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Incidence, Pattern, and Early Outcomes of Cardiac Arrhythmias during the First 48 Hours of Acute Myocardial Infarction: A Prospective Descriptive Study

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Abstract
Background: Electrical instability is a frequent early complication of acute myocardial infarction (AMI) and continues to influence short-term clinical outcomes despite advances in reperfusion therapy. ***Objective***: To assess the frequency, temporal distribution, and clinical associations of cardiac arrhythmias occurring during the first 48 hours of hospitalization in patients with AMI. ***Methods***: A prospective observational study was carried out in 100 consecutive patients diagnosed with AMI and admitted to the ICCU of a tertiary care center over 18 months. Continuous electrocardiographic surveillance was maintained for 48 hours. Demographic data, cardiovascular risk factors, infarct localization, thrombolytic therapy status, and left ventricular ejection fraction (LVEF) were recorded. Statistical comparisons were performed using the Chi-square test and $p < 0.05$ was considered statistically significant. ***Results***: Rhythm disturbances were identified in 78% of patients. The most frequently observed abnormality was sinus bradycardia (23%), followed by ventricular premature complexes (15.4%). Nearly 70% of arrhythmic events occurred within the first hour of admission. Patients with LVEF <40% demonstrated a higher occurrence of arrhythmias (54.2%). Most episodes resolved without intervention; however, 17.9% required pharmacological therapy and 12.8% required electrical management. ***Conclusion***: Early-phase arrhythmias remain highly prevalent in AMI, particularly among patients with impaired left ventricular function. Vigilant monitoring during the initial hours of hospitalization is essential for optimal clinical management.

Keywords: Acute myocardial infarction, Cardiac rhythm disturbance, Ventricular ectopy, Left ventricular dysfunction, Reperfusion

INTRODUCTION
Cardiovascular disease remains a dominant cause of mortality worldwide, and acute myocardial infarction represents one of its most critical clinical presentations [1]. Although modern reperfusion strategies have significantly improved survival rates, early complications such as cardiac rhythm abnormalities continue to affect in-hospital outcomes [2]. Ischemic injury to the myocardium alters cellular electrophysiology, leading to disturbances in impulse formation and conduction. Contributing mechanisms include autonomic imbalance, metabolic derangements, electrolyte shifts, and reperfusion-related myocardial irritability [3]. Ventricular tachyarrhythmias, particularly ventricular tachycardia (VT) and ventricular fibrillation (VF), are of particular concern due to their association with sudden cardiac death during the acute phase [4]. Even transient abnormalities such as sinus bradycardia and premature ventricular beats may signify conduction system involvement or evolving myocardial injury [5]. The widespread adoption of thrombolytic therapy and primary percutaneous coronary intervention has modified the arrhythmic spectrum observed in AMI, with increased recognition of reperfusion-associated arrhythmias and a relative reduction in sustained malignant rhythms [6]. Additionally, reduced left ventricular systolic performance is a well-recognized predictor of electrical instability and adverse outcomes following MI [7]. While several international studies have documented arrhythmia patterns in AMI [8,9], contemporary regional data remain limited. Hence, this study aimed to evaluate the incidence, characteristics, timing, and predictors of arrhythmias during the first 48 hours after AMI.

MATERIAL AND METHODS
This prospective descriptive investigation was performed at a tertiary care superspeciality hospital over an 18-month period. A total of 100 consecutive patients presenting with confirmed acute myocardial infarction and admitted to the ICCU were included in the analysis.

Inclusion Criteria

- Patients 18 years of age or above admitted in the ICCU with acutemyocardial infarction.
- Myocardial infarction less than 48 hours old.

Exclusion Criteria

- Patients less than 18 years of age.
- Myocardial infarction 48 hours old or more.
- Known pre-existing chronic arrhythmias
- Prior pacemaker implantation

Clinical Data

All patients underwent detailed clinical evaluation including history of cardiovascular risk factors and thorough systemic examination. Continuous cardiac monitoring was maintained for 48 hours to detect rhythm abnormalities. Two-dimensional echocardiography was performed to determine left ventricular ejection fraction.

