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Clinical Profile of Atrial Fibrillation with Reference to Echocardiography

Dr. Akshita Subhash Sonawala1, Dr. Uddhav Khaire

PG Resident, Govt. Medical College, Aurangabad, India akshita.sonawala@gmail.com ,

Associate Professor, Govt. Medical College, Aurangabad, India uddhavkhaire@gmail.com

Corresponding Author: Dr. Akshita Subhash Sonawala

(akshita.sonawala@gmail.com)

Abstract

Introduction: Atrial fibrillation (AF) is the most common arrhythmia and was first demonstrated on electrocardiography more than a century ago. It is commonest sustained cardiac arrhythmia which a physician comes across, found in association with cardiac as well as extra cardiac diseases and sometimes as "lone phenomenon". It is a major global health burden due to increasing life expectancy and global increase in coronary risk factors with age.

Aim and Objective: The study focuses on clinical profile of atrial fibrillation with reference to echocardiography, that is, causes, clinical features and complications of AF.

Methodology: A cross sectional study was conducted in Department of Medicine in tertiary care hospital. A non-probability convenience sampling method was used to select 126 patients. Informed written consent was taken from them. Patients were thoroughly interviewed, examined and investigated. Detailed demographic data, history of illness, general and systemic examination findings were recorded, routine investigations and blood tests were done. All patients who satisfied inclusion criteria after detailed evaluation by using ECG, were analysed with 2D ECHO (M mode and colour Doppler).

Result: Mean age of study population was 48.83 ± 14.75. 61.11% were females. Breathlessness was commonest symptom (85.71%). RHD was major etiological factor in 79.37%. Isolated MS (45%) was major type of valvular abnormality. 42.86% had severely abnormal LA size. 67.46% had mild degree MS based on valve area. 70.63% had pulmonary hypertension as complication.

Conclusions: AF is more common in the age group of 21 – 50 years, more in females compared to males. Major symptoms were breathlessness & palpitation. Rheumatic heart disease was commonest cause. Echocardiography is useful to identify the etiology and complications of AF.

Keywords: atrial fibrillation, echocardiography, non-rheumatic heart disease, rheumatic heart disease

Introduction:

Atrial fibrillation (AF) is a supraventricular arrhythmia characterized electrocardiographically by low-amplitude baseline oscillations (fibrillatory or f waves) and an irregularly irregular ventricular rhythm. The f waves have a rate of 300 - 600 beats/min and are variable in amplitude, shape, and timing. The ventricular rate during atrial fibrillation in the absence of negative dromotropic agents is typically 100 - 160 beats/min1.

According to RE-LY-AF study where patients from Africa, India, and the Middle East were on average 10-12 years younger than those from other regions of the world. Similarly, in the REALIZE AF and IHRS AF study, the average age of patients was 60 & 54 years, respectively (a decade younger than Western counterparts). Thus, it increases the economic burden by more DALY's lost2. Apart from age, prevalence of AF is greater in patients with conditions such as hypertension, heart failure, coronary artery disease (CAD), valvular heart disease, obesity, diabetes mellitus or chronic kidney disease. The increase in prevalence is attributed to better detection of silent AF as well as increasing age and conditions predisposing to AF3. The most dreaded complication of AF is stroke/thromboembolic events, the annual incidence of such an event in non-valvular AF is 4%/year as compared to 17-18%/year in patients with rheumatic AF. Hence, demonstrating increased morbidity and mortality translating to further increase in the economic burden on the national resources2. Patients who have been diagnosed with atrial fibrillation have a 5-fold increased risk of stroke compared to those without atrial fibrillation thus making it

a public health problem4. Although accurate worldwide estimates are lacking, calculations suggest that ≥1% of the adult population is affected in the developed world 5-6. Compared with 1990, the counts of AF prevalent cases in 2017 increased from about 19.14 million (95% UI 16.44–21.92) to 37.57 million (95% UI 32.55–42.59) an increase of around 18.43 million cases7.

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AF is classified into five types based on the presentation, duration and spontaneous termination of episodes8: a) First Diagnosed AF: AF that has not been diagnosed before, irrespective of the duration of the arrhythmia or the presence and severity of AF-related symptoms. b) Paroxysmal AF: It is self-terminating, in most cases within 48 hours. Some AF paroxysms may continue for up to 7 days. AF episodes that are treated by cardioversion within 7 days should also be considered paroxysmal. c) Persistent AF: AF that lasts longer than 7 days, including episodes that are terminated by cardioversion, either with drugs or by direct current cardio version, after 7 days or more. d) Long-standing persistent AF: Continuous AF lasting for ≥1 year, when it is decided to adopt a rhythm control strategy. e) Permanent AF: AF that is accepted by the patient (and physician). Hence, rhythm control interventions are, by definition, not pursued in patients with permanent AF. Should a rhythm control strategy be adopted, the arrhythmia would be reclassified as 'long-standing persistent AF'.

Etiology of atrial fibrillation includes9: Cardiovascular diseases like Rheumatic heart disease, Coronary artery disease, Systemic Hypertension, Congenital heart disease (Atrial septal Defect, Lutembacher syndrome), Cardiomyopathy, Pericardial disease (Constrictive pericarditis, Pericardial effusion), Pre – Excitation syndromes (Wolff Parkinson White syndrome, Lown Ganong Levine syndrome), Atrial myxoma, Metabolic (Hyperthyroidism, Hyperkalemia, Uremia). In developed countries, hypertensive heart disease and coronary heart disease (CHD) are the most common underlying chronic disorders in patients with atrial fibrillation. Rheumatic heart disease, though now uncommon in developed countries, is associated with a much higher incidence of AF and still remains the commonest cause in developing countries10.

