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# Electrocardiographic and Echocardiographic Evaluation of Subjects with Atrial Fibrillation

Gharge Sushilkumar Sunil<sup>1</sup>, Vivek E. Redkar<sup>2</sup>

<sup>1</sup>Resident Department of Medicine Department of Medicine, Krishna Institute of Medical Sciences, Karad, Maharashtra, India; <sup>2</sup>Associate Professor, Department of Medicine, Krishna Institution Medical Sciences, Karad, Maharashtra, India.

## ABSTRACT

**Introduction:** Atrial fibrillation (AF) is one of the most commonly sustained arrhythmia and an important cause of morbidity, mortality, and health care expenditure. It is associated with many predisposing factors like an underlying cardiovascular disease. The most notable is rheumatic mitral stenosis. Hypertension (HTN) and coronary artery disease (CAD) are the most common risk factors in the developed world.

**Aim:** Here is to evaluate the electrocardiographic and echocardiographic findings in patients with atrial fibrillation patients.

**Method:** We have adopted for our research is a cross-sectional, observational, non-interventional, study. This study the period of October 2018 to March 2020.

**Result:** The male: female ratio was 1: 0.80 IHD (40.76%) was the most common antecedent cause for AF, followed by Rheumatic heart disease (RHD), Mitral stenosis (MS) (both 33.84%) and hypertension (HTN) (31.53%).

**Conclusion:** Electrocardiographic evaluation of the subjects revealed ischemic heart disease as the most common finding. Followed by echocardiographic evaluation showed left atrial enlargement and mitral stenosis..

**Key Words:** Atrial fibrillation, Hypertension, Coronary artery disease, Diabetes mellitus

## INTRODUCTION

Atrial fibrillation (AF) is one of the most commonly sustained arrhythmias and an important cause of morbidity, mortality, and health care expenditure.<sup>1,2</sup> Currently there are 2.3 million people in the US who have AF and this is expected to rise to 5.6 million by 2050. In persons aged 60-65, the prevalence is around 1%, but in those > 80 years of age, the prevalence is 8-10%. It is present in 6 - 10% of patients older than 70 years.<sup>2</sup> The prevalence is also higher in men than women and whites than black ethnicity.<sup>2</sup> It is also associated with a 5-fold risk for stroke and 2 fold risk for all-cause mortality.<sup>3,4</sup> It is described as an irregular and often rapid heart rhythm. The symptoms of AF may vary from person to person. In many people, AF may cause symptoms but doesn't do any harm and many have no symptoms at all. Palpitations are the most common symptoms with intermittent AF, anxiety and irregular fluttering are others.<sup>5</sup> In patients with an uncontrolled ventricular response, exercise intolerance and Dyspnoea may also develop which is mostly related to con-

gestive heart failure (CHF). Thromboembolism is the most threatening complication of AF.

AF can be present in a structurally normal heart (lone AF) but usually, it is associated with many predisposing factors like an underlying cardiovascular disease. The most notable is rheumatic mitral stenosis. Hypertension (HTN) and coronary artery disease (CAD) are the most common risk factors in the developed world. Other risk factors are - Diabetes Mellitus (DM), congestive heart failure (CHF), valvular Heart diseases (VHD), and previous myocardial infarction (MI). Clinical hyperthyroidism is also associated with new-onset AF but, prevalence is low. In developing countries, Rheumatic VHD, HTN and congenital heart disease (CHD) are important causes.<sup>6</sup>

### Rheumatic heart disease

One of the most common complications is AF. Historically rheumatic MS has been proven to be closely related to AF.<sup>7</sup> The incidence of AF in RHD is about 40%. Devil et al.

### Corresponding Author:

Vivek E. Redkar, Associate Professor, Department of Medicine, Krishna Institution Medical Sciences, Karad, Maharashtra, India.  
Email: [vivekredkar12@outlook.com](mailto:vivekredkar12@outlook.com)

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reported the incidence of AF to be related to age. AF was uncommon in young patients, but increased in frequency each decade and occurred in the majority of patients after the 4th decade.<sup>8</sup>

William Kennel et al reported an incidence rate of 10.2% and 26.5% among men and women respectively for RHD among their AF patients.<sup>2</sup> Adell Culler et al., reported 19% incidence of RHD among their AF patients.<sup>9</sup> Aberg et al, reported RHD among 11% of patients with AF.<sup>10</sup> Eugene Rich et al observed RHD in 10% of patients with AF.<sup>11</sup> The prevalence of RHD in India is high. In a study conducted by T.K.Raman et al, RHD was observed in 58% of the cases of AF studied by them.<sup>12</sup>