Statistical Analysis

Data were compiled using Microsoft Excel and analyzed with SPSS version 11.5. Categorical variables were summarized as frequencies and percentages. The Chi-square test was used to examine associations between variables. A p-value <0.05 was considered statistically significant. All analyses were two-tailed with a 95% confidence level.

RESULTS

A total of 100 patients with acute myocardial infarction were included in the study. The majority were males and aged above 50 years. Cardiac arrhythmias were observed in 78% of patients, most commonly within the first hour of hospitalization.

Table 1: Time of Arrhythmia Vs Gender

Time of arrhythmia	Gender		Total
	Male %	Female %	
No	28.9	-	22
Within 1st hour	47.3	58.3	50
1-12:00 hr	21	16.6	20
12-24:00 hr	2.6	16.6	6
>24hrs	-	8.3	2
Total	100	100	100

P=0.093+

Majority of arrhythmias in both males and females occurred during the first hour of hospitalization and was statistically significant.

Table 2: Termination of Arrhythmia Vs Gender

Termination	Gender		Total
	Male %	Female %	
No arhythmia	28.9	-	22
Spontaneous	34.2	75	44
Persisted for 48 hours	10.5	8.3	10
Pharmacological intervention	13.1	16.6	14
	13.1	-	

Electrical intervention			10
Total	100	100	100

P=0.055+

Spontaneous resolution was noted more in females. Arrhythmia persistence for 48 hours was more in males and pharmacological intervention was more in females and was statistically significant.

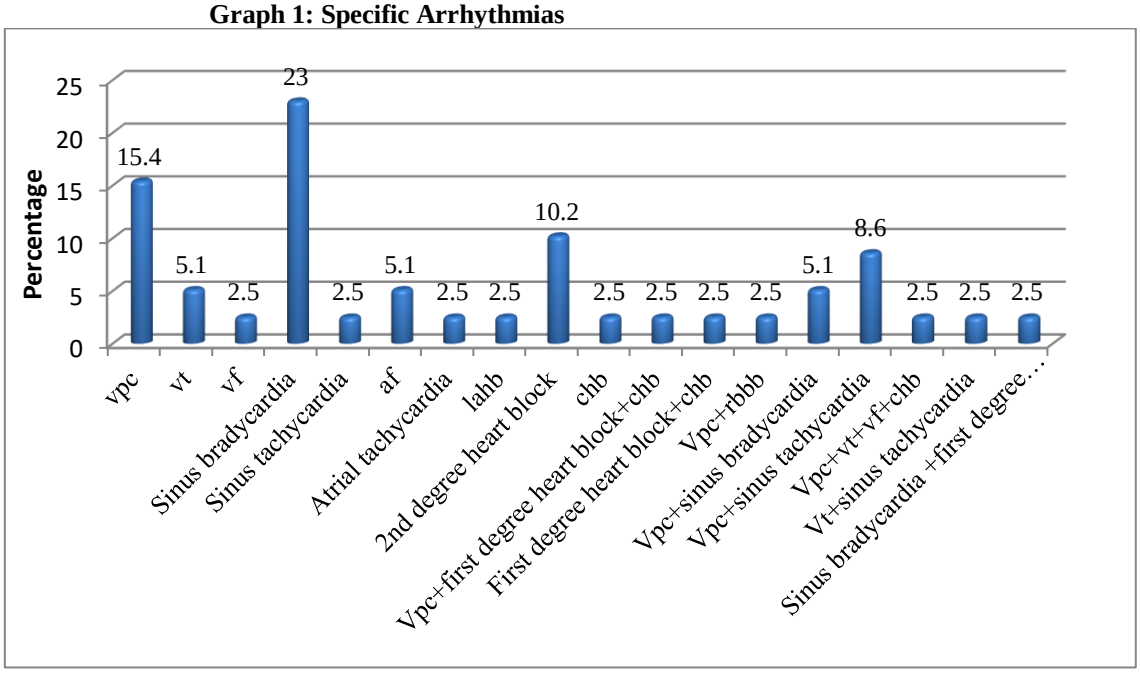
Table 3: Type of Arrhythmia Vs Gender

Type of arrhythmia	Gender		Total
	Male %	Female %	
vpc	3.7	41.6	15.9
vt	7.4		5.1
vf	3.7		2.5
Sinus bradycardia	33.3		23.0
Sinus tachycardia	3.7		2.5
af	3.7	8.3	5.1
Atrial tachycardia	3.7		2.5
lahb	3.7		2.5
2^{nd}degree heart block	3.7	25.0	10.2
chb		8.3	2.5
Vpc+1^{st}degree heart block+chb	3.7		2.5
1^{st}degree heart block+chb	3.7		2.5
Vpc+rbbb	3.7		2.5
Vpc+sinus bradycardia	3.7	8.3	5.1
Vpc+sinus tachycardia	7.4	8.3	8.6
Vpc+vt+vf+chb	3.7		2.5
Vt+sinus tachycardia	3.7		2.5