Not all patients with AF are symptomatic. Among those that are, symptoms associated with AF are variable. Typical symptoms include: Palpitations, tachycardia, fatigue, weakness, dizziness, light headedness, reduced exercise capacity, increased urination, or mild dyspnea. More severe symptoms include dyspnea at rest, angina, presyncope, or infrequently, syncope. In addition, some patients present with an embolic event or insidious onset of heart failure (as manifested by pulmonary edema, peripheral oedema, weight gain, and ascites)11.

ECG Features of AF include irregularly irregular rhythm, no P waves, absence of an isoelectric baseline, variable ventricular rate, QRS complexes usually <120 milliseconds (unless pre- existing bundle branch block, accessory pathway, or rate related aberrant conduction), fibrillatory waves may be present and can be either fine (amplitude < 0.5mm) or coarse (amplitude >0.5mm), fibrillatory waves may mimic P waves leading to misdiagnosis12.

Among subjects with AF, several echocardiographic indices predict increased mortality, including presence of thrombus and left ventricular systolic dysfunction. Several echocardiographic indices also predict thromboembolic stroke, including rheumatic mitral valve disease, left ventricular systolic dysfunction or hypertrophy on TTE (transthoracic echocardiogram), and markers of left atrial/LAA dysfunction13. Hence, TTE findings may provide prognostic information that is additive to traditional clinical factors. The integrated use of echocardiography will be an important component in the optimal management of the looming AF epidemic14. Once diagnosed, atrial fibrillation requires chronic, multidimensional management in five domains (acute management, treatment of underlying and concomitant cardiovascular conditions, stroke prevention therapy, rate control, and rhythm control)15.

The public health dimension of AF motivates research in modifiable AF risk factors and improved precision in AF prediction and management16. Early detection of Atrial Fibrillation (AF) is a public health priority across the globe because AF-related strokes are preventable17. Echocardiography has a unique and important role in the assessment of cardiac structure and function, risk stratification, and increasingly in guiding the management of AF18.

Aim

The study focuses on clinical profile of atrial fibrillation with reference to echocardiography. **Objectives**

1. To study the causes of atrial fibrillation
2. To study the clinical features of atrial fibrillation
3. To study the complications of atrial fibrillation

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Materials and Methods

Research design and duration: This study was conducted during the period of 2018 - 2020 as a cross sectional descriptive study in the Department of Medicine in tertiary care hospital. **Study population:** All the diagnosed cases of atrial fibrillation admitted in medicine wards, medical ICU & attending outpatient department of Medicine at the tertiary care hospital.

Sampling technique & sample size: Prevalence was used to calculate the sample size. A non- probability convenience sampling method was used to select 126 patients who met the designed set of criteria. Following formula was used to calculate sample size:

Sample size (n) = Z2PQ/e2

Z=1.96 at 95% confidence interval p = prevalence

q = 1- p

e = allowable error 7 %

p= 20% prevalence of atrial fibrillation in India19 = 1.96 x 1.96 x 0.2 x (1-0.2) =125.44

0.07 x 0.07

Calculated sample size = 126

Inclusion criteria:

1. Patient with clinically diagnosed atrial fibrillation
2. Patient with electrocardiographically diagnosed atrial fibrillation
3. Patient of either sex
4. Patient having age more than 12 years

Exclusion criteria:

1. Patient having age less than 12 years
2. Patient with arrhythmias other than atrial fibrillation
3. Patient not willing to participate

Clinical grounds for inclusion: Age of the patient, sex, history of CAD, systemic hypertension, congenital heart disease, cardiomyopathies, thyroid disorder, COPD, cerebrovascular accidents were taken into account.

The following features were noted:1. Irregularly irregular pulse, 2. Pulse deficit > 10 calculated by simultaneous counting of pulse rate and heart rate, 3. Absent 'a' wave in jugular venous pulsation, 4. Variable intensity of first heart sound on auscultation. 12 lead ECG was taken for all the cases with a standardization of 1mV= 10 MM, with the paper speed at 25mm/sec. The following features were noted: 1. Absence of P wave, 2. Atrial activity reflected by an irregularly corrugated deflection 'f' wave, 3. Atrial rate >350/min, 4. Irregularly irregular RR interval

Informed written consent was taken from patients. They were thoroughly interviewed, examined and investigated. Detailed demographic data, history of illness, general and systemic examination findings were recorded, routine investigations and blood tests were done.

Other Investigations included were Thyroid function test, Chest X-ray PA view, Blood glucose levels –fasting and post prandial, PT/INR

Transthoracic echocardiography was done in all patients with attention to the following features:

Valvular / non-valvular lesion, valves involved, left atrium size, left atrial/ ventricular clot, Ejection fraction, Left ventricular hypertrophy.

Patients were analysed with 2D ECHO, M mode and colour Doppler. Patients were grouped based on LA size enlargement according to American society of Echocardiography.

