Pattern of Arrhythmias in Acute Coronary Syndrome Patients Presenting at B. P. Koirala Institute of Health Sciences, Nepal

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ABSTRACT

BACKGROUND

Acute Coronary Syndrome (ACS) is the leading cause of mortality and morbidity worldwide. Arrhythmias are a major contributor to morbidity and mortality in patients with ACS. Early arrhythmic events, particularly ventricular tachycardia (VT) and ventricular fibrillation (VF), frequently lead to sudden cardiac death if not promptly treated. Although these arrhythmias occur most commonly within the first 24 hours following ACS, late-onset arrhythmia can also develop, especially in patients with extensive infarcts or heart failure. The presence of arrhythmias often indicates more severe myocardial injury and is associated with a poorer long-term prognosis.

METHODS

This was a prospective cross sectional observational study conducted at the department of Cardiology, B.P. Koirala Institute of Health Sciences, Dharan, Nepal, for a period of 3 months (2026 to March 2026). 70 consecutive cases of Acute Coronary Syndrome (ACS) were included in the study based on inclusion and exclusion criteria. Detailed clinical profiles, electrocardiographic changes, echocardiographic metrics, and serum cardiac biomarkers were systematically documented. Continuous cardiac monitoring was done in Coronary Care Unit (CCU) admission to capture all distinct arrhythmic presentations. Statistical data analysis was performed by SPSS 2020.

RESULTS

The cohort showed a slight male predominance (51.42%), a median age of 65 years, and 78.6% of patients were over 60. Key risk factors included diabetes (45.71%), dyslipidemia (40.0%), smoking (38.57%), and hypertension (34.32%). ST-elevation myocardial infarction (STEMI) was the primary presentation (58.6%), most frequently affecting the anteroseptal wall (44.28%).

The overall arrhythmia incidence was 75.7%. Ventricular premature contractions (VPCs) were most common (52.9%), followed by sinus tachycardia (25.7%). Complete (third-degree) atrioventricular block occurred in 7.1% of cases (requiring temporary pacing) and sustained ventricular tachycardia (VT) in 4.3% (requiring cardioversion). Regarding complications, 20% developed acute heart failure, 10% experienced cardiogenic shock, and 2.85% died from refractory VT.

CONCLUSIONS

Arrhythmias complicate a vast majority of ACS presentations in this regional Nepalese setting and significantly contribute to in-hospital morbidity and mortality. Metabolic and lifestyle risks, particularly diabetes, dyslipidemia, and smoking are highly prevalent and underscore the need for enhanced risk stratification and vigilant continuous cardiac monitoring in resource-constrained cardiac units.

KEY WORDS

Acute Coronary Syndrome; Arrhythmias; Myocardial Infarction; Nepal; Ventricular Tachycardia.

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INTRODUCTION

Ischemic heart disease (IHD) is the leading cause of death among cardiovascular diseases (CVD), accounting for more than nine million deaths worldwide in 2016 according to the World Health Organization (WHO). Within IHD, acute coronary syndrome (ACS) remains the leading cause of mortality globally and is a major contributor to disease burden, particularly in high-income countries. ACS includes a spectrum of clinical conditions, including ST-elevation myocardial infarction (STEMI), non-ST elevation myocardial infarction (NSTEMI), and unstable angina (UA), resulting from acute myocardial ischemia. It is almost always associated with rupture of an atherosclerotic plaque and partial or complete thrombosis of the infarct-related artery. It is a leading cause of morbidity and mortality worldwide, including in resource-limited settings like Nepal. The occurrence of arrhythmias among acute coronary syndrome patients is very common and it significantly contribute to poor outcomes of ACS by precipitating hemodynamic instability, sudden cardiac arrest, and increased mortality. Early recognition and management of arrhythmias can substantially improve the prognosis of ACS patients.

