RESEARCH ARTICLE

Epidemiological and Clinical Insights into Cardiac Arrhythmias: A Cross-sectional Analysis of 500 Patients in a Tertiary Care Hospital

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Abstract

Background: Cardiac arrhythmias represent a broad spectrum of disorders affecting the rate or rhythm of the heartbeat, potentially leading to significant morbidity and mortality. Despite advancements in detection and management, arrhythmias remain underdiagnosed, particularly in resource-limited settings.

Objective: To analyze the prevalence, clinical characteristics, risk factors, and treatment patterns of arrhythmias in a cohort of adult patients presenting to a tertiary care center.

Methods: A hospital-based cross-sectional study was conducted involving 500 adult patients diagnosed with arrhythmia between January 2022 and December 2023. Clinical evaluations, ECGs, Holter monitoring, and echocardiography were performed. Data were analyzed for demographics, arrhythmia type, risk factors, and therapeutic interventions.

Results: Atrial fibrillation was the most common arrhythmia (38%), followed by premature ventricular contractions (22%) and supraventricular tachycardia (15%). Hypertension, ischemic heart disease, and diabetes mellitus were the most prevalent comorbidities. Antiarrhythmic drug use was documented in 72% of patients, and 18% required invasive procedures such as catheter ablation or ICD implantation.

Conclusion: This study highlights the substantial burden and heterogeneity of arrhythmias in clinical practice. Early identification, risk factor control, and individualized treatment are crucial in optimizing patient outcomes.

Keywords

Arrhythmia; Atrial fibrillation; Tachycardia; Bradycardia; Holter monitoring; Cardiac electrophysiology; Antiarrhythmic drugs; Risk factors

Introduction

Cardiac arrhythmias encompass a range of disorders in which the electrical impulses that coordinate heartbeats function abnormally. These disorders can be benign or potentially life-threatening, with varying degrees of clinical significance. Atrial fibrillation (AF), the most prevalent arrhythmia worldwide, affects over 33 million individuals globally and contributes substantially to the risk of stroke and heart failure.

Although modern medicine offers a wide array of diagnostic and therapeutic tools—from ECG monitoring to catheter-based ablation—arrhythmias are still underdiagnosed in many parts of the world. Risk factors such as hypertension, aging, myocardial infarction, and metabolic syndromes play a pivotal role in their pathogenesis.

The current study aims to elucidate the epidemiological and clinical profile of arrhythmias in a diverse patient population, thus aiding in improved diagnostic and therapeutic strategies in real-world clinical settings.

Materials and Methods

Study Design and Setting

This was a descriptive, cross-sectional study conducted at Northfield Medical College, a tertiary care teaching hospital in the United States, from January 2022 to December 2023.

Study Population

A total of 500 adult patients (>18 years old) presenting with documented cardiac arrhythmias, either symptomatic or asymptomatic, were included. Exclusion criteria were incomplete records, congenital heart defects, and end-stage organ failure.

Data Collection

Data were collected through:

- Clinical history and physical examination
- 12-lead Electrocardiogram (ECG)
- 24-hour Holter monitoring (in 280 patients)
- 2D Echocardiography (in 410 patients)
- Relevant laboratory investigations

  A structured proforma was used to record:

- Demographic details
- Clinical symptoms (palpitations, dizziness, syncope, etc.)
- Risk factors and comorbidities
- Type and classification of arrhythmia
- Treatment modalities (pharmacological and interventional)

Statistical Analysis

Data were analyzed using SPSS version 26. Descriptive statistics such as mean, standard deviation, and frequency distributions were used. Chi-square test was used to assess associations. A p-value <0.05 was considered statistically significant.

Results

Demographic Characteristics

Out of 500 patients, 298 were males (59.6%) and 202 females (40.4%), with a mean age of 61.2 ± 13.8 years. The most affected age group was 60–69 years.

Types of Arrhythmias Observed

- Atrial Fibrillation (AF): 38%
- Premature Ventricular Contractions (PVCs): 22%
- Supraventricular Tachycardia (SVT): 15%
- Ventricular Tachycardia (VT): 9%
- Atrial Flutter: 7%

- Sinus Bradycardia and other bradyarrhythmias: 6%

- Other rare arrhythmias: 3%

Clinical Presentations

- Palpitations: 64%

- Dizziness: 29%

- Syncope: 10%

- Chest pain: 23%

- Asymptomatic: 12%

Associated Risk Factors

- Hypertension: 65%

- Ischemic heart disease: 47%

- Diabetes mellitus: 39%

- Obesity (BMI >30): 28%

- Alcohol or tobacco use: 22%

Therapeutic Interventions

- Pharmacologic therapy (beta-blockers, calcium channel blockers, antiarrhythmics): 72%

- Anticoagulation for AF patients: 61%

- Electrical cardioversion: 8%

- Catheter ablation: 10%

- ICD/Pacemaker implantation: 8%

Discussion

Our findings reinforce the dominant burden of atrial fibrillation among arrhythmias, consistent with global prevalence data. The correlation of hypertension and ischemic heart disease with arrhythmia types underlines the importance of primary prevention in cardiovascular care.

The frequency of PVCs and SVTs may be underrecognized due to their transient or asymptomatic nature, but Holter monitoring greatly enhanced their detection in our cohort. The relatively high use of pharmacologic management reflects reliance on conservative measures in initial stages, with invasive options reserved for refractory cases.

Interestingly, 12% of patients were asymptomatic, diagnosed during routine screenings or evaluation for unrelated symptoms, suggesting that actual prevalence may be even higher in the general population.

Limitations of our study include the lack of long-term follow-up data and reliance on a single-center population, which may affect generalizability.

Conclusion

Arrhythmias, particularly atrial fibrillation and PVCs, are increasingly prevalent and pose significant clinical challenges. Holistic management that incorporates risk factor control, timely diagnosis, and individualized therapy—including pharmacological and interventional approaches—is essential. Further multicentric, longitudinal studies are warranted to guide effective prevention and treatment protocols.

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