation myocardial infarction (STEMI) compared to non-ST-elevation myocardial infarction (NSTEMI). Patients who developed arrhythmias had higher rates of complications, including heart failure (33.3%), cardiogenic shock (20%), and sudden cardiac death (10%). Mortality was higher among patients with arrhythmias (16.7%) compared to those without arrhythmias (5%).

Conclusion: Arrhythmias are common during the acute stage of AMI, particularly within the first 24 hours. Ventricular premature complexes were the most frequently observed rhythm disturbance, while ventricular tachycardia and fibrillation were associated with increased mortality. Continuous cardiac monitoring and prompt management of arrhythmias are crucial in reducing complications and improving survival in patients with acute myocardial infarction.

Keywords: Acute myocardial infarction, Cardiac arrhythmias, ST-elevation myocardial infarction (STEMI), Non-ST-elevation myocardial infarction (NSTEMI), Ventricular premature complexes, Ventricular tachycardia, Ventricular fibrillation.

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Introduction

Acute myocardial infarction (AMI) continues to be a major cause of morbidity and mortality worldwide. Despite significant improvements in early diagnosis, pharmacological management, and reperfusion strategies, complications arising during the acute phase remain a major determinant of patient outcomes. Among these complications, cardiac arrhythmias are the most frequent and potentially life-threatening events observed during the early stage of infarction [1].AMI results from abrupt interruption of coronary blood flow, most commonly due to atherosclerotic plaque rupture

followed by thrombus formation. Prolonged ischemia leads to myocardial necrosis and profound metabolic and electrophysiological disturbances. Ischemic myocardial cells exhibit depletion of adenosine triphosphate (ATP), intracellular acidosis, accumulation of calcium, and extracellular potassium shifts. These biochemical alterations affect membrane potentials, conduction velocity, and refractoriness, thereby predisposing the myocardium to arrhythmias [2].

The acute stage of myocardial infarction—particularly the first 24 to 72 hours—is characterized by marked electrical instability. Both ongoing ischemia and reperfusion injury contribute to arrhythmogenesis.

Reperfusion, although essential for myocardial salvage, may transiently increase the risk of ventricular arrhythmias due to sudden ionic shifts and restoration of blood flow to previously ischemic tissue [2]. In addition, heightened sympathetic nervous system activity during acute infarction increases automaticity and triggered activity, further enhancing susceptibility to tachyarrhythmias [3].

Arrhythmic manifestations during AMI encompass a broad spectrum, ranging from benign premature beats to malignant ventricular arrhythmias.

Ventricular premature complexes are commonly observed in the early hours of infarction. While often clinically insignificant, frequent or complex ventricular ectopy may precede sustained ventricular tachycardia (VT) or ventricular fibrillation (VF).

Ventricular fibrillation remains one of the leading causes of sudden cardiac death during the early phase of myocardial infarction, particularly within the first few hours of symptom onset [1]. Sustained ventricular tachycardia may arise due to re-entry circuits formed within ischemic or border-zone myocardium. Early ventricular tachyarrhythmias are typically related to acute ischemia and metabolic disturbances, whereas late arrhythmias may reflect structural myocardial damage and electrical remodelling.

Differentiating early transient arrhythmias from those indicating extensive myocardial injury is important for prognostic assessment and management decisions [3].

Supraventricular arrhythmias also occur during the acute stage of myocardial infarction. Atrial fibrillation (AF) is among the most common supraventricular arrhythmias in this setting and is frequently associated with advanced age, left ventricular dysfunction, elevated atrial pressures, or atrial ischemia.

The development of AF during AMI has been linked to increased risk of heart failure, thromboembolic complications, prolonged hospitalization, and higher mortality rates [4]. Sinus tachycardia is commonly observed and often reflects pain, anxiety, hypovolemia, or left ventricular dysfunction. Conversely, sinus bradycardia is more frequently associated with inferior wall infarctions due to increased vagal tone or involvement of the sinoatrial node artery. Conduction abnormalities form another important group of arrhythmic manifestations. Atrioventricular (AV) blocks are particularly common in inferior wall myocardial infarctions, often due to ischemia of the AV node supplied by the right coronary artery.

First-degree and Mobitz type I AV blocks are usually transient and hemodynamically well tolerated. However, complete heart block may occur and may necessitate temporary pacing. In contrast, conduction defects such as bundle branch blocks in anterior wall infarctions often indicate extensive septal involvement and are associated with a poorer prognosis [5].