Sinus bradycardia+1st degree heart block	3.7		2.5
Total	100	100	100

Among female, VPCs were the commonest arrhythmia followed by second degree heart block. Among males, sinus bradycardia was the commonest arrhythmia.

Graph 1: Specific Arrhythmias



Bar graph representation of frequency of each arrhythmia category — Sinus bradycardia highest, followed by VPC

Table 4: Type of Arrhythmia Vs Age Distribution

Type of arrhythmia	Age code						Total
	20-29	30-39	40-49	50-59	60-69	70-79	
No arrhythmia	50%	50%	14.2%	18.18%	16.6%	40%	22%
Vpc				18.18%	16.6%		12%
vt				4.5%	8.3%		4%
vf					8.3%		2%
sinus bradycardia			42.8%	9.09%	25%	20.0%	18%
Sinus tachycardia					8.3%		2%
Af			14.2%	4.5%			4%
Atrial tachycardia				4.5%			2%

Lahb			14.2%				2%
2^{nd}degree heart block				9.09%		40.0%	8%
Chb				4.5%			2%
Vpc+1^{st} degree heart block+chb				4.5%			2%
1^{st} degree heart block+chb				4.5%			2%
Vpc+rbbb					8.3%		2%
Vpc+sinus bradycardia				4.5%	8.3%		4%
Vpc+sinus tachycardia				13.6%			6%
Vpc+vt+vf+chb			14.2				2%
Vt+sinus tachycardia	50%						2%

The commonest arrhythmia in the 40–49-year group was sinus bradycardia. Commonest in 50–59-year group was VPC. Commonest in 60–69-year group was sinus bradycardia. Commonest in 70–79-year group was second degree heart block.

Table 5: Site of Infarction Vs L.V. Dysfunction

Site of infarction	**Lvef level**		**Total**
	<40%	**>40%**	
Awmi	70.5	29.5	100
Iwmi	22.2	77.7	100
Ilmi	33.3	66.7	100
iwmi+rv	100	-	100
Lwmi	60	40	100
Total	54.2	45.7	100

In AWMI majority of patients in whom 2-D Echo was done, had L.V. dysfunction. In IWMI, majority did not have L.V. dysfunction.

Table 6: Type of Arrhythmia Vs L.V. Dysfunction

Type of arrhythmia	Lvef level		Total
	<40	>40	
vpc	66.7	33.3	100
vt	100		100
Sinus bradycardia		100	100
Sinus tachycardia	100		100
Atrial tachycardia		100	100
2nd degree heart block	33.3	66.7	100
Vpc+1st degree heart block+chb		100	100
1st degree heart block+chb	100		100
Vpc+rbbb	100		100
Vpc+sinus bradycardia	50	50	100
Vpc+sinus tachycardia	66.7	33.3	100
Vt+sinus tachycardia	100		100
Sinus bradycardia+1st degree heart block		100	100
Total	54.2	45.7	100

L.V. Dysfunction was found in majority of patients who had VPC, VT, sinus tachycardia. 54.2% of those with arrhythmia had L.V. Dysfunction.

