ORIGINAL RESEARCH PAPER

Cardiology

KEY WORDS:

# AMBULATORY 24 HOUR HOLTER MONITORING IN PATIENTS WITH ATRIAL FIBRILLATION IN A TERTIARY CARE HOSPITAL

**Dr. Ganesh Thangamuthu Kumar K** M.D., D.M, Assistant Professor,Dept, Of Cardiology,madras Medical College, Chennai-3

**Dr. S. Murugan*** M.D., D.M, Associate Professor, Dept Of Cardiology, Madras Medical College, Chennai-3 *Corresponding Author

## INTRODUCTION:

Atrial fibrillation is the most common sustained arrhythmia. AF Incidence increases with age and associated with increased risk of stroke and heart failure. Control of ventricular response is generally considered as the cornerstone therapy in atrial fibrillation. Beta blockers, calcium channel blockers and digoxin are effective in rapid control of ventricular response in atrial fibrillation. Since heart rate response varies with exertion in atrial fibrillation, ambulatory 24 hour Holter monitoring shows optimal assessment of adequate heart rate control in these patients. The main aim of our study was to assess average 24hour heart rate and nocturnal heart rate in 50 patients with atrial fibrillation on medical therapy using ambulatory 24 hour Holter monitoring.

## MATERIALS & METHODS:

## (STUDY POPULATION AND DESIGN)

Our study was an observational cross sectional study done in the Institute of Cardiology, Madras Medical College and Rajiv Gandhi Govt. General Hospital, Chennai during the period between JAN 2019 TO JUNE 2019.50 patients with atrial fibrillation on medical therapy who satisfied the inclusion criteria were selected in review OPD and subjected to ambulatory 24 hour Holter monitoring. Informed written consent was obtained from all the patients and ethics committee approval was obtained as per mandatory hospital regulation. Our Study included 40 female patients (90%) and 10 male patients (10%)Inclusion Criteria include rheumatic heart disease patients with atrial fibrillation, age below 60 years, patients on following rate control therapy regimen – atenolol and digoxin (20 Patients), verapamil and digoxin (20 patients), digoxin alone (10 patients) and with good drug compliance. Exclusion Criteria include Age above 60 years, Non valvular Atrial Fibrillation, patients with rapid ventricular response, Patients who are hemodynamically unstable or in heart failure, patients with poor drug compliance and with thromboembolic complications. Data was recorded by 24 hour Holter monitoring. The parameters collected were average 24 hour heart rate, minimum heart rate and maximum heart rate during daytime and night. All variables were presented in absolute values and proportions.

**Table 1: Age & Sex distribution of the study population**

| Age group | Male n (%) | Female n (%) | Total n (%) |
|---|---|---|---|
| 20 – 30 years | 0 (0%) | 3 (7.6%) | 3 (6 %) |
| 30 – 40 years | 2 (20%) | 7 (17.5%) | 9 (18%) |
| 40 – 50 years | 4 (40%) | 16 (40%) | 20 (40%) |
| 50 – 60 years | 4 (40%) | 14 (35%) | 18 (36%) |

## RESULTS:

A total of 50 patients were enrolled during the study period. Out of 50 patients, 40 patients ( 80%) had average 24 hour heart rate below 80 bpm.5 patients ( 10%) had average 24 hour heart rate above 100 bpm. Minimum heart rate of 30 – 40 bpm was present in 35 patients (70%).14 patients (28%) had minimum heart rate of 40 – 50 bpm. Maximum heart rate of 100 – 150 bpm was seen in 45 patients (90%). 5 patients (10%) had maximum heart rate of 150 – 200 bpm. Lowest heart rates were recorded during 12AM to 6 AM in 47 out of 50 patients (94%). Highest heart rates were recorded between 6AM – 2PM in 27 patients (54%) and between2 PM – 10PM in 23 patients (46%). 19 out of 20 patients (95%) on atenolol and digoxin combination had average 24 hour heart rate below 80 bpm.18 out of 20 patients (90%)on verapamil and digoxin combination had average 24 hour heart rate below 80 bpm. 3 out of 10 patients (30%) on digoxin alone had average 24 hour heart rate below 80 bpm.The study clearly confirmed that rate control achieved with drugs was superior with combination therapy of digoxin with beta blockers (Atenolol) or calcium channel blockers (verapamil)than digoxin alone. Atenolol (95%) achieved better heart rate control than verapamil (85%) among combination therapy.