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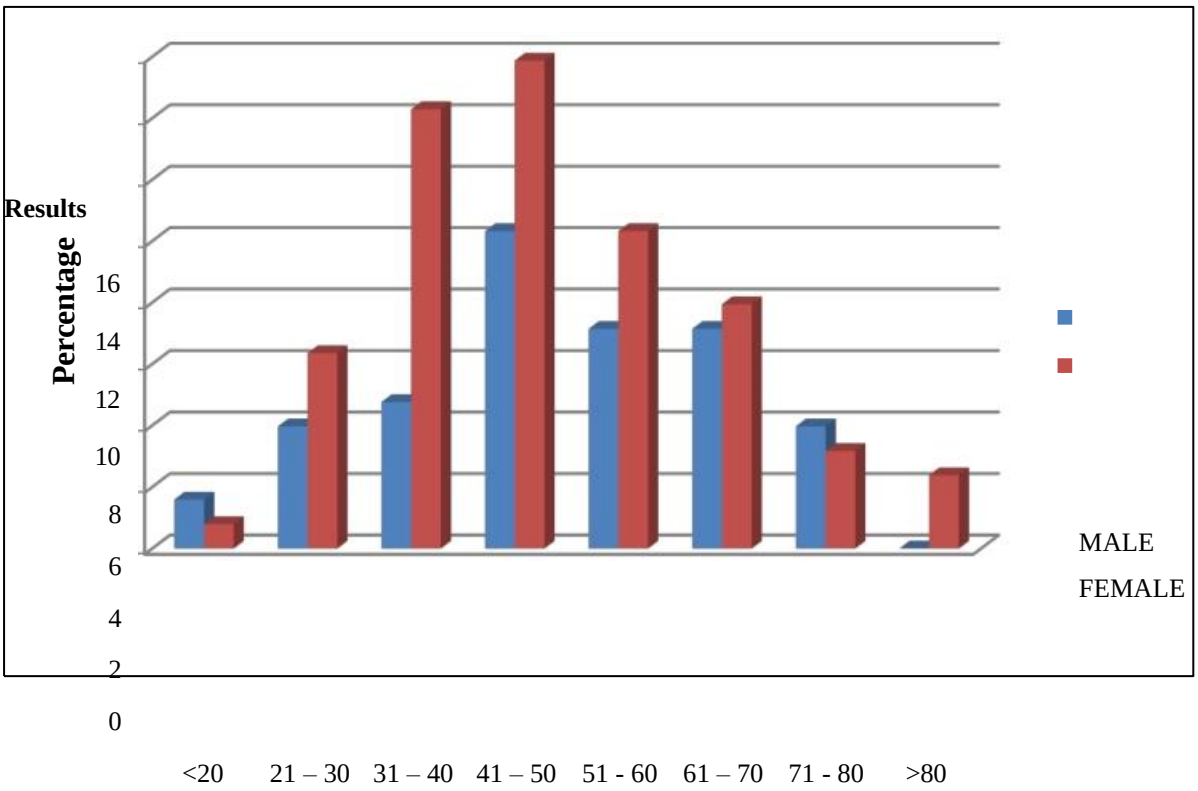

Fig. I : Age group

Out of 126 patients, maximum number 55 (43.50%) patients were in the age group of 41-60 years followed by 37 (29.8%) were in the age group of 21-40 years, 31 (24.6%) in the age group above 60 years, and 3 (2.38 %) in < 20 years of age group. Mean age score was 48.83 and standard deviation was 14.75. Maximum numbers of patient were females 77(61.11%) followed by males 49 (38.89%). Female to male simplified ratio was approxim[illegible]

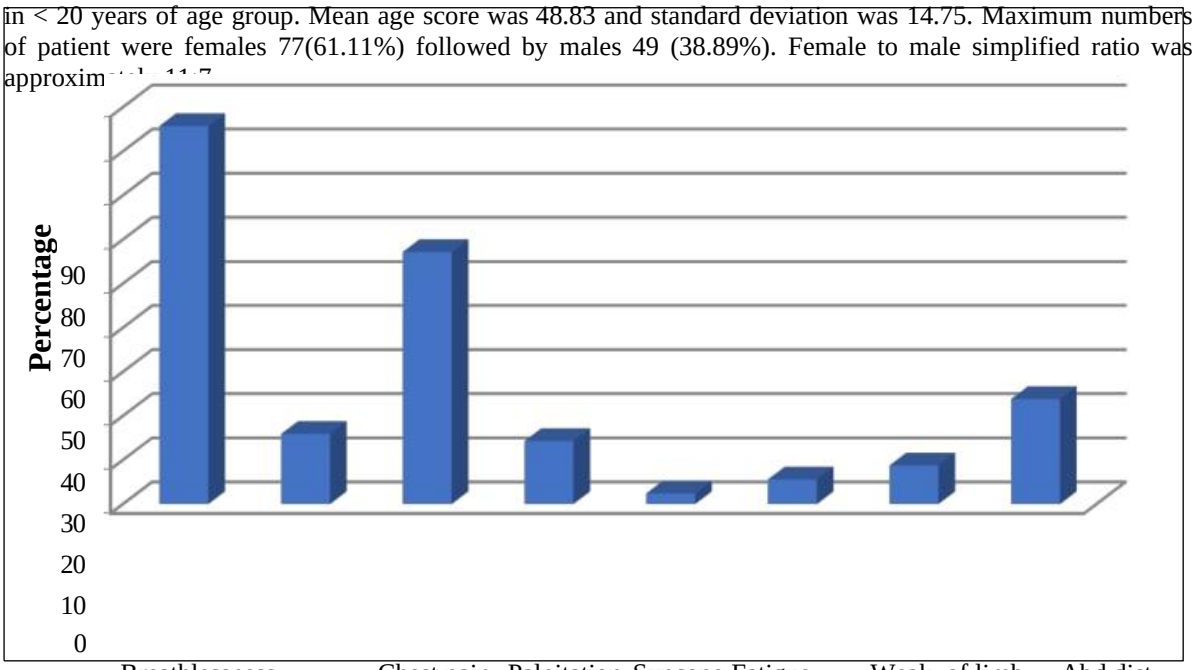

Fig II. Symptoms

Out of 126 patients, maximum number of patients, 108 (85.71%) were having breathlessness followed by palpitation in 72 (57.14%), swelling of feet in 30 (23.80%), chest pain in 20

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(15.87%), syncope in 18 (14.29%), weakness of limb in 07 (5.56%) and the remaining had fatigue 3 cases (2.38%). Data also reveals that patients had single or multiple symptoms.