### Hypertensive heart disease

It is designated if a subject is hypertensive and had either LVH by ECG, cardiac enlargement by X-ray, increased LV mass index (>131 g/m in men and >110 g/m<sup>2</sup> in women) or a cardiac failure.<sup>13</sup> The incidence of AF in HTN varies and the frequency of fibrillation is directly related to the chronicity, severity and associated complications of HTN. Studies on the precursors of AF have reported hypertensive heart disease to be the one most commonly associated with AF. William Kennel et al. reported that hypertensive HD accounted for 45.7% in men and 51.2% among women of the cases of AF.<sup>2</sup> De Carvalho Filho et al, observed 51% of hypertensive HD among their patients with AF.<sup>14</sup> Adell Culler et al reported hypertensive HD in 34% of the series 1 of AF patients studied by them.<sup>10</sup> Leclercq et al. in their study on PAF had HTN as the only disorder in most of their cases.<sup>15</sup>

## AIM

To evaluate the electrocardiographic and echocardiographic findings in patients with atrial fibrillation patients admitted to Krishna hospital and Medical Research Centre, Karad.

### Objectives

1. To assess the frequency of underlying heart disease in patients with atrial fibrillation.
2. To study various clinical presentations of atrial fibrillation.
3. To evaluate the electrocardiographic and echocardiographic findings in patients with atrial fibrillation.

## METHOD

### Type of study

This was a cross-sectional, observational, non-interventional, study. The study was conducted in the Department of General Medicine of Krishna Institute of Medical Sciences and Research Center, Karad, in patients of inpatient department of

tertiary care, teaching institute from October 2018 to March 2020.

### Sample Size:

According to, [Clinical and etiological study of atrial fibrillation in upper Assam], Kotokey RK et al, the prevalence of RHD in patients of AF was 43.5%.<sup>16</sup>

Hence, we chose  $p=43.5\%$ ,  $q=1-p$  i.e.  $56.5\%$ . Using the formula for cross-sectional studies, with a relative precision of 20% at 95% confidence interval ( $e=20\%$  of 43.5), and  $p=43.5\%$ , the minimum sample size comes up to 127 patients which was rounded off to 130 patients.

### Haematology

1. Hemoglobin by fully automated 3 part cell analyzer
2. Total leukocyte count by fully automated 3 part cell analyzer
3. Platelet count by fully automated 3 part cell analyzer  
All CBC parameters were performed in an automated 3 part analyzer by Nihon Kohden (Model number MEK 6420P)
4. Prothrombin time (PT/INR) by Stag analyzer (Model number- BT3305B301)

### Biochemistry

1. Blood urea by Urease-GLDH (Glutamate dehydrogenase) method
2. Serum Creatinine by Modified Japanese Female Facial Expression (JAFPE'S) method
3. Serum Sodium by ISE (ion-selective electrode) based method
4. Serum Potassium by ISE (ion-selective electrode) based method
5. Random blood sugar by Hexokinase-mediated reaction
6. Serum Calcium by Arsenazo method
7. Serum Magnesium by Xylidyl blue method
8. Serum Phosphorus by UV Molybdate method
9. Liver function tests by Calorimetric
10. Serum T3, T4, TSH by immune-enzymometric assay (automated) on TOSOH

### Machine

All biochemistry parameters analyzed in EM 360 analyzer by Transasia

## RESULT

The mean age of patients in our study was  $64.42 \pm 14.66$  years (Range 21-95 years). The majority of the patients were seen in the age group of 61-80 years (75 patients, 57.7%), followed by 41-60 years (30 patients, 23.1%), >81 years (13 patients, 10%) and 20-40 years (12 patients, 9.2%). The majority of the participants were males (55.4%) and the rest

were females (44.6%). The male: female ratio was 1: 0.80. Ischemic heart disease (IHD) (40.76%) was the most common antecedent cause for AF, followed by RHD, MS (both 33.84%) and HTN (31.53%). Other causes are MR (6.92%), Hyperthyroidism (3.84%), ASD, PHT, TR (all 1.5%), AS, AR and COPD (0.8%). There was no significant difference in the distribution of aetiology among both sexes. (chi sq. value = 33.575, p-value = 0.117) Dyspnoea (97.7%) was the most common presenting symptom, followed by pedal edema (64.6%), palpitations (61.5%), chest pain (60.8%), cough (13.1%), hepatomegaly (3.8%), hemoptysis (2.3%), abdominal pain (1.5%) and syncopal attacks (0.8%). All patients had irregularly irregular pulses. The average pulse rate was  $119.34 \pm 17.54$  bpm. The range was 66-168 bpm. The pulse rate was  $>110$  bpm (67.7%) in the majority of the patients followed by 90-110 bpm (26.2%) and  $<90$  bpm (6.2%). The average pulse deficit was  $12.08 \pm 2.33$ . The range was 6-16. The pulse deficit was  $> 10$  in 87 patients i.e. 66.9% and  $\leq 10$  in 43 patients (33.1%).