The incidence and pattern of arrhythmias vary depending on infarct size, infarct location, time to reperfusion, and underlying patient characteristics. Larger infarcts and delayed presentation are associated with higher arrhythmic risk. Electrolyte imbalances, hypoxia, and pre-existing structural heart disease further increase susceptibility to rhythm disturbances [2].

The establishment of coronary care units (CCUs) with continuous electrocardiographic monitoring has significantly reduced mortality from acute myocardial infarction by enabling early detection and prompt treatment of life-threatening arrhythmias [1].

Rapid defibrillation, appropriate antiarrhythmic therapy, correction of metabolic abnormalities, and timely reperfusion strategies have collectively improved survival outcomes. Nevertheless, arrhythmias remain a major contributor to early in-hospital morbidity and mortality.

A systematic evaluation of arrhythmic manifestations during the acute stage of myocardial infarction is therefore essential. Understanding their incidence, timing, clinical associations, and prognostic implications will aid in risk stratification, guide therapeutic interventions, and ultimately improve patient outcomes.

The present study is undertaken to comprehensively assess the spectrum of arrhythmias occurring during the acute phase of myocardial infarction and to evaluate their clinical significance.

Aim of the Study: To study the arrhythmic manifestations occurring during the acute stage (first week) of myocardial infarction and to evaluate their clinical significance and impact on patient outcomes.

Objectives of the Study

1. To determine the incidence of various cardiac arrhythmias during the acute stage of myocardial infarction.
2. To identify the types and patterns of arrhythmias observed in patients with acute myocardial infarction.
3. To assess the timing of occurrence of arrhythmias during the first week following myocardial infarction.
4. To correlate the occurrence of arrhythmias with the type of myocardial infarction (ST-elevation MI and non-ST-elevation MI).
5. To evaluate in-hospital complications associated with arrhythmias, including cardiogenic shock, heart failure, and sudden cardiac death.
6. To analyse the short-term outcome and mortality in patients who develop arrhythmias compared to those who do not.

Materials and Methods

The study was carried out in the Department of General Medicine and Intensive Care Unit (ICU) Department of Cardiology at Tertiary Care Hospital, Vijayawada, and Andhra Pradesh on 50 patients diagnosed with acute myocardial infarction and admitted during Jan 2025-Jan 2026 were included in the study. All patients admitted with a diagnosis of acute myocardial infarction (ST-elevation myocardial infarction [STEMI] or non-ST-elevation myocardial infarction [NSTEMI]) within 24 hours of onset of symptoms were screened for eligibility.