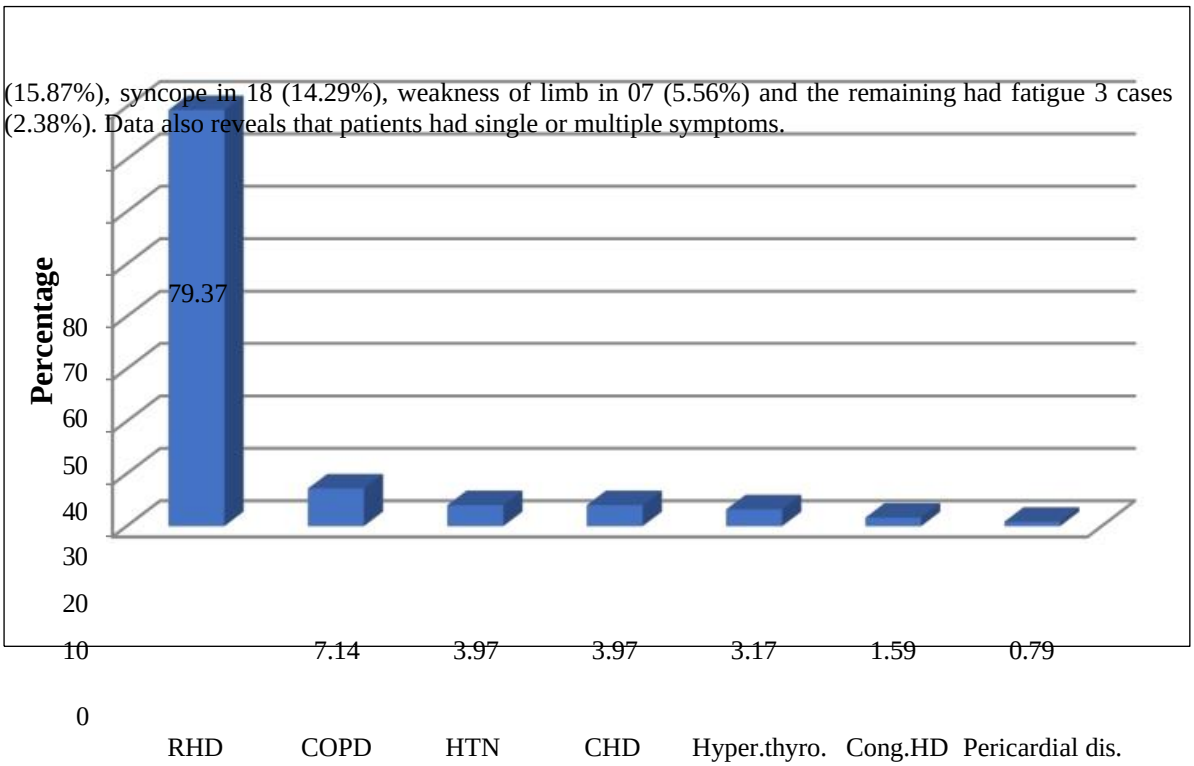

Fig III. Etiology

Maximum number of patients, 100 (79.37%), were having Rheumatic heart disease, followed by COPD in 09 (7.14%), hypertension in 5 (3.97%), coronary heart disease in 5 (3.97%), hyperthyroidism in 4 (3.17%), congenital heart disease in 2 (1.59%) and the remaining was pericardial disease 1 case (0.79%). Data reveals that patients have comorbid illness along with atrial fibrillation. Among RHD cases, maximum were female 66 (52.38%) followed by males
34 (26.98%). There was no significant correlation between gender of RHD and non RHD cases as $p>0.05$.

n = 126

Left ventricular hypertrophy	Frequency	Percentage
Yes	20	15.87
No	106	84.13

Table I: Left ventricular hypertrophy (LVH)

In present study maximum number of patients, 106 (84.13%) had no Left ventricular hypertrophy followed by 20 (15.87%) who had Left ventricular hypertrophy.

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n = 126

Regional wall motion abnormality	Frequency	Percentage
Yes	06	04.76
No	120	95.24

Table II: Regional wall motion abnormality (RWMA)

Maximum number of patients, 120 (95.24%) had no regional wall motion abnormality followed by 6 (04.76%) who had regional wall motion abnormality.

