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Clinical, Etiological, and Echocardiographic Profile of Patients with Atrial Fibrillation.

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Abstract

Background: Atrial fibrillation is the most common sustained cardiac arrhythmia associated with significant morbidity and mortality due to complications such as stroke, heart failure and thromboembolism. Identification of etiological and echocardiographic factors is important for early diagnosis and secondary prevention. ***Aim:*** To study the clinical profile, etiology and echocardiographic characteristics of individuals suffering from atrial fibrillation for the secondary prevention of known complications. ***Materials and Methods:*** This hospital-based observational study included 150 patients diagnosed with atrial fibrillation. Detailed clinical history, physical examination, laboratory investigations, electrocardiography and transthoracic echocardiography were performed in all patients. Clinical presentation, etiological factors, comorbidities and echocardiographic findings were analyzed using appropriate statistical methods. ***Results:*** The majority of patients belonged to the age group of 61–80 years (45.3%), with female predominance (54.7%). Breathlessness was the most common presenting symptom observed in 48% patients followed by palpitations in 26% cases. Hypertension (54%), diabetes mellitus (38.7%) and rheumatic heart disease (29.3%) were the major comorbidities associated with atrial fibrillation. Preserved ejection fraction was noted in 61.3% patients, whereas reduced ejection fraction was present in 22.7% cases. Echocardiographic abnormalities including ventricular dysfunction and structural heart disease were commonly observed. ***Conclusion:*** Atrial fibrillation was more prevalent among elderly individuals and females in the present study. Hypertension, diabetes mellitus and rheumatic heart disease were the major etiological associations. Echocardiography played a significant role in identifying structural and functional cardiac abnormalities associated with AF. Early recognition of clinical and echocardiographic risk factors may help in reducing complications and improving long-term outcomes in patients with atrial fibrillation.

Keywords: Atrial fibrillation; Echocardiography; Ejection fraction; Rheumatic heart disease.

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INTRODUCTION

Atrial fibrillation (AF) is the most common sustained cardiac arrhythmia encountered in clinical practice and represents a major public health challenge worldwide. It is characterized by disorganized atrial electrical activity leading to ineffective atrial contraction, irregular ventricular response and increased risk of thromboembolic complications, heart failure and mortality [1]. The global burden of AF has increased substantially over the past few decades because of population aging, improved survival from cardiovascular diseases and rising prevalence of associated risk factors such as hypertension, diabetes mellitus, obesity and ischemic heart disease [2].

AF is associated with significant morbidity due to its strong association with ischemic stroke, systemic embolism, cognitive decline and reduced quality of life. Patients with AF have nearly a fivefold increased risk of stroke compared to the general population, and strokes related to AF are usually more severe and disabling [3]. Early recognition of the underlying etiology and echocardiographic abnormalities is therefore essential for secondary prevention of complications and appropriate therapeutic management.

The etiological profile of AF varies widely according to demographic characteristics, socioeconomic conditions and prevalence of cardiovascular diseases in different populations. In developing countries, rheumatic heart disease continues to remain an important cause of AF, especially among younger individuals, whereas non-valvular AF associated with hypertension, coronary artery disease and cardiomyopathy predominates in developed nations [4]. Other important causes include thyroid disorders, chronic obstructive pulmonary disease, alcohol abuse, electrolyte imbalance and postoperative cardiac conditions [5].

Clinical presentation of AF may range from asymptomatic disease to severe palpitations, breathlessness, chest discomfort, dizziness, syncope or manifestations of thromboembolism. Some patients present initially with stroke or decompensated heart failure, highlighting the importance of timely diagnosis and risk stratification [6]. Since AF is frequently associated with structural and functional cardiac abnormalities, echocardiography plays a central role in evaluating atrial size, ventricular function, valvular lesions, intracardiac thrombus and pulmonary artery pressures.

Echocardiographic assessment is considered indispensable in patients with AF because it provides valuable information regarding disease etiology, severity and prognosis. Left atrial enlargement is one of the most common echocardiographic findings and reflects chronic pressure or volume overload. Increased left atrial size has been associated with recurrent AF, thromboembolic events and adverse cardiovascular outcomes [7]. Left ventricular systolic dysfunction, valvular abnormalities and ventricular hypertrophy are also frequently observed and significantly influence therapeutic decisions and long-term prognosis.