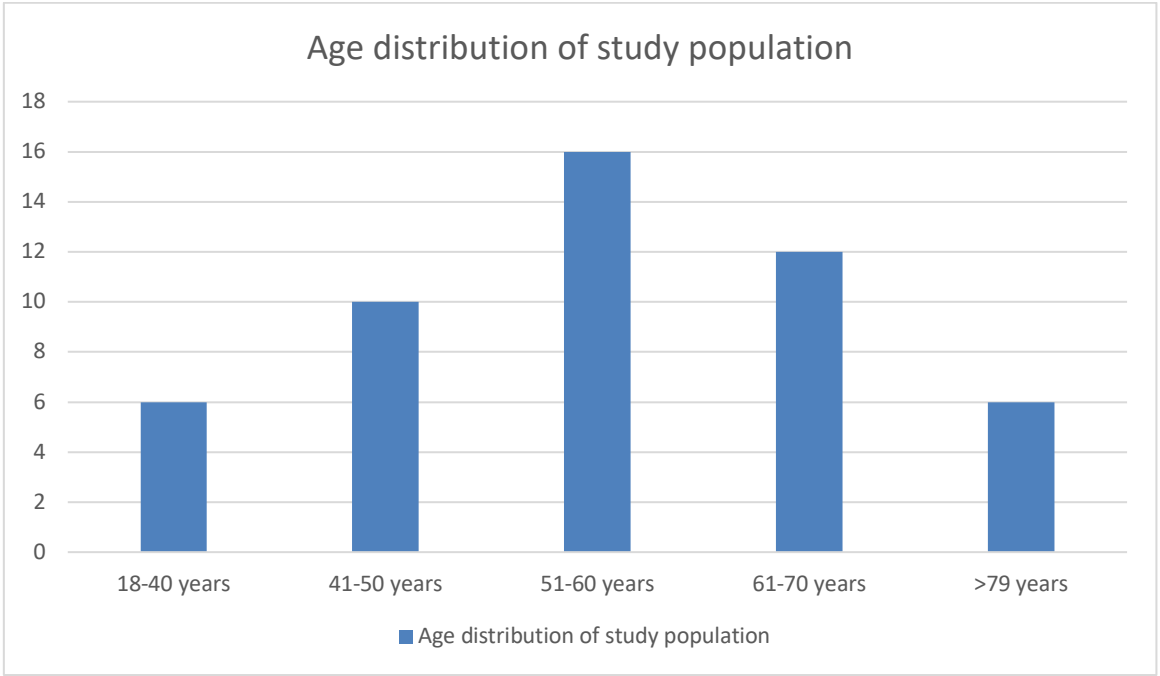
Inclusion Criteria

- Patients aged 18 years and above.
- Patients diagnosed with acute myocardial infarction based on:
- Typical clinical symptoms (chest pain or equivalent),
- Electrocardiographic changes suggestive of myocardial infarction, and/or
- Elevated cardiac biomarkers (Troponin I/T or CK-MB).
- Patients admitted within 24 hours of onset of symptoms.
- Patients willing to provide informed consent for participation in the study.

Exclusion Criteria

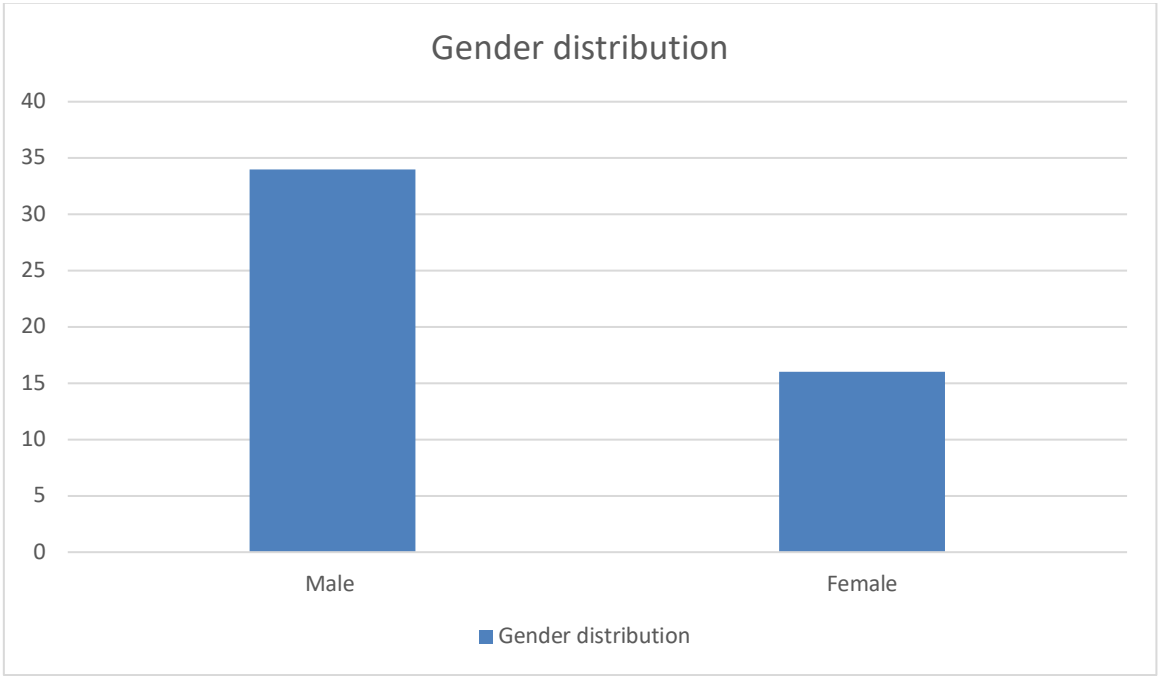
- Patients with a history of pre-existing chronic arrhythmias (e.g., chronic atrial fibrillation, known ventricular tachycardia).
- Patients with a previously implanted permanent pacemaker.
- Patients with known structural heart diseases unrelated to myocardial infarction (e.g., congenital heart disease, significant valvular heart disease).
- Patients with severe electrolyte imbalance at admission that could independently precipitate arrhythmias.
- Patients who were unwilling or unable to provide informed consent.