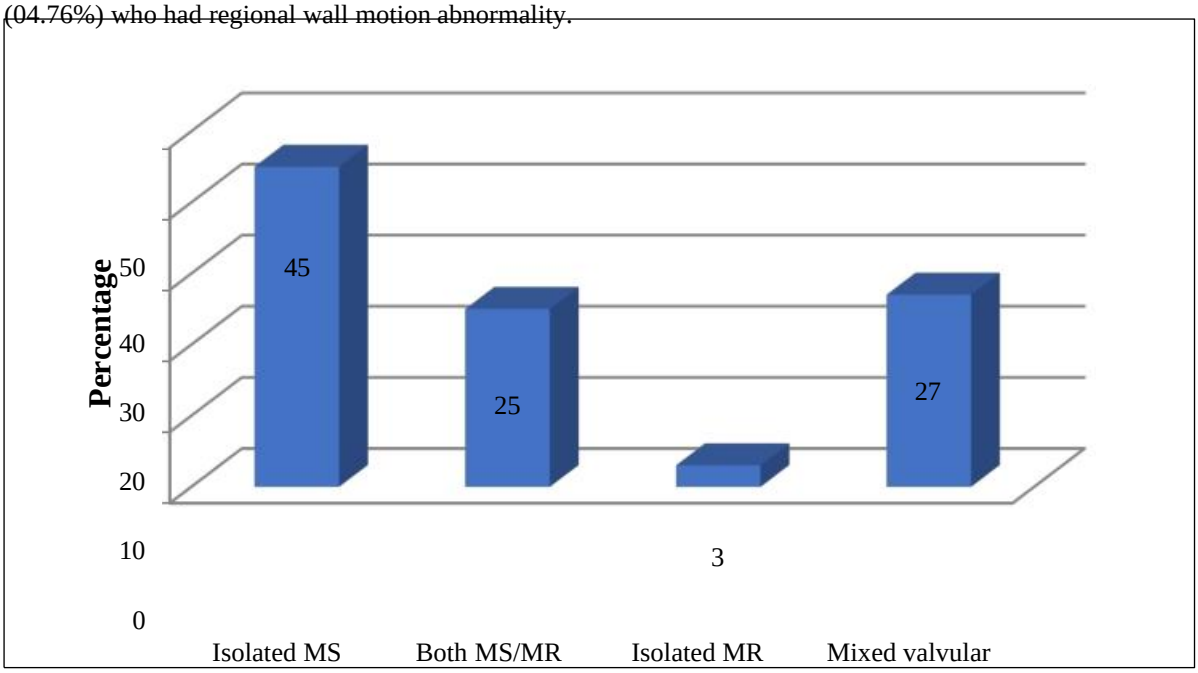

Fig IV: Type of valvular abnormality

Out of 100 RHD cases, maximum number of patients (45%) had Isolated MS followed by mixed valvular disease in 27%, both MS/MR in 25% and 3% had Isolated MR.

n = 126

Severity of MS Valve area (cm2)	Frequency	Percentage
Mild (> 1.5 cm2)	85	67.46
Severe (< 1.5 cm2)	09	07.14
Normal	32	25.40

Table III: Mitral Stenosis (MS) severity according to valve area

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Maximum number of patients 85 (67.46%) had mild degree mitral stenosis (MS) based on valve area followed by severe MS in 9 (7.14%) cases.

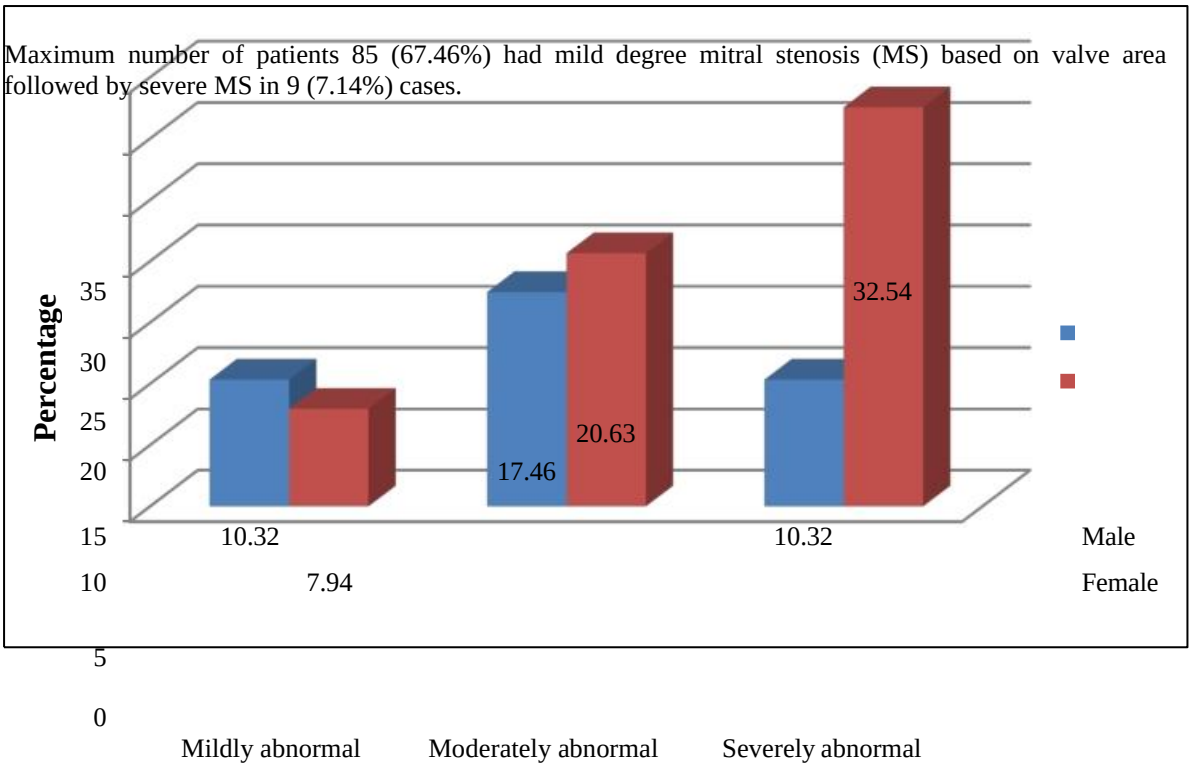

Fig V: Left atrium size (mm)

Out of 126 patients, maximum number 54 (42.86%) were having severe abnormal atrium size followed by moderately abnormal in 48 (38.10%) and mildly abnormal in 23 (18.25%). There was no significant correlation between above variables as p>0.05.