The mean Spontaneous bacterial peritonitis (SBP) was  $142.38 \pm 17.38$  mmHg (Range 90-170). The mean Diastolic blood pressure (DBP) was  $86.46 \pm 10.11$  mmHg (Range 60-110). The mean random blood sugar (RBS) was  $149.83 \pm 51.09$  mg/dl (Range 74-364). The mean Urea was  $37.00 \pm 18.84$  mg/dl (Range 14-142). The mean Creatinine level was  $1.26 \pm 0.57$  mg/dl (Range 0.6-4.5). The mean Sodium levels were  $139.08 \pm 5.55$  mEq/l (Range 123.0-149.0). The mean Potassium levels were  $4.09 \pm 0.45$  mEq/l (Range 3-5). Jugular venous pulse (JVP) was raised in 80 (61.5%) patients. Chest X-ray was normal in 71 (54.6%) patients. Cardiomegaly was seen in 58 (44.6%) patients. One patient (0.8%) had features of Chronic obstructive pulmonary disease (COPD). ECG was done using a 12-lead electrocardiogram. The rate varied from 74-180 bpm and in the majority of the patients i.e. 45%, the rate was 90-110 bpm. The rhythm was irregularly irregular in all patients. P-waves were absent in all patients. QRS complexes were normal, but irregular in time and varied in amplitude.

## DISCUSSION

AF is one of the most commonly sustained arrhythmia and an important cause of morbidity, mortality, and health care expenditure.<sup>1,2</sup> AF is identified and treated early, risk of serious or life-threatening problems are minimal. This study was conducted on 130 patients of AF to assess the presenting symptoms, underlying predisposing factors, electrocardiographic and echocardiographic findings in patients with AF.

In our study, the mean age of patients in our study was  $64.42 \pm 14.66$  years (Range 21-95 years). The majority of the patients were seen in the age group of 61-80 years (75 patients, 57.7%), followed by 41-60 years (30 patients, 23.1%),

$>81$  years (13 patients, 10%) and 20-40 years (12 patients, 9.2%). These results are similar to previous Indian studies. In a study by Vivek GC et al, the mean age of the patients was  $54.84 \pm 17.49$  years (Range 30-80) and the majority belonged to the 60-79 age group i.e. 30%.<sup>45</sup> In another study by Sharma et al, and Gurpal Singh et al<sup>47</sup> the mean age was  $40.0 \pm 7.0$  years and 57.33 years respectively. Kulkarni et al reported the mean age for AF as 59.6 years.<sup>18,19,20</sup> The Framingham heart study provides the single best evidence for chronic AF and proves that the incidence rises with increasing age.<sup>13</sup> The prevalence of AF was 0.5% in 50-59 years and rises to 8.8% in 80-89 years.<sup>49</sup> A study by Prakash SK and Chugh SK reported that all cases of AF due to CAD were above 50 years.<sup>22</sup>

Few studies in western countries, where the major cardiac precursors of AF are HTN and CAD also found a higher incidence of AF in increasing age groups.<sup>23,29,24</sup> In the Indian population, the major cardiac precursors of AF is RHD.

The symptoms of AF may vary from person to person. In many people, AF may cause symptoms but doesn't do any harm and many have no symptoms at all. Palpitations are the most common symptom with intermittent AF, anxiety and irregular fluttering are others.<sup>5</sup> In our study, Dyspnoea (97.7%) was the most common presenting symptom, followed by pedal edema (64.6%), palpitations (61.5%), chest pain (60.8%), cough (13.1%), hepatomegaly (3.8%), hemoptysis (2.3%), abdominal pain (1.5%) and syncopal attacks (0.8%). Similarly, Vivek GC et al, reported that, 82% cases had dyspnoea followed by palpitations (78%), edema (66%), chest pain (36%), abdominal pain (18%), hemoptysis (10%) and syncopal attacks (4%).<sup>17</sup> Similar symptoms were observed by Gurpal Singh et al. too.<sup>19</sup> **Table 1** given below indicates the comparison baseline characteristics in AF patients.

