

Prevalence and Factors Associated with Atrial Fibrillation Among Patients with Rheumatic Heart Disease

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Abstract

Introduction: Rheumatic heart disease (RHD) is one of the common causes of atrial fibrillation (AF) and is associated with significant morbidity and mortality. There is a lack of data on the prevalence of AF and factors associated with increased risk of AF in patients with RHD from Nepal.

Methods: A total of 120 patients who received care at Nobel Medical College Teaching Hospital from January 2018 to February 2019 with a diagnosis of RHD with AF were enrolled. Demographic information, relevant clinical and laboratory parameters and predisposing conditions for AF were obtained from a structured questionnaire designed.

Results: The prevalence of AF was 120 (36.3%) out of 330 cases of RHD screened. The male to female ratio was 32:88. The mean age was 50.2 (range 22-80) years. Prevalence was slightly more in females (36.9%) as compared to males (34.7%). The prevalence of AF in patients with predominant mitral stenosis (MS) was 66.6% and less in patients with predominant mitral regurgitation (MR) (16.6%). The prevalence of AF in cases of MS with mitral valve area (MVA) < 1.5 cm² was 76.2% as compared to 23.7% in cases with MVA > 1.5 cm². Mitral valve (MV) was the most commonly affected valve (83.3%) followed by the aortic valve (10%). Both mitral and aortic valves were involved in 6.6% of patients. Majority of patients (97.5%) had enlarged left atrium (>40mm), reduced estimated glomerular filtration rate (eGFR) of <90 ml/min (85.8%). Patients of RHD with AF were complicated with decreased left ventricular (LV) systolic function (67.5%), pulmonary artery hypertension (52.5%), left atrial clot (9.1%), stroke (8.3%), and peripheral embolism (2.5%).

Conclusions: AF is a common rhythm disorder in patients with RHD. Prevalence of AF is common in females, increases with age, increasing LA size, increased severity of MS and decreased level of eGFR.

Introduction

Rheumatic heart disease (RHD) is one of the common types of structural heart disease and carries significant morbidity and mortality [1]. Although uncommon in developed countries, RHD is still a public health problem in developing countries like Nepal and is associated with a higher incidence of AF.

The association between AF and RHD is well established. The presence of RHD was a strong predictor of the development of AF [2]. Although information regarding the overall prevalence of AF in various cardiac conditions and its predictors are available from studies done in different countries, there is a paucity of data among patients with RHD in particular. The knowledge of factors associated with increased risk of AF in patients with RHD is important for its prevention and to reduce morbidity and mortality. Hence, this study will give insight into the prevalence of AF and various factors associated with AF in patients with RHD.

Key Words

Atrial fibrillation, Prevalence, Rheumatic heart disease, Risk factors.

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Methods and Materials

This is an observational cross-sectional study. The diagnosis of RHD was based on the basis of clinical history, examination, and echocardiography. The patients were classified as in sinus rhythm or AF based on (ECG). AF is defined as an irregularly irregular heart rate without detectable 'a' wave along with f wave on 12 lead ECG. A total of 330 patients of RHD with age >15 years who received care at the cardiology unit of the Department of Internal Medicine, Nobel Medical College Teaching Hospital were screened for AF on a consecutive basis. Focused history and examination were performed to note demographic profile and co-morbid conditions. Echocardiographic parameters like different valves' involvement, its severity, mitral valve area, left atrial size, left ventricular (LV) size, LV function was assessed.

Echocardiography

Transthoracic echocardiogram (GE, Vivid E95, and Chicago, USA) was performed with use of 2D, M-mode, doppler modalities. Images were taken from the parasternal long axis, parasternal short axis, apical four chambers, and apical five-chamber views. The mitral valve area (MVA) was quantified based on planimetry and pressure half time (PHT) methods. Mitral stenosis (MS) was classified as mild for valve area between 1.6–2.0 cm², moderate for 1.1–1.5 cm², and severe for ≤1.0 cm². Mitral and aortic regurgitation were evaluated

using quantitative methods. Aortic stenosis (AS) was diagnosed based on the presence of commissural fusion of the aortic leaflets. Valve area was assessed using planimetry and pressure gradient across the valve.

Statistical Analysis

Data were entered in Microsoft excel 2007 and converted into IBM SPSS data editor, version 20. Continuous and categorical variables were presented as mean, percentage and interquartile range wherever found necessary. The tabular presentation was made for necessary variables.