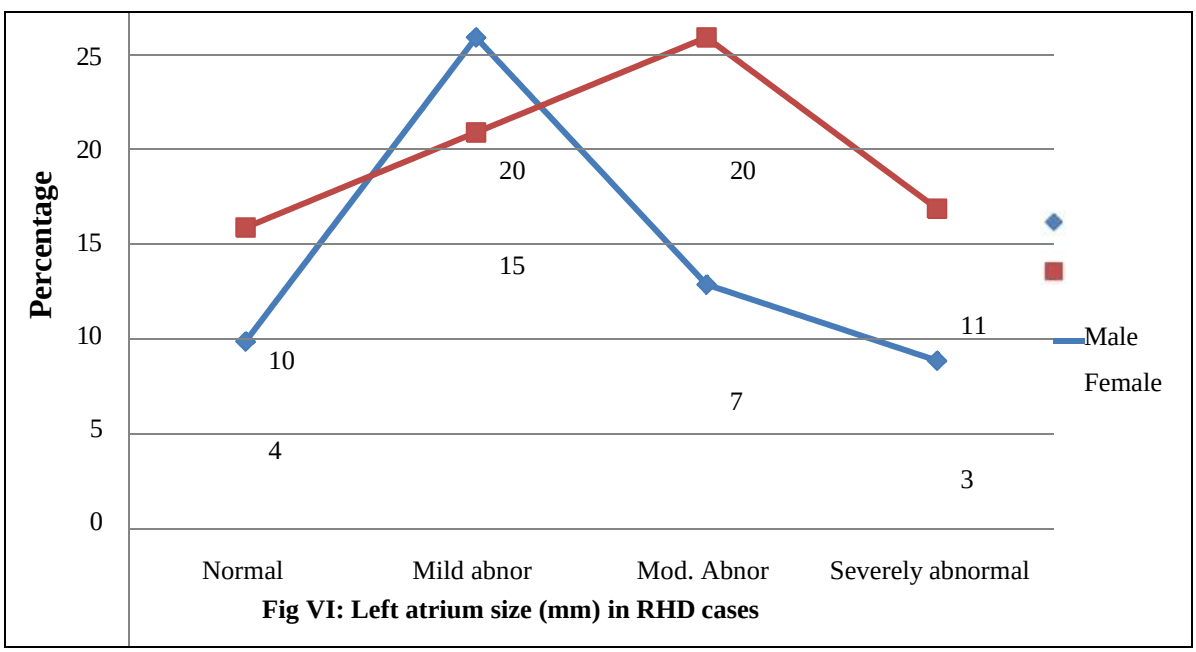

Fig VI: Left atrium size (mm) in RHD cases

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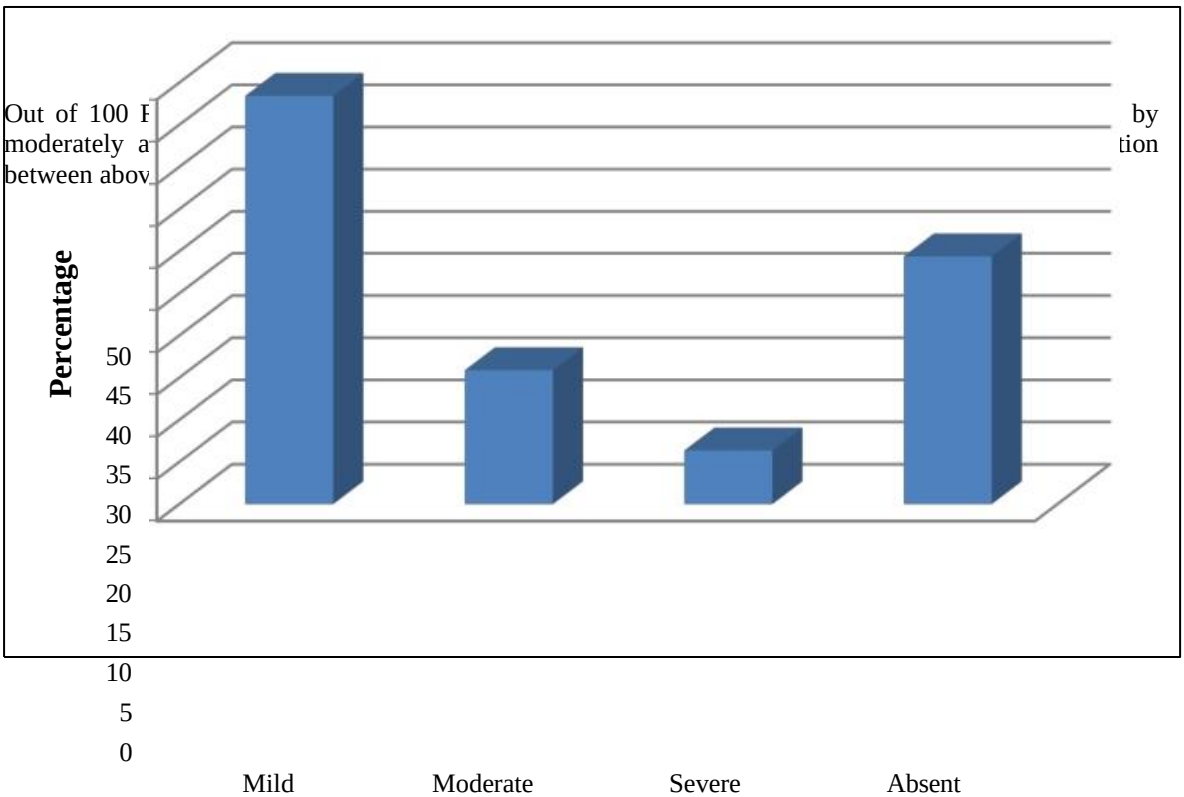