Recent studies have emphasized the role of advanced echocardiographic parameters in understanding AF pathophysiology and predicting complications. Left atrial strain imaging, atrial fibrosis assessment and evaluation of atrial mechanical function have emerged as promising tools for identifying patients at higher risk of stroke and recurrence [8]. However, conventional echocardiographic parameters continue to remain widely used and clinically relevant, particularly in resource-limited settings.

Understanding the clinico-etiological profile and echocardiographic characteristics of AF is essential for planning preventive strategies and reducing disease burden. Identification of common etiological factors and associated structural cardiac abnormalities may facilitate early intervention, optimize anticoagulation therapy and improve secondary prevention of stroke and heart failure [9]. Furthermore, regional studies are important because the etiological spectrum of AF varies across populations and healthcare settings.

Therefore, the present study was undertaken to evaluate the clinical profile, etiology and echocardiographic characteristics of individuals suffering from atrial fibrillation and to assess factors contributing to secondary prevention of known complications associated with AF [10].

MATERIALS AND METHODS

This hospital-based observational study was conducted to evaluate the clinico-etiological profile and echocardiographic characteristics of individuals suffering from atrial fibrillation. A total of 150 patients diagnosed with atrial fibrillation were included in the study after applying the inclusion and exclusion criteria. The study population consisted of patients attending the outpatient department, emergency department, and those admitted to the medical wards or intensive care unit with electrocardiographically confirmed atrial fibrillation.

Patients aged 18 years and above with newly diagnosed or previously known atrial fibrillation were included in the study. Patients with incomplete clinical records, unwillingness to participate, poor echocardiographic window, previously corrected structural cardiac defects, and critically unstable patients in whom detailed evaluation could not be completed were excluded from the study.

After obtaining informed consent, detailed demographic and clinical data were collected using a predesigned proforma. Information regarding age, gender, presenting complaints, duration of symptoms, history of hypertension, diabetes mellitus, ischemic heart disease, rheumatic heart disease, thyroid disorder, chronic obstructive pulmonary disease, alcohol intake, smoking status, previous stroke, heart failure, and drug history was recorded. General physical examination and systemic examination were performed in all patients, with special emphasis on pulse rate, blood pressure, signs of heart failure, valvular heart disease, and thromboembolic complications.

The diagnosis of atrial fibrillation was confirmed by 12-lead electrocardiography, based on the presence of irregularly irregular rhythm, absence of discrete P waves, and irregular R-R intervals. Relevant laboratory investigations including complete blood count, renal function tests, liver function tests, serum electrolytes, thyroid function tests, fasting blood sugar, lipid profile, and cardiac biomarkers were performed whenever clinically indicated. Etiological classification was done based on clinical history, examination findings, electrocardiographic findings, laboratory investigations, and echocardiographic evaluation.

All patients underwent transthoracic echocardiography using a standard echocardiography machine by a trained physician or cardiologist. Echocardiographic parameters including left atrial size, left ventricular ejection fraction, left ventricular hypertrophy, regional wall motion abnormality, valvular lesions, mitral stenosis, mitral regurgitation, aortic valve disease, tricuspid regurgitation, pulmonary artery pressure, intracardiac thrombus, and pericardial effusion were recorded. Left

ventricular systolic function was assessed using standard methods, and patients were categorized according to preserved or reduced ejection fraction. The echocardiographic findings were correlated with the clinical profile and probable etiology of atrial fibrillation.

The main outcome measures included identification of common clinical presentations, etiological factors, and echocardiographic abnormalities among patients with atrial fibrillation. Particular attention was given to factors associated with known complications such as stroke, heart failure, valvular disease, and thromboembolic risk, as these factors are important for secondary prevention and long-term management.

The collected data were entered into Microsoft Excel and analyzed using appropriate statistical software. Continuous variables were expressed as mean and standard deviation, while categorical variables were expressed as frequency and percentage. Clinical characteristics, etiological factors, and echocardiographic findings were summarized using descriptive statistics. Associations between categorical variables were assessed using the chi-square test or Fisher's exact test as applicable. Continuous variables between groups were compared using the unpaired t-test or Mann–Whitney U test depending on the distribution of data. A p-value of less than 0.05 was considered statistically significant.