Results



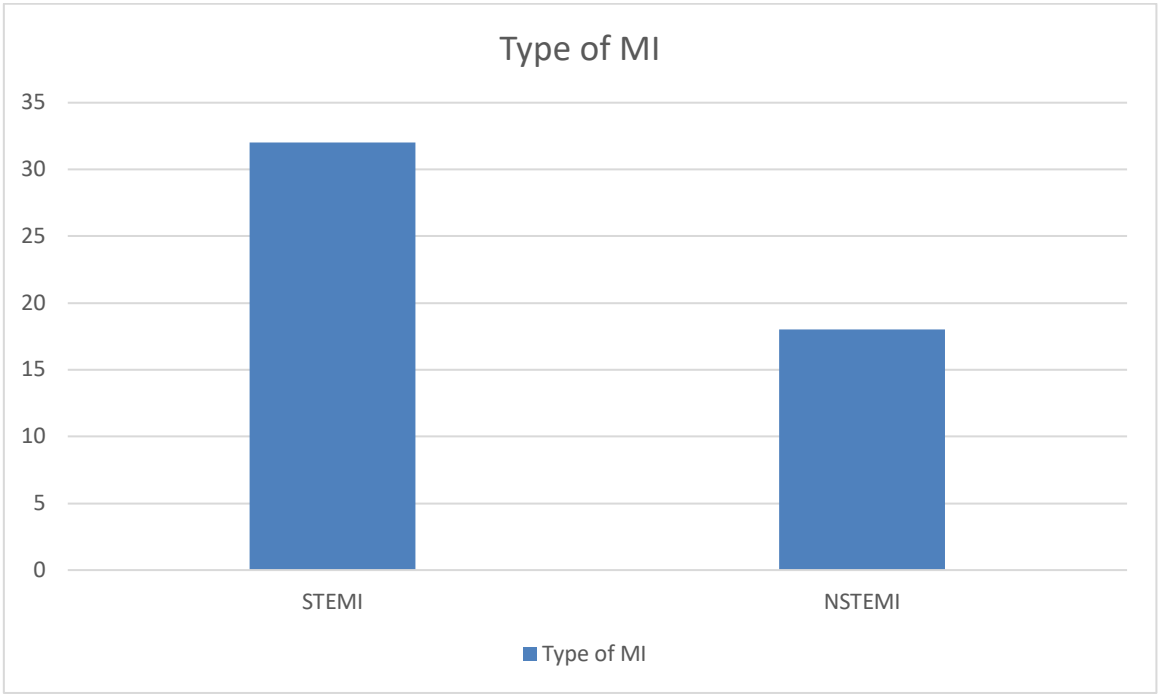
Graph 1: Age Distribution of Study Population (n = 50)

The majority of patients (32%) were in the 51–60 years age group, followed by 24% in the 61–70 years group. Younger patients below 40 years constituted only 12% of the study population. This indicates that acute myocardial infarction was more common in middle-aged and elderly individuals in the present study.



Graph 2: Gender Distribution

Males comprised 68% of the study population, while females accounted for 32%. This demonstrates a clear male predominance among patients admitted with acute myocardial infarction. The finding is consistent with the known higher incidence of coronary artery disease in men compared to women.



Graph 3: Type of Myocardial Infarction

ST-elevation myocardial infarction (STEMI) was observed in 64% of patients, whereas 36% had non-ST-elevation myocardial infarction (NSTEMI). Thus, STEMI was the more common presentation in this study. This suggests that a majority of patients presented with complete coronary artery.

Table 1: Overall Incidence of Arrhythmias occlusion requiring urgent intervention.

Arrhythmia Occurrence	Number of Patients	Percentage (%)
Present	30	60%
Absent	20	40%
Total	50	100%

Arrhythmias were observed in 60% of patients during the acute phase of myocardial infarction. Forty percent of patients did not develop any rhythm disturbances during hospitalization. This highlights that arrhythmias are a frequent complication in the early stage of myocardial infarction.

Table 2: Types of Arrhythmias Observed (n = 30)

Type of Arrhythmia	Number of Patients	Percentage (%)
Ventricular Premature Complexes (VPCs)	10	33.3%
Ventricular Tachycardia (VT)	5	16.7%
Ventricular Fibrillation (VF)	3	10%
Atrial Fibrillation (AF)	6	20%
Sinus Bradycardia	4	13.3%
Complete Heart Block	2	6.7%
Total	30	100%

Among patients who developed arrhythmias, ventricular premature complexes (33.3%) were the most common type. Atrial fibrillation accounted for 20%, while life-threatening arrhythmias such as ventricular tachycardia and ventricular fibrillation were seen in 16.7% and 10% respectively. Conduction disturbances like sinus bradycardia and complete heart block were less frequently observed.