**Table 2: Average 24 hour heart rate in the study population**

| Average heart rate | Males n (%) | Females n (%) | Total n (%) |
|---|---|---|---|
| Below 80 bpm | 7 (70%) | 33 (82.5%) | 40 (80%) |
| 80 -100 bpm | 2 (20%) | 4 (10%) | 5 (10%) |
| Above 100 bpm | 1 (10%) | 3 (7.5%) | 5 (10%) |

**Table 3: Minimum Heart Rate in the study group**

| Minimum heart rate | Males n (%) | Females n (%) | Total n (%) |
|---|---|---|---|
| 30 – 40 bpm | 6 (60%) | 29 (72.5 %) | 35 (70%) |
| 40 – 50 bpm | 3 (30%) | 11 (27.5%) | 14 (28%) |
| 50 - 60 bpm | 1 (10%) | 0( 0%) | 1 (2%) |

**Table 4: Maximum heart rate in the study population**

| Maximum heart rate | Males n (%) | Females n (%) | Total n (%) |
|---|---|---|---|
| 100 – 150 bpm | 8 (80%) | 37 (92.5%) | 45 (90%) |
| 150 -200 bpm | 2 (20%) | 3 (7.5%) | 5 (10%) |

**Table 5: Time zone in which lowest heart rate was recorded in the study group**

| Time zone | Males n (%) | Females n (%) | Total n (%) |
|---|---|---|---|
| 10 PM – 12 AM | 0 (0%) | 3 (7.5%) | 3 (6%) |
| 12 AM – 2 AM | 2 (20%) | 2 (5%) | 4 (8%) |
| 2 AM – 4 AM | 5 (50%) | 18 (45%) | 23 (46%) |
| 4 AM – 6 AM | 3 (30%) | 17 (42.5%) | 20 (40%) |

**Table 6: Time zone in which highest heart rate was recorded in the study group**

| Time zone | Males n (%) | Females n (%) | Total n (%) |
|---|---|---|---|
| 6 AM – 10 AM | 2 (20%) | 9 (22.5%) | 11 (22%) |
| 10 AM – 2 PM | 4 (40%) | 12 (30%) | 16 (32%) |
| 2 PM – 6 PM | 3 (30%) | 7 (17.5%) | 10 (20%) |
| 6 PM – 10 PM | 1 (10%) | 12 (30%) | 13 (26%) |

**Table 7: Average 24 hour heart rate below 80 bpm achieved with 3 different drug regimen**

| Drug | Males n /n (%) | Femalesn/n (%) | Total n/n (%) |
|---|---|---|---|
| Atenolol + digoxin | 4/4 (100%) | 15/16 (93.75%) | 19/20 (95%) |

| | | | |
|---|---|---|---|
| Verapamil + digoxin | 3/4 (75%) | 14/16 (87.5%) | 18/20 (90%) |
| Digoxin | 0/2 (0%) | 3/8 (37.5%) | 3/10 (30%) |