DISCUSSION

In the present study, arrhythmias were observed in 78% of patients within 48 hours of AMI, which is consistent with prior large-scale observations reporting high early arrhythmic burden following myocardial infarction [10]. Sinus bradycardia emerged as the most common rhythm disturbance, a finding comparable to previous reports highlighting the prominence of bradyarrhythmias, particularly in inferior wall infarctions [11]. Ventricular premature complexes were the second most frequent abnormality. Although isolated ectopic beats are often benign, their occurrence in the setting of reduced ventricular function may indicate heightened electrical instability [12]. Ventricular tachycardia was documented in a minority of patients. Evidence suggests that early-onset VT occurring within the first 48 hours may be transient; however, when

associated with significant ventricular dysfunction, it portends a poorer prognosis [13,14]. A substantial proportion of patients with arrhythmias demonstrated reduced LVEF, reinforcing the established relationship between impaired ventricular function and susceptibility to malignant arrhythmias [15]. Additionally, a higher occurrence of rhythm disturbances was noted among patients receiving thrombolytic therapy, likely reflecting transient reperfusion-related electrical irritability [16]. These findings emphasize the necessity of intensive monitoring during the early hospitalization period, especially in patients with anterior wall infarction and compromised ventricular function.

CONCLUSION

Cardiac rhythm disturbances are highly prevalent during the early phase of acute myocardial infarction, affecting approximately three-fourths of patients in this study. Sinus bradycardia and ventricular premature complexes were the most frequently encountered abnormalities. Most arrhythmic events occurred shortly after admission and resolved spontaneously; however, patients with reduced left ventricular function exhibited a greater risk of clinically significant arrhythmias.

Early detection through continuous monitoring and prompt therapeutic intervention remain fundamental to reducing early complications and preventing sudden cardiac death.

REFERENCE

1. Thygesen K, Alpert JS, Jaffe AS, et al. Fourth universal definition of myocardial infarction. Eur Heart J. 2018; 39:119–177.
2. Piccini JP, Berger JS, Brown DL. Early sustained ventricular arrhythmias complicating acute myocardial infarction. Am Heart J. 2008; 155:699–705.
3. Gheeraert PJ, Henriques JP, De Buyzere ML, et al. Out-of-hospital ventricular fibrillation in ST-elevation myocardial infarction. Eur Heart J. 2006; 27:1072–1080.
4. Gang UJO, Hvelplund A, Pedersen S, et al. High-degree atrioventricular block complicating ST-segment elevation myocardial infarction. Heart. 2012; 98:1543–1549.
5. Montalescot G, Sechtem U, Achenbach S, et al. ESC Guidelines for acute coronary syndromes. Eur Heart J. 2013; 34:2949–3003.
6. Adabag AS, Therneau TM, Gersh BJ, Weston SA, Roger VL. Sudden death after myocardial infarction. Circulation. 2008; 118:2553–2561.
7. Pouleur AC, Barkoudah E, Uno H, et al. Sudden death risk in post-MI patients with LV dysfunction. Eur Heart J. 2010; 31:221–229.
8. Huikuri HV, Castellanos A, Myerburg RJ. Sudden death due to cardiac arrhythmias. N Engl J Med. 2009; 361:2137–2147.
9. Steg PG, James SK, Atar D, et al. ESC Guidelines for STEMI management. Eur Heart J. 2012; 33:2569–2619.
10. Goyal A, Mehta SR, Díaz R, et al. Differential clinical outcomes associated with ventricular arrhythmias in acute myocardial infarction: Insights from the Global Registry of Acute Coronary Events (GRACE). Circulation. 2009; 119(8):1082–1088.
11. Bauer A, Watanabe MA, Schmidt G. Heart rate turbulence and arrhythmic risk after myocardial infarction. Lancet. 2008; 372:1289–1295.
12. Solomon SD, Zelenkofske S, McMurray JJV, et al. Sudden death in patients with myocardial infarction and LV dysfunction. N Engl J Med. 2005; 352:2581–2588.
13. Mehta RH, Starr AZ, Lopes RD, et al. Incidence of sustained ventricular tachycardia or fibrillation in ST-elevation myocardial infarction treated with reperfusion therapy. JAMA. 2009; 301:1779–1789.
14. Al-Khatib SM, Stevenson WG, Ackerman MJ, et al. 2017 AHA/ACC/HRS guideline for management of ventricular arrhythmias. Circulation. 2018; 138:e272–e391.
15. De Ferrari GM, Sanzo A, Bertoletti A, et al. Arrhythmias and sudden death in acute myocardial infarction. Eur Heart J Suppl. 2008; 10:F13–F20.
16. Elayi CS, Hummel JD, Strickberger SA. Ventricular arrhythmias in acute coronary syndromes. Cardiol Clin. 2008; 26:559–572.