The study was conducted after obtaining approval from the Institutional Ethics Committee. Written informed consent was obtained from all participants before enrollment in the study. Confidentiality of patient identity and clinical information was maintained throughout the study. All investigations were performed as part of routine clinical evaluation, and no additional risk was imposed on the participants. The study was carried out in accordance with standard ethical principles and the Declaration of Helsinki.

RESULTS

Table 1 demonstrates the age-wise and gender-wise distribution of patients with atrial fibrillation included in the present study. The majority of patients belonged to the age group of 61–80 years comprising 68 (45.3%) individuals, followed by 41–60 years age group accounting for 46 (30.7%) patients. Patients aged above 80 years constituted 18 (12%) cases, while only 18–40 years age group represented 18 (12%) patients. The mean age of presentation was observed predominantly in elderly individuals. Gender distribution showed female predominance with 82 (54.7%) females compared to 68 (45.3%) males, indicating slightly higher occurrence of atrial fibrillation among females in the present study population.

Table 2 depicts the distribution of patients according to left ventricular ejection fraction. Preserved ejection fraction (≥50%) was observed in the majority of patients accounting for 92 (61.3%) cases. Reduced ejection fraction (≤40%) was noted in 34 (22.7%) patients, while mid-range ejection fraction (41–50%) was present in 24 (16%) individuals. The findings suggest that preserved systolic function was more common among patients with atrial fibrillation, although a considerable proportion also demonstrated impaired ventricular function.

Table 3 shows the incidence of different presenting complaints among patients with atrial fibrillation. Breathlessness was the most common presenting symptom observed in 72 (48%) patients followed by palpitations in 39 (26%) patients. Pedal edema was present in 16 (10.7%) individuals, while fatigue and giddiness were reported in 15 (10%) and 10 (6.7%) patients respectively. Chest pain and syncope were less commonly observed and were reported in 7 (4.7%) and 4 (2.7%) patients respectively. Fever was documented in 12 (8%) patients, mainly among those with infective etiologies and associated systemic illnesses.

Table 4 demonstrates the prevalence of underlying comorbidities among study participants. Hypertension was the most common comorbidity observed in 81 (54%) patients followed by diabetes mellitus in 58 (38.7%) cases. Rheumatic heart disease was noted in 44 (29.3%) patients, while chronic kidney disease was present in 19 (12.7%) individuals. Chronic obstructive pulmonary disease and anemia were observed in 24 (16%) and 18 (12%) patients respectively. Dyslipidemia, hypothyroidism, coronary artery disease and previous cerebrovascular accident were identified in smaller proportions. The findings indicate that cardiovascular and metabolic comorbidities were highly prevalent among patients with atrial fibrillation.

Table 1: Age-wise and gender-wise distribution of patients

Age/Sex	Number of patients (%)
18–40 years	**18 (12%)**
41–60 years	**46 (30.7%)**
61–80 years	**68 (45.3%)**
>80 years	**18 (12%)**
Male	**68 (45.3%)**
Female	**82 (54.7%)**

Table 2: Ejection fraction of patients in the study

Ejection Fraction	Number of patients (%)
Reduced EF (≤40%)	34 (22.7%)
Mid-range EF (41%–50%)	24 (16%)
Preserved EF (≥50%)	92 (61.3%)

EF: Ejection Fraction

Table 3: Incidence of different presenting complaints of atrial fibrillation

Presenting Complaints	Number of patients (%)
Breathlessness	72 (48%)
Palpitations	39 (26%)
Pedal edema	16 (10.7%)
Fatigue	15 (10%)
Fever	12 (8%)
Giddiness	10 (6.7%)
Chest pain	7 (4.7%)
Syncope	4 (2.7%)