Arrhythmias in ACS occur due to a variety of mechanisms, including ischemia-induced myocardial irritability, electrolyte imbalances, and autonomic nervous system dysregulation. Sudden cardiac death is most often attributed to this pathophysiology, but many patients survive the early stage of an ACS. Different types of arrhythmias are seen in ACS and these arrhythmias may manifest as bradyarrhythmia's (e.g., sinus bradycardia, atrioventricular blocks) or tachyarrhythmias (e.g., ventricular tachycardia, atrial fibrillation, SVTs). The type and frequency of arrhythmias can vary based on the subtype of ACS, the location and extent of myocardial injury, and the presence of comorbidities such as diabetes mellitus and hypertension. Sustained ventricular tachyarrhythmias (VAs) may be associated with circulatory collapse and require immediate treatment. Atrial fibrillation (AF) may also warrant urgent treatment when a fast ventricular rate is associated with hemodynamic deterioration. Early identification and treatment of arrhythmia decrease mortality and morbidity. ,

In Nepal, where healthcare resources are limited, continuous cardiac monitoring in all ACS patients is often not feasible, making it crucial to identify high-risk populations predisposed to arrhythmias. B.P. Koirala Institute of Health Sciences (BPKIHS), as a tertiary referral center, caters to a diverse patient population from Eastern Nepal. However, data on the patterns of arrhythmias in ACS patients in this region remains sparse. Understanding these patterns is essential for tailoring monitoring and treatment protocols to optimize resource utilization and improve patient outcomes.

This study aims to evaluate the spectrum and frequency of arrhythmias in ACS patients at BPKIHS. Furthermore, it seeks to identify the clinical and biochemical factors associated with arrhythmias, thereby contributing to the existing knowledge base and providing insights for improving ACS management in similar settings.

By addressing this gap in the literature, the findings of this study could help inform clinical practices and prioritize interventions for patients at higher risk of arrhythmias, ultimately improving the quality of care for ACS patients in Nepal.

METHODS

This was a hospital based observational study with cross-sectional design conducted at the department of Cardiology, BPKIHS, Dharan Nepal for a period of 3 months from January 2026 to March 2026. 70 consecutive cases of myocardial infarction admitted with diagnosis of ACS in BPKIHS were included in the study based on inclusion and exclusion criteria.

Inclusion Criteria:

1. Adult patients (≥18 years) are diagnosed with ACS based on clinical presentation, ECG findings, and cardiac biomarkers. (4th universal definition of MI) .

Exclusion Criteria:

1. Patients with preexisting arrhythmia (e.g., chronic atrial fibrillation, WPW syndrome, congenital heart block).
2. Patients with implantable pacemakers or defibrillators before ACS diagnosis.
3. Patients with severe comorbidities limiting survival beyond hospitalization (e.g., end-stage heart failure, terminal malignancy).
4. Patients who are against medical advice (LAMA) before arrhythmia assessment.

Thorough history taking, clinical examinations and relevant investigations including ECG, Echocardiography, cardiac enzymes (quantitative Troponin-I, Creatinine Kinase- CK MB), electrolytes and other routine investigations were done in all

cases. Informed consent was taken from all the patients or their guardians. All the patients were managed according to the standard protocol and guidelines of management of acute myocardial infarction and were admitted to the coronary care unit (CCU) for observation. Reperfusion with Thrombolysis by streptokinase was done in patients with STEMI presenting within 12 hours of onset of symptoms and if Percutaneous Coronary Intervention (PCI) was not feasible within the 120 minutes of presentation. Cardiac monitors were attached to every patient and vitals were monitored closely. Monitoring and recording of arrhythmia during the CCU stay was done. Types and duration of arrhythmia were recorded;

if a single patient had two different arrhythmias, then both were recorded as separate events. Need for cardioversion, Temporary Percutaneous Trans-Venous Pacemaker Insertion (TPI) or drugs for termination of arrhythmia was also recorded. Complications due to arrhythmia and outcome of the arrhythmia in terms of clinical outcome or mortality were also recorded. The results were analyzed using SPSS 2020.

RESULT

A total of 70 consecutive cases presenting with ACS were taken on admission to the Coronary Care Unit, aged between 24 to 78 years at B.P. Koirala Institute of Health Sciences.

In this study acute coronary syndrome was common among males than females (51.42% Vs 48.58%) with male to female ratio of 1.058:1. The median age of the patient presenting with ACS was 65±7 years. The youngest patient was 24 years and eldest was 78 years old.

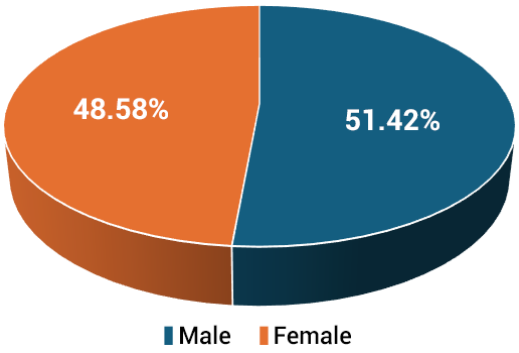

Figure 1: Sex Distribution of the patients

This study showed acute coronary syndrome was more common among age group more than 60 years (78.6%) and was present in only 4.3% among those with age<50 years.