Results

The prevalence of AF was 120 (36.3%) out of 330 cases (238 females and 92 males) of RHD screened. The male to female ratio was 32:88. The mean age was 50.2 (range 22-80) years. The prevalence of AF was more in the age group of 30-60 yrs (81.6%) and the prevalence was slightly more in females (36.9%) as compared to males (34.7%). Among all patients, 10 (8.3%) were current smoker and 6 (5%) had a history of significant alcohol consumption. Mean hemoglobin (Hb) was 12.9 gm/dl (range 8.3-18.7) with 43(35.8%) patients having anemia (Hb <12gm/dl). Mean body mass index (BMI) was 21.39 (range 13.8-33.7) kg/m² with 24 (20%) having BMI <18kg/m². Majority 103 (85.8%) had reduced eGFR of <90 ml/min. Baseline characteristics of patients with RHD and AF have been illustrated in [Table 1].

Table 1: Baseline characteristics of patients with atrial fibrillation (n= 120)

Characteristics	Number
Male: female	32:88
Mean age in years (Range)	50.2 (22-80)
Smoker	10 (8.3%)
Alcohol use	6 (5%)
Education level and employment	
No education	95 (79.1%)
Primary education	25 (20.8%)
Currently employed	12 (10%)
Mean body mass index in kg/m ² (Range)	21.39 (13.8-33.7)
Mean systolic blood pressure in mmHg (Range)	107.5 (80-150)
Mean diastolic blood pressure in mmHg (Range)	72.2 (60-100)
Mean hemoglobin (gm/dl) (Range)	12.9 (8.3-18.7)
Mean eGFR (ml/min)	69.5 (26.1-125)
Mean heart rate (BPM)	93.74 (50-160)
Heart rate (BPM) < 100	77 (64.1%)
≥100	43 (35.8%)
Prior history of rheumatic fever	12 (10%)
Coronary artery disease	2 (1.6%)
Drugs use pattern	
Antithrombotics	
Aspirin	70 (58.3%)
OACs	46 (38.3%)
None	4 (3.3%)
For rate control	
Beta-blockers	70 (58.3%)
Calcium channels blockers	46 (38.3%)
Digoxin	10 (8.3%)
Diuretics	94 (78.3%)
Penicillin prophylaxis	30 (25%)

eGFR: Estimated glomerular filtration rate, BPM: Beat per minute, OACs: Oral anticoagulants

The mitral valve was the most commonly affected valve (83.3%) followed by the aortic valve (10%). Both mitral and aortic valves were involved in 6.6% of patients. The primary Tricuspid valve was involved in 4.1% and secondary Tricuspid regurgitation was present in 52.4% cases. The prevalence of AF in patients with predominant MS was 66.6% and less in patients with predominant MR (16.6%) as shown in [Table 2]. The prevalence of AF in cases of MS with mitral valve area ≤ 1.5 cm² was 76.2% as compared to 23.7% in cases of MS with MVA > 1.5 cm². Majority of patients (97.5%) had enlarged left atrium (>40mm), reduced estimated glomerular filtration rate (eGFR) of <90 ml/min (85.8%). Distribution of different characteristics and risk factors in patients with AF has been illustrated in [Table 3].

Patients of RHD with AF were complicated with decreased LV systolic function (67.5%), pulmonary artery hypertension (52.5%), left atrial clot (9.1%), stroke (8.3%), and peripheral embolism (2.5%) as shown in [Table 4].

Discussion

RHD is one of the common causes of AF and associated with significant morbidity and mortality [3]. Thus, the estimation of the burden of AF and factors associated with AF is important for its prevention and control. Various studies have reported the prevalence of AF in patients with RHD which ranges from 13.9% to 43% [3,4,5,6]. In our study, we observed a significant burden of AF (36.3%) in patients with RHD.

In low to middle-income countries, RHD, particularly mitral stenosis is the common cause of AF and it is more common in women than men [7]. Similarly, in our study, we observed an increased prevalence of AF in female patients.

There is an independent association of AF with age, LA size and MS among patients with RHD. [4] Although the average age of patients with RHD developing AF in developing countries is 15 to 20 years earlier than patients in western countries [8]. In the present study, the highest incidence of AF was found in the age group of 31 to 60 years.