Table 3: Timing of Arrhythmia Occurrence

Time of Onset	Number of Patients	Percentage (%)
Within 24 hours	18	60%
24–72 hours	8	26.7%
4–7 days	4	13.3%
Total	30	100%

Most arrhythmias (60%) occurred within the first 24 hours of admission. About 26.7% developed between 24–72 hours, while only 13.3% occurred between days 4–7. This indicates that the highest risk period for arrhythmias is during the initial 24 hours following myocardial infarction.

Table 4: Arrhythmias in STEMI vs NSTEMI

Type of MI	Arrhythmia Present	Arrhythmia Absent	Total
STEMI (n=32)	22	10	32
NSTEMI (n=18)	8	10	18
Total	30	20	50

Arrhythmias were more common in STEMI patients (22 out of 32) compared to NSTEMI patients (8 out of 18). The proportion of arrhythmias was therefore higher in STEMI cases. This suggests that patients with more extensive myocardial injury are at greater risk of developing rhythm disturbances.

Table 5: In-Hospital Complications among Patients with Arrhythmias (n = 30)

Complication	Number of Patients	Percentage (%)
Cardiogenic Shock	6	20%
Heart Failure	10	33.3%
Sudden Cardiac Death	3	10%
No Major Complication	11	36.7%
Total	30	100%

Heart failure was the most frequent complication among patients with arrhythmias (33.3%), followed by cardiogenic shock (20%). Sudden cardiac death occurred in 10% of patients with arrhythmias. These findings indicate that arrhythmias significantly contribute to adverse in-hospital outcomes.

Table 6: Mortality Comparison

Group	Number of Patients	Deaths	Mortality Rate (%)
With Arrhythmias	30	5	16.7%
Without Arrhythmias	20	1	5%
Total	50	6	12%

Mortality was higher among patients with arrhythmias (16.7%) compared to those without arrhythmias (5%). Overall mortality in the study population was 12%. This demonstrates that the development of arrhythmias during acute myocardial infarction is associated with increased risk of death.

Discussion

In this study of acute myocardial infarction (AMI) patients, the incidence of arrhythmias was 60%, which aligns with multiple prior clinical observations that arrhythmias are frequent complications following AMI, often occurring early in the disease course. Previous investigations have also reported high arrhythmia rates; for example, Patil et al. found that 76% of AMI patients developed arrhythmias, with most occurring within the first 12–24 hours of admission, and sinus tachycardia and ventricular premature beats were commonest [6]. Similarly, Shah et al. reported a high male predominance and identified ventricular premature contractions as the most common arrhythmia in first-week AMI patients [7]. The consistency between our findings and these Indian cohorts reinforces that arrhythmias remain a major early complication in AMI across diverse settings.

Comparative studies have also documented varied incidence based on population and diagnostic criteria. The China Acute Myocardial Infarction (CAMI) registry reported a lower overall arrhythmia incidence of 8.35% in a large multicentre cohort, though this study focused specifically on sustained arrhythmias and excluded transient ECG changes, highlighting how definitions influence reported rates [9]. In contrast, primary PCI studies show very high arrhythmia rates (up to 89% in the first 24 hours), suggesting that more intensive monitoring and reperfusion strategies reveal more arrhythmic events than retrospective cohorts relying on routine ECGs [11].

Our finding that arrhythmias were more frequent in STEMI than NSTEMI reflects the general trend observed in literature, where STEMI's complete coronary occlusion and larger ischemic burden predispose to greater electrical instability. Although one comparative study did not find a significant difference in ventricular arrhythmias between STEMI and NSTEMI, it did note overall hemodynamic instability patterns that vary with infarct type, underscoring the complexity of arrhythmia risk across presentations [4]. These nuances suggest that infarct characteristics and associated comorbidities modify arrhythmia risk more than just ECG presentation.