Age Group	No. of Patients	Percent (%)
<50 Years	3	4.3
50-59 Years	12	17.1
60-69 Years	32	45.7
>70 Years	23	32.9

Table 1: Age Group distribution of the patients

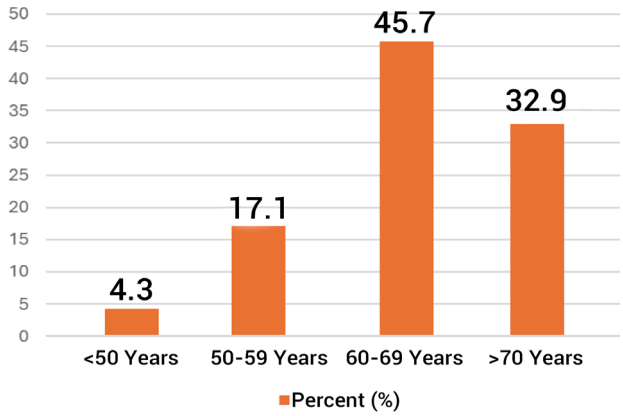

Figure 2: Age Group Distribution of the patients

Diabetes mellitus was the most common risk factor identified which was present in 45.71% of patients. In 4.28% of patients there was previous history of coronary artery disease. 27 (38.57%) patients had history of smoking.

Risk Factors	No. of Patients	Percentage (%)
Diabetes Mellitus	32	45.71
Hypertension	24	34.32
Dyslipidemia	28	40.00
Prior history of CAD	3	4.28
Smoking	27	38.57

Table 2: Risk factors distributions of the patients

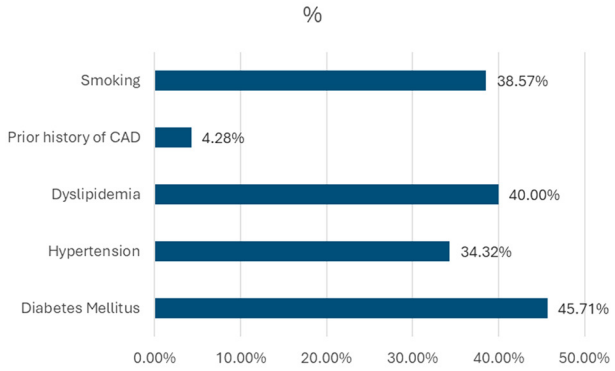

Figure 3: Risk factors distribution of the patients

In our study STEMI (58.6%) was the most common type of ACS followed by UA (21.42%).

Types of ACS	Number of patients	Percent (%)
UA	15	21.42
NSTEMI	14	20.0
STEMI	41	58.6

Table 3: Distribution of types of ACS

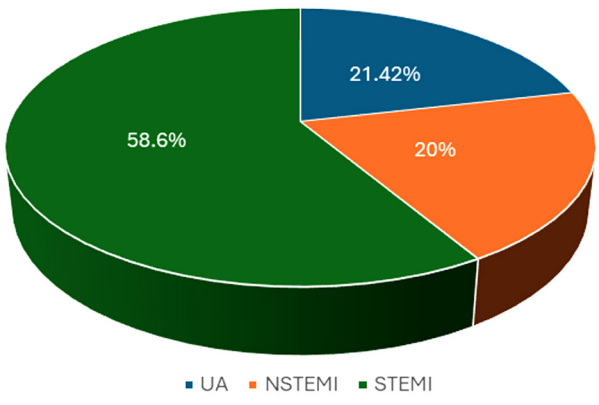

Figure 4: Distribution of Types of ACS

In this study anteroseptal infarction was the most common site of infarction in 44.28% of patients, anterior wall (24.3%) and inferior was (15.7%) are other common sites of infarction.