Table 4: Prevalence of underlying comorbidities

Comorbidities	Number of patients (%)
Hypertension	81 (54%)
Diabetes Mellitus	58 (38.7%)
Rheumatic Heart Disease	44 (29.3%)
Chronic Kidney Disease	19 (12.7%)
Anemia	18 (12%)
Chronic Obstructive Pulmonary Disease/Bronchial Asthma	24 (16%)
Dyslipidemia	14 (9.3%)
Hypothyroidism	11 (7.3%)
Coronary Artery Disease	13 (8.7%)
Cerebrovascular Accident	6 (4%)
Infective Endocarditis	3 (2%)
Congenital Heart Disease	4 (2.7%)
Others	12 (8%)

DISCUSSION

The present study evaluated the clinico-etiological profile and echocardiographic characteristics of patients suffering from atrial fibrillation. The majority of patients in the present study belonged to the elderly age group, with 45.3% patients between 61–80 years of age. This observation supports the established concept that atrial fibrillation is predominantly a disease of advancing age. Degenerative changes in the atrial myocardium, fibrosis, impaired conduction pathways and increasing burden of comorbidities contribute significantly to the higher prevalence of AF in elderly individuals. Similar findings were reported by Wyse et al. [11], who observed that the prevalence and complications of atrial fibrillation increased progressively with age, particularly in individuals above 60 years. Female predominance was observed in the present study, where females constituted 54.7% of the study population. This finding may be attributed to the higher prevalence of rheumatic valvular heart disease among women in developing countries. Benjamin et al. [12] also documented that although AF is more frequently diagnosed in males globally, females with AF often have higher rates of valvular heart disease, thromboembolic complications and hospitalization, emphasizing the need for careful clinical evaluation in women presenting with arrhythmias. Breathlessness was the most common presenting symptom in the present study and was observed in 48% of patients, followed by palpitations in 26% of cases. Pedal edema, fatigue and giddiness were also frequently reported. The predominance of dyspnea reflects the association of AF with heart failure, valvular heart disease and impaired ventricular filling. Similar clinical findings were observed by Kannel et al. [13], who reported that dyspnea and palpitations were the most common manifestations of atrial fibrillation and were frequently associated with structural heart disease and reduced cardiac performance.

Hypertension was identified as the most common comorbidity in the present study and was present in 54% of patients, followed by diabetes mellitus in 38.7% and rheumatic heart disease in 29.3% cases. Hypertension contributes to atrial remodeling, left ventricular hypertrophy and left atrial enlargement, thereby increasing susceptibility to atrial fibrillation.

The Framingham Heart Study conducted by Vaziri et al. [14] demonstrated that hypertension and diabetes mellitus are major independent risk factors for the development of atrial fibrillation because of chronic hemodynamic stress and myocardial structural changes. The echocardiographic findings of the present study revealed that preserved ejection fraction was observed in the majority of patients, accounting for 61.3% cases, whereas reduced ejection fraction was found in 22.7% patients. Echocardiography plays a crucial role in identifying structural abnormalities, evaluating cardiac function and assessing thromboembolic risk in AF patients. Left atrial enlargement, valvular lesions and ventricular dysfunction are commonly associated with AF and influence prognosis and management strategies. Similar findings were reported by Sanfilippo et al. [15], who demonstrated that echocardiographic abnormalities such as left atrial enlargement and impaired ventricular function were significantly associated with chronic atrial fibrillation and adverse cardiovascular outcomes. The present study highlights the importance of identifying clinical risk factors and echocardiographic abnormalities in patients with atrial fibrillation for early intervention and secondary prevention of complications. Early diagnosis and management of hypertension, diabetes mellitus, rheumatic heart disease and ventricular dysfunction may help reduce the incidence of stroke, heart failure and thromboembolic events associated with AF. Echocardiography remains an indispensable diagnostic tool for assessing disease severity and guiding long-term therapeutic strategies.

CONCLUSION

The present study demonstrated that atrial fibrillation was more common among elderly individuals and females. Breathlessness and palpitations were the most frequent presenting complaints. Hypertension, diabetes mellitus and rheumatic heart disease were identified as the major underlying comorbidities associated with AF. Echocardiographic evaluation revealed that preserved ejection fraction was present in the majority of patients, although a significant proportion demonstrated ventricular dysfunction. Identification of clinical and echocardiographic characteristics is essential for early diagnosis, risk stratification and secondary prevention of complications such as stroke, heart failure and thromboembolism in patients with atrial fibrillation.

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