LA size and severity of MS were reported as the risk factors of AF in a retrospective cohort of patients of RHD with MS [9]. The occurrence of AF is known to correlate with LA size, and the incidence of AF rises from 3% when the left atrial diameter is < 40mm to 54% if the left atrial diameter is > 40 mm [10]. In our patients with RHD, 97.5%

Table 2: Patterns of valve involvement (n=120)

Valves	Number
Mitral valve	100 (83.3%)
Predominant MS	80 (66.6%)
Predominant MR	20 (16.6%)
Aortic valve	12 (10%)
Predominant AS	8 (6.6%)
Predominant AR	4 (3.3%)
Mitral +Aortic valve	8 (6.6%)
Tricuspid Valve (primary)	5 (4.1%)
Tricuspid Valve (Secondary)	63 (52.5%)

MS: Mitral stenosis, MR: Mitral regurgitation, AS Aortic stenosis, AR: Aortic regurgitation

of patients with AF had an LA size of more than 40mm.

Several studies in patients with various cardiovascular diseases reported an increased incidence of AF with a decreasing threshold of eGFR [11,12,13]. We observed an increased prevalence of AF among patients with RHD with a decreasing level of eGFR since 85.7% of our patients had eGFR of less than 90 ml/min.

Although chronic anemia is an independent predictor of death and hospitalizations in elderly patients with HF, coronary artery disease or AF, [14] it has not been shown to be associated with an increased incidence of new-onset AF [15]. Similarly, we did not find any relationship between blood hemoglobin levels and the prevalence of AF in our patients with RHD.

Although Zafar N et al [16] could not find an association between AF and the severity of MS, there is an association between the severity of MS and burden of AF as reported by Keren et al [17] and Sharma SK [6]. In our study, we found that the prevalence of AF increased with moderate to severe MS compared to mild MS. The observed association of AF with the severity of MS may have clinical implications for AF prevention offering percutaneous transvenous mitral commissurotomy (PTMC) for mild to moderate MS in the prevention of AF.

Table 3: Distribution of different characteristics and risk factors in patients with Atrial Fibrillation

Characteristics	Number
Female	88 (73.3%)
Male	32 (26.6%)
Age (in years)	
≤ 30	3 (2.5%)
31-40	28 (23.3%)
41-50	34 (28.3%)
51-60	36 (30%)
61-70	12 (10%)
≥70	7 (5.8%)
Body mass index (kg/m²)	
<18	24 (20%)
18-23	63 (52.5%)
>23	33 (27.5%)
eGFR (ml/min)	
<50	23 (19.1%)
50-90	80 (66.6%)
>90	17 (14.1%)
Blood Hemoglobin (gm/dl)	
<10	6 (5%)
10-12	37 (30.8%)
>12	77 (64.1%)
LA diameter (mm)	
<40	3 (2.5%)
41-50	42 (35%)
>50	75 (62.5%)
LVEF (%)	
<40	19 (15.8%)
40-55	62 (51.6%)
>55	39 (32.5%)
MVA (cm²)	
<1	30 (25%)
1-1.5	31 (25.8%)
1.6-2	19 (15.8%)

eGFR: Estimated glomerular filtration rate, LA: Left atrium, LVEF: Left ventricular ejection fraction, MVA: Mitral valve area

Table 4: Complications of atrial fibrillation in patients with rheumatic heart disease

Complications	Number
LV systolic dysfunction (LVEF <55%)	81 (67.5%)
Pulmonary artery hypertension	63 (52.5%)
LA/LAA clot	11 (9.1%)
Stroke	10 (8.3%)
RV dysfunction	6 (5%)
Peripheral embolism	3 (2.5%)

LV: left ventricular, LVEF: left ventricular ejection fraction, LA: Left atrium, LAA: Left atrial appendage, RV: Right ventricle

Limitations

This study lacks data on a control group which would have provided an important contrast and helped to adjust the variables. This is a single-center study in a limited number of patients that may influence the estimation of the prevalence of AF and its determinants in patients with RHD. The prevalence of AF was documented based on ECG that was done at the time of enrollment thus paroxysmal AF may have been missed.

Disclosure

The authors declare no conflict of interest.

Conclusion

AF is a common rhythm disorder in patients with RHD. Prevalence of AF is common in females, increases with age, increasing LA size, increased severity of MS and decreasing the level of eGFR. AF increases the risk of left ventricular dysfunction, pulmonary hypertension, and systemic thromboembolism.

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