Site of infarction	Frequency	Percent (%)
Anterior wall	17	24.3
Antero-septal wall	31	44.28
Antero-lateral wall	2	2.9
Inferior + lateral wall	1	1.4
Inferior wall	11	15.7
Lateral wall	8	11.4

Table 4: Distribution of sites of infarction in patients

Arrhythmias	Number of Patients	Percent (%)
Absent	17	24.3
Present	53	75.7

Table 5: Distribution of incidence of arrhythmias

Type of arrhythmia	Number of patients	Percent (%)
Sinus Tachycardia	18	25.7
1st degree AV block	1	1.4
Atrial fibrillation	5	7.1
3rd degree AV block	5	7.1
Sustained VT	3	4.3
Supraventricular Tachycardia	2	2.9
VPC	37	52.9
NSVT	1	1.4

Table 6: Distribution of Types of arrhythmias.

In our study incidence of arrhythmias was 75.7 % (53) among them most common arrhythmias were presence of VPC followed by sinus tachycardia which was present in 52.9% and 25.7% of patients respectively. Sustained ventricular tachycardia needing cardioversion was noted in 3 (4.3%) patients and 3rd degree AV block needing temporary pacing was present in 5 (7.1%) patients. There was no need for permanent pacemakers in any of our study patients.

In our study 7 (10%) patients develop cardiogenic shock, 14 (20%) patients develop acute heart failure and 2 (2.85%) patients died because of ventricular tachycardia

DISCUSSION

This prospective observational study conducted at B.P. Koirala Institute of Health Sciences (BPKIHS), Dharan, demonstrates a high incidence of arrhythmias (75.7%) among 70 patients with acute coronary syndrome (ACS). The findings highlight the persistent burden of electrical complications in ACS in a resource-limited tertiary care setting in eastern Nepal, where timely primary percutaneous coronary intervention (PCI) is not always feasible.6,

The demographic profile in our cohort showed a near-equal male-to-female ratio (1.058:1), with most patients (78.6%) aged over 60 years. This pattern reflects the shifting epidemiology of coronary artery disease (CAD) in South Asia, where cardiovascular risk among women is rising rapidly, possibly due to increasing prevalence of metabolic syndrome and lifestyle changes. The predominance of older patients aligns with reduced myocardial resilience and higher comorbidity burden in this age group.6,4

Diabetes mellitus emerged as the leading risk factor (45.71%), followed by dyslipidemia (40%), smoking (38.57%), and hypertension (34.32%). These findings are consistent with regional data emphasizing the central role of metabolic and lifestyle factors in accelerating atherosclerosis and arrhythmogenesis in South Asian populations. Diabetes promotes autonomic neuropathy and microvascular dysfunction, lowering the threshold for ventricular arrhythmias.8,5,

STEMI accounted for 58.6% of cases, with anteroseptal and anterior wall infarctions being most common (68.6% combined). This distribution points to frequent involvement of the left anterior descending (LAD) artery, which supplies a large myocardial territory and critical conduction pathways, thereby explaining the high rate of both tachy- and bradyarrhythmia observed.8,

Ventricular premature contractions (VPCs) were the most frequent arrhythmia (52.9%), followed by sinus tachycardia (25.7%). Atrial fibrillation and complete (third-degree) AV block each occurred in 7.1% of patients. Sustained ventricular tachycardia (VT) requiring cardioversion was seen in 4.3%, while all cases of complete heart block necessitated temporary transvenous pacing, with no requirement for permanent pacemakers. These patterns are broadly consistent with the known mechanisms of arrhythmias in ACS, including re-entry circuits in ischemic border zones, enhanced automaticity, triggered activity, and autonomic imbalance. , ,

The overall arrhythmia incidence of 75.7% in our study is comparable to other Nepalese and South Asian reports, such as 90.2% by Kidwai et al. (2017) and 77.6% in a recent Indian observational study. Global literature reports varying incidences, often lower in contemporary series with

widespread reperfusion, ranging from 8–30% for clinically significant arrhythmias, though higher rates are noted during the acute phase when continuous monitoring is employed.8, ,

Arrhythmic complications significantly contributed to morbidity, with 20% developing acute heart failure, 10% cardiogenic shock, and 2.85% in-hospital mortality due to refractory VT. These outcomes underscore the prognostic importance of arrhythmias as markers of larger infarct size and hemodynamic instability, consistent with multiple studies linking malignant ventricular arrhythmias to worse short-term prognosis.

CONCLUSION

In conclusion, arrhythmia complicates most cases of ACS and remains an important contributor to in-hospital morbidity and mortality. Enhanced risk stratification, optimized acute management, and region-specific preventive programs are essential to improve outcomes in similar resource-constrained Nepalese settings.