Regarding specific arrhythmia types and outcomes, our study aligns with broader evidence that life-threatening ventricular arrhythmias are associated with poor prognosis. A large inpatient sample with AMI complicated by cardiogenic shock found atrial fibrillation, ventricular tachycardia, and ventricular fibrillation to be common and linked with higher severity markers, though not independently predictive of mortality after adjustment, indicating multifactorial risk dynamics [3]. Moreover, some regional studies like the NICVD retrospective cohort have shown that certain arrhythmias such as AV nodal blocks and ventricular tachycardia are predictors of mortality, supporting the trend seen in our mortality comparisons [10][14].

Our observations also echo global patterns of demographic predispositions, where male gender predominates and advanced age increases arrhythmia risk, consistent with large registry and retrospective analyses [15]. Such demographic associations reflect underlying pathophysiologic processes including structural myocardial changes, conduction system vulnerabilities, and risk factor clustering that predispose to arrhythmogenesis post-ischemia.Overall, this study's results contribute to the cumulative evidence that arrhythmias are frequent, early, and prognostically significant complications in AMI. Variations in incidence across studies largely reflect differences in patient populations, arrhythmia definitions (transient vs sustained), monitoring intensity, and healthcare settings. Nonetheless, the consistent finding across diverse cohorts is that arrhythmias contribute meaningfully to morbidity and mortality in AMI, underscoring the importance of vigilant monitoring and rapid management strategies in clinical practice.

Conclusion

This study demonstrates that arrhythmias are a frequent and serious complication during the acute phase of myocardial infarction. The majority of rhythm disturbances occurred within the first 24 hours, highlighting the importance of early and continuous cardiac monitoring. Ventricular premature complexes were the most common arrhythmia, while ventricular tachycardia and fibrillation were associated with higher mortality. Arrhythmias were more common in STEMI patients and were linked to complications such as heart failure and cardiogenic shock. Overall, the presence of arrhythmias significantly increased in-hospital morbidity and mortality, emphasizing the need for prompt detection and management.

References

1. Braunwald E. Complications of acute myocardial infarction. In: Braunwald's Heart Disease: A Textbook of Cardiovascular Medic ine. 11th ed. Philadelphia: Elsevier; 2019.

2. Zipes DP, Jawline J. Cardiac Electrophysiology: From Cell to Bedside. 7th ed. Philadelphia: Elsevier; 2018.
3. Myerburg RJ, Castellanos A. Cardiac arrest and sudden cardiac death. In: Braunwald's Heart Disease. 11th ed. Philadelphia: Elsevier; 2019.
4. Crenshaw BS, Ward SR, Granger CB, et al. Atrial fibrillation in the setting of acute myocardial infarction. Circulation. 1997; 96: 1441–1448.
5. Hindman MC, Wagner GS, JaRo M, et al. The clinical significance of bundle branch block complicating acute myocardial infarction. Circulation. 1978; 58:679–688.
6. Patil BM. Incidence of Arrhythmias in Myocardial Infarction. Natl J Integr Res Med. 2014; 5(6):102-107.
7. Shah MJ, Bhatt NR, Dabhi A, et al. A Study of 100 Cases of Arrhythmias in First Week of Acute Myocardial Infarction (AMI) In Gujarat. J Clin Diagn Res. 2014; 8(1):58-61.
8. Zhang M, et al. Burden of cardiac arrhythmias in AMI: insights from China CAMI registry. BMC Cardiovasc Disord. 2022.
9. Vallabhajosyula S, et al. Burden of Arrhythmias in AMI Complicated by Cardiogenic Shock. Am J Cardiol. 2020.
10. Complications in Patients with STEMI vs NSTEMI.J Cardiovasc Emergencies 2025.
11. Arrhythmia in AMI: Retrospective Analysis from NICVD. PubMed 2019.
12. Sex Differences in Ventricular Arrhythmias and Outcomes after AMI. ACC Journals. 2024.
13. AlHabib KF, Hersi A, Hamza TH, et al. Acute myocardial infarction in the Middle East Gulf Registry: impact of arrhythmias on clinical outcomes. Int J Cardiol. 2017; 230:15–20.
14. Steg PG, Dabbous OH, Feldman LJ, et al. Determinants and prognostic impact of early sustained ventricular arrhythmias after acute myocardial infarction: insights from the Global Registry of Acute Coronary Events. Eur Heart J. 2008;29(17):2104–2112.
15. Goldberg RJ, et al. Trends in the incidence and outcomes of ventricular fibrillation complicating acute myocardial infarction: a 20-year community study. Ann Intern Med. 2009; 150(6):401–409.