Fig VII: Pulmonary hypertension

In present study maximum number of patients 61 (48.41%) had mild degree of pulmonary hypertension followed b

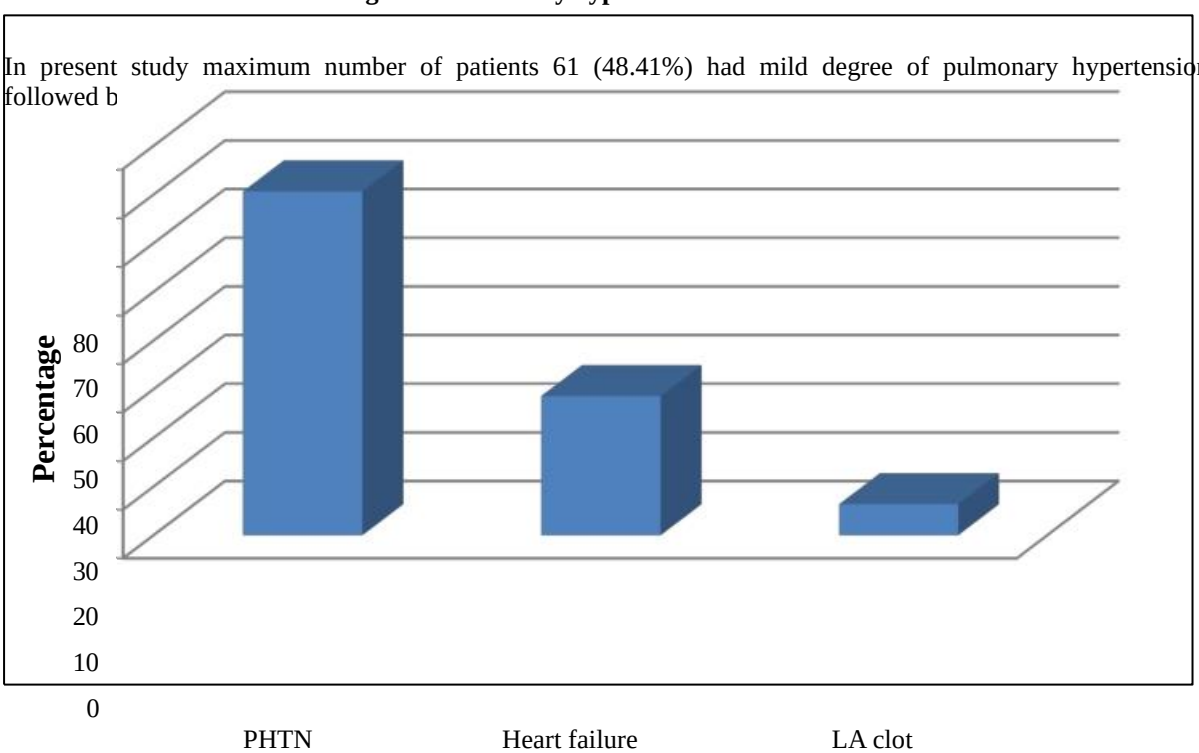

Fig VIII: Complications

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In the present study maximum number of patients, 89 (70.63%) had pulmonary hypertension followed by Heart failure in 36 (28.57%) and LA clot in 8 (6.35%). Further association of complications with prognosis shows significant correlation as $p<0.05$.

Discussion

AGE: The mean age and standard deviation was 48.83 ± 14.75. The relationship between mean age versus RHD and Non RHD was found non-significant ('p' value >0.05). In a study done by Vora A. et.al.20 under the aegis of the Indian Heart Rhythm Society (IHRS) mean age among Indian AF was found as 54.7. Also, Benjamin. O et al.21 reported mean age as 58 in
their study. In our study we divided the patients into 8 age groups, ranging from 19-84 years of age. In our study most of the patients, 33 (26.19%) were in 41-50 years of age group followed by 22 (17.46%) in 51-60 years. These findings were consistent with study done by Dushyant S.et.al.22 where 31% cases were in 41-50 years of age group.

GENDER: Females were more in number than males. Out of 126 patients, 61.11% were females and 38.89% were males. These findings were consistent with study done by Dushyant S., et al.22 in which 42% were males and 58% were females. Also, Framingham heart study23 reported a higher incidence in males.