Hypertension, diabetes, dyslipidemia, history of prior coronary artery disease and smoking are important predictors for development of arrhythmias in ACS patients. More attention should be paid to patients with those risk factors.

REFERENCES:

1. Rao SV, O'Donoghue ML, Ruel M, Rab T, Tamis-Holland JE, Alexander JH, et al. 2025 ACC/AHA/ACEP/NAEMSP/SCAI Guideline for the Management of Patients with Acute Coronary Syndromes: A Report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. Circulation. 2025 Feb 27. doi: 10.1161/CIR.0000000000001309.
2. Ibanez, B., James, S., Agewall, S., et al. (2018). 2017 ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation. European Heart Journal, 39(2), 119-177.
3. Senthilkumar K, Lakshmanadoss U, Chacko P. Arrhythmic complications in acute coronary syndrome: mechanisms, manifestations, and management. In: Lakshmanadoss U, editor. Understanding acute coronary syndrome - symptoms, causes, and treatment options. London: IntechOpen; 2025. p. 231-254. doi: 10.5772/intechopen.1010982.
4. Pandey S, Sharma A, Goyal NC, Singh TP. Analyzing arrhythmia patterns in acute myocardial infarction: a clinical perspective. J Popul Ther Clin Pharmacol. 2024;31(11):2018-2026. doi: 10.53555/mn85qe25.
5. Zhao, J., Zhang, X., & Gao, C. (2020). Arrhythmias in acute myocardial infarction: Pathogenesis, prognosis, and management. Clinical Cardiology, 43(10), 1039-1050.
6. Kidwai A. Study of Cardiac Arrhythmias in Acute Myocardial Infarction: A Hospital Based Study. J Nepalgunj Med Coll. 2017 Jul;15(1):15-9.
7. Thygesen K, Alpert JS, Jaffe AS, Chaitman BR, Bax JJ, Morrow DA, et al. Fourth universal definition of myocardial infarction (2018). Eur Heart J. 2019 Jan 14;40(3):237-269. doi: 10.1093/eurheartj/ehy462.
8. Khanal RR, Karki P, Regmi S, et al. Arrhythmias: Its Occurrence, Risk Factors, Therapy, and Prognosis in Acute Coronary Syndrome. J Nepal Health Res Counc. 2023;21(1):8-14.
9. Yusuf S, Hawken S, Ounpuu S, et al. Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case-control study. Lancet. 2004;364(9438):937-52.
10. Collet JP, Thiele H, Barbato E, et al. 2020 ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation. Eur Heart J. 2021;42(14):1289-367.
11. Al-Khatib SM, Stevenson WG, Ackerman MJ, et al. 2017 AHA/ACC/HRS Guideline for Management of Patients With Ventricular Arrhythmias and the Prevention of Sudden Cardiac Death. Circulation. 2018;138(13):e272-e391.
12. Kalarus Z, Svendsen JH, Capodanno D, et al. Cardiac arrhythmias in the emergency settings of acute coronary syndrome and revascularization: an European Heart Rhythm Association (EHRA) consensus document. Europace. 2019;21(12):1845-63.
13. Hindricks G, Potpara T, Dagres N, et al. 2020 ESC Guidelines for the diagnosis and management of atrial fibrillation developed in collaboration with the European Association for Cardio-Thoracic Surgery (EACTS). Eur Heart J. 2021;42(5):373-498.
14. Mani S, Ramalingam S, Ramalingam S. Incidence and Types of Arrhythmias in Acute Coronary Syndrome: An Observational Study. Med Res Arch. 2023;11(9).
15. Rao SV, O'Donoghue ML, Ruel M, et al. 2025 ACC/AHA/ACEP/NAEMSP/SCAI Guideline for the Management of Patients With Acute Coronary Syndromes. Circulation. 2025. doi:10.1161/CIR.0000000000001309.
16. Khan AB, Ahmed C. Pattern of arrhythmias in acute coronary syndrome. Pak Heart J. 2021;54(1):15-22. Available from: https://doi.org/10.47144/phj.v54i1.2071
17. Winkler C, Funk M, Schindler DM, et al. Arrhythmias in Patients with Acute Coronary Syndrome in the First 24 Hours of Hospitalization. Heart Lung. 2013;42(6):422-7.