**Table 1: Studies comparing baseline characteristics in AF patients**

Studies	N	Mean age	Sex distribution	Presenting symptoms
Vivek GC et al.	50	$54.84 \pm 17.49$	M- 48% F- 52%	Dyspnoea (82%), palpitations (78%), Edema (66%), Chest pain (36%), Abdominal pain (18%), Hemoptysis (10%) and syncopal attacks (4%)
Sharma et al.	60	$40.0 \pm 7.0$	-	-
Gurpal Singh et al.	60	57.33	M- 45% F- 55%	Dyspnoea, palpitations, oedema was the most common symptoms.

**Table 1: (Continued)**

Studies	N	Mean age	Sex distribution	Presenting symptoms
Kulkarni et al.	50	59.6	M-40% F-60%	-
Manyara et al.	86	72±7	M- 43% F- 57%	-
Present Study	130	64.42 ± 14.66	M- 55.4% F-44.6%	Dyspnoea (97.7%), pedal edema (64.6%), palpitations (61.5%), chest pain (60.8%), cough (13.1%), hepatomegaly (3.8%), hemoptysis (2.3%), abdominal pain (1.5%) and syncopal attacks (0.8%)

AF can be present in a structurally normal heart (lone AF) but usually, it is associated with many predisposing factors like an underlying cardiovascular disease. In India, the incidence of RHD is around 35-45% of all cardiac cases.<sup>25</sup> It is the most common antecedent disease for atrial fibrillation. In our study, IHD (40.76%) was the most common antecedent cause for AF, followed by RHD, MS (both 33.84%) and HTN (31.53%). Other causes are MR (6.92%), Hyperthyroidism (3.84%), ASD, PHT, TR (all 1.5%), AS, AR and COPD (0.8%). There was no significant difference in the distribution of aetiology among both genders. Vivek GC et al, reported that RHD (50%) was the most common cause for AF, followed by IHD and HTN (12%) cases, only HTN (12%), IHD alone(8%), ASD (4%), cardiomyopathy (6%) cases, COPD (6%), and Thyrotoxicosis (2%).<sup>17</sup> Gurpal Singh et al<sup>47</sup> reported the etiology of AF to be RHD (26%) , DCM (23%), HTN (14.06%) , MVP, thyrotoxicosis (9.37% each),IHD (3.1%), ASD (1.5%), digitalis toxicity(1.5%) and lone fibrillation (1.5%). Similar results were reported by Prakash SK and Chugh SK et al, who reported that 91.61% of AF was secondary to chronic RHD, 5.94% due to CAD.<sup>22</sup> The Framingham heart study reported that RHD and cardiac failure were the most predictive precursor of AF. 24Davidson et al, in their study of 704 cases of AF, reported atherosclerotic CVD (55%) including MI, hypertensive heart disease and CAD as the most frequent cause associated with AF. Chronic RHD (22.8%), COPD (2.8%), WPW syndrome (2.6%) and thyrotoxicosis (2.6%),cardiomyopathy (0.9%),MVP (0.9%), sick sinus syndrome (0.7%),myocarditis (0.6%), pulmonary embolism (0.3%) and ASD (0.3%)were among others. 55 In two studies by Levy S et al, it was reported that RHD is pre-

sent in about 20-23% of AF patients and ASD is the most common congenital heart disease reported to cause AF. They also reported a case of thyrotoxicosis.<sup>26,27</sup> The Framingham heart study reported hypertensive heart disease as the most common cardiac precursor for AF.<sup>13</sup>

CCF was the most common complication seen in 90 patients (69.3%). Of these, 3.07%patients died and one patient had associated DCM. No complications were seen in 30.8%. Similarly, Vivek GC et al. reported that 80% of cases developed CCF.<sup>17</sup> The ALFA study by Levy et al, showed 38% of patients had CCF and a study by Sharma et al, reported CCF was present in 30%.<sup>26,18</sup> Other complications like stroke,cor-pulmonale and superior mesenteric ischemia were also reported in a few other studies.<sup>13,17,28</sup>

## CONCLUSION

Atrial fibrillation is the most common form of arrhythmia encountered during regular clinical practice. In consideration of the present study, dyspnoea and palpitations were the commonly observed presenting complaints in patients. There was no specific gender predominance found in the patient distribution. Ischemic heart disease and rheumatic heart disease were the leading etiological factors. The electrocardiographic evaluation of the subjects revealed ischemic heart disease as the most common finding. Followed by echocardiographic evaluation showed left atrial enlargement and mitral stenosis.

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