SYMPTOM ANALYSIS: Predominant symptom was breathlessness 108 (85.71%) followed by palpitation in about 72 (57.14%), next was swelling of feet which was present in about 30 (23.80%) cases, syncope accounted for 14.28% and limb weakness was present in only about 5.55%. Findings of our study are consistent with study done by Flaker et.al.24 which shows 78% of the patients with breathlessness and 11% of them were with chest pain. Also, in Tischler et.al.25 study showed breathlessness in 62% of patients, palpitation in 33% patients and syncope in 12% patients. Multiple patients in our study had combinations of two or more symptoms in varying percentages.

ETIOLOGICAL FACTOR: Rheumatic heart disease was the most common etiological factor associated with AF. It was observed in 100 (79.36%) of the patients and remaining 26 (20.64%) cases had non rheumatic etiological factors. These results correlate with previous study by Dushyant S. et.al.22 in which 78% cases had RHD as etiology for AF. Also, in the study done by Morin DP. et.al.26 found that 70% of their population had RHD as the etiology of AF. COPD was second most common etiological factor in our study i.e., 7.14% cases. In a prospective, population-based cohort study (Rotterdam Study) demonstrated that COPD is associated with a 28% increased risk of developing AF, and that having frequent COPD exacerbations increases the AF risk approximately 2-fold27. In present study, other etiological
factors were hypertension in 5 (3.97%) cases. According to the Framingham study23 half of the cases were accounted by hypertension. In an AFFIRM study it was present in 71% of cases28. Also, in our study coronary heart disease was seen in 5 (3.97%) cases. In the AFFIRM28 study, CAD was present in 38% of the cases. Sameul Levy et.al.29 reported 16.6% of CAD as the underlying cause of AF.

RHD and non RHD: Females were predominant in the RHD group. Out of the 100 patients with RHD, 66 were females and 34 were males. Among the Non RHD patients, males were predominant. In which 15 were males, 11 were females. Most of previous studies indicate that AF was commonly seen in RHD cases.

ECHOCARDIOGRAPHIC FEATURES:

TYPE OF VALVULAR ABNORMALITY: Isolated MS was present in 45% of the patients,

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25% of the cases presented with both MS/MR, isolated MR was present in 3%, and the remaining 27% of the cases presented with both mitral and aortic valve lesions, which conforms with previous study done by Diker E et.al.30.
In our study population out of 126 patients, mild MS was present in 67.46 % of the patients, and the remaining 7.14 % cases presented with severe MS. A previous study by Habibzadeh F. et.al.31 also found that MS was most common subtype of valvular heart disease associated with AF.

LEFT ATRIUM (LA) SIZE: Among 126 patients, maximum number 54 (42.86%) were having severe abnormal atrium size followed by moderately abnormal in 48 (38.10%) and mildly abnormal in 23 (18.25%). These findings were different from study findings by Flaker et.al.24 where majority cases 62.39% had moderately abnormal LA size. Findings are correlated with Henry WL. et.al.32 and Cabin HS. et.al.33
Among RHD group of patients, the mean LA size was 43.90 mm, in Non RHD patients mean LA size was 42.80 mm. No statistically significant difference was observed between the LA sizes of the RHD group and the non-RHD group (p value >0.05). This finding disagrees with the finding by Flaker et al.24 where there was significant correlation (p=0.007).

SEVERITY OF MITRAL STENOSIS (MS): 85 (67.46%) cases had mild degree mitral stenosis (MS) based on valve area followed by severe MS in 9 (7.14%) cases which was less than the cross-sectional retrospective study by Shaikh et.al.34 who found that in rheumatic heart disease, the frequency of mitral stenosis was 66 (33%) & severe MS was 15 (22.7%).

LEFT VENTRICULAR HYPERTROPHY (LVH): 20 (15.87%) cases presented with left ventricular hypertrophy. Our study finding correlates to study done by Hijazi Z. et.al.35 in which 23.8% cases presented with LVH. In study done by Verdecchia P. et.al.36 in the Randomized Evaluation of Long-Term Anticoagulant Therapy (RE-LY) Study, LVH was present in 22.7% of cases.

COMPLICATIONS: In our study 28.57% of patients presented with heart failure as complication, 70.63% of patients presented with pulmonary hypertension and 6.35% with LA clot. The difference was statistically significant ('P' value < 0.05). These results correlate with the study done by Maisel WH. et.al.37 who found that complication was significantly associated with outcome of the study. Atrial fibrillation is common in patients with pulmonary hypertension and is closely associated with clinical decompensation and poor clinical outcomes38. Atrial fibrillation (AF) significantly increases the risk of left atrial (LA) thrombus and systemic thromboembolism39.

PULMONARY HYPERTENSION (PH):
In our study 70.63% cases had pulmonary hypertension. Early correction of the lesion helps reverse the PH. PH persisting for a longer time may result in right ventricular (RV) dysfunction and functional tricuspid regurgitation. PH and RV dysfunction increase the perioperative risk in patients undergoing MV surgery40. In our study 61 (48.41%) had mild degree of pulmonary hypertension and 6.35% had severe PH.

Conclusion
It can be concluded that AF is more common in the age group of 21 – 50 years, more common in females compared to males. The major symptoms of AF at presentation were breathlessness
& palpitation. Rheumatic heart disease is the commonest cause. AF due to Hypertension, Coronary Heart Disease and other etiologies is common in old age. Mitral valve got affected in all cases of RHD with AF. Isolated MS & combined mitral valve lesions (MS+MR) were common structural lesions. Echocardiography has significant importance in analysing the relation between atrial fibrillation and left atrial size, etiology of AF, presence or absence of thrombus and complications.

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Conflict of Interest: No.

Funding: No.

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