## DISCUSSION:

Atrial Fibrillation is the most common sustained arrhythmia requiring hospitalisation[1]. In the ATRIA study, incidence of atrial fibrillation increases with age , with prevalence ranging from 0.9 % among adults below 55 years to 9 % among elderly above 80 years[2]. Males have higher prevalence (1.1 % vs 0.8%) than females. According to Framingham Heart Study[3], risk of developing atrial fibrillation for age group 40 – 95 years was 26% for males and 23% for females. In developed countries, hypertension and coronary artery disease are the leading causes of atrial fibrillation but in developing countries, Rheumatic Heart disease still predominate. In Rheumatic Heart Disease, prevalence varies with the type of valve involvement[4], more common in mitral valve than aortic valve disease. Important risk factors in India other than RHD, as per REALIZE AF registry are hypertension, diabetes mellitus, dyslipidemia, heart failure, smoking, alcoholism, CKD, obstructive sleep apnoea and cardiopulmonary diseases like COPD and pulmonary embolism[5].Even in data obtained from Indian cohort of REALIZE AF registry, Rheumatic heart diseases contributed to 40.7 % cases when compared to global average of 26.7%.Mechanism proposed for atrial fibrillation are multiple wavelet theory[6] – AF due to re entry mechanism in atrial muscle and ectopic focus theory – AF due to increased automatacity of ectopic foci in the atrium. Atrial fibrillation occurs when structural or electrophysiological abnormalities alter the atrium to promote abnormal impulse formation or propagation. Left atrial size is an important predictor of AF with incidence increasing from 3 % with left atrium size below 40 mm to 54% with values above 40 mm[7].Histopathological changes noted in both left and right atrium in rheumatic heart disease include myocyte hypertrophy, myocytolysis, endocardial inflammation, interstitial fibrosis , amyloid deposition and Aschoff bodies.

Medical management of atrial fibrillation include rate control, rhythm control and anticoagulation. CRRAFT study done in KEM Hospital, Mumbai showed that rhythm control approach was superior to rate control for rheumatic atrial fibrillation[8]. However, trials like RACE and AFFIRM didnot show any change in mortality with rhythm control strategy than rate control strategy.Beta blockers and calcium channel blockers areeffective for rate control than digoxin, which becomes ineffective during exercise. Electrophysiological action of digoxin is mediated through augmentation of vagal tone on AV node and hence slows ventricular rate only during rest.Beta blockers and calcium channel blockers slows ventricular rate not only during peak exertion but also maintains these effects during rest. In 1960 , Dr.Norman Holter[9] devised a novel method of recording , storing and displaying the electrical rhythm of the heart which was later named as Holter monitoring . Holter monitoring uses a device that continuously monitors the electrical activity of the heart for 24 hours or more. These recording devices are easy to wear and record data in a memory card. In patients with cryptogenic stroke, Holter monitoring is useful to detect episodes of paroxysmal AF which may be clinically silent. In chronic AF, this method is useful to assess the adequacy of rate control throughout the 24 hour period and to correlate the symptoms associated with episodes of rapid or slow ventricular rates.

In our study, among 50 patients, 80% had average 24 hour heart rate below 80 bpm. 10% had average 24 hour heart rate above 100 bpm despite on medical therapy. Minimum heart rate of 30 – 40 bpm was present in 70% of the patients.28% had minimum heart rate of 40 – 50 bpm. Maximum heart rate of 100 – 150 bpm was seen in 90% of patients. 10% of patients in spite of on medical therapy had maximum heart rate of 150 – 200 bpm. 94 % of the study population had their lowest heart rates recorded during 12 AM to 6 AM . 54 % of the study group had their highest heart rates recorded between 6 AM – 2 PM and remaining 46% between 2 PM – 10 PM. 19 (95%) out of 20 patients on atenolol and digoxin combination had average 24 hour heart rate below 80 bpm. Similarly, 18(90%) out of 20 patients on verapamil and digoxin combination had average 24 hour heart rate below 80 bpm. Notwithstanding, only 3(30%) out of 10 patients on digoxin alone had average 24 hour heart rate below 80 bpm. The study clearly confirmed that rate control achieved was superior with combination therapy of digoxin with beta blockers (Atenolol) or calcium channel blockers (verapamil) than digoxin alone. Atenolol (95%) achieved better heart rate control than verapamil (85%) among combination therapy.

## LIMITATION:

This was a single centre open label study done in small number of patients. Females predominated the study group and males were under represented in the study population. Despite high prevalence of AF in elderly population, they were not included in the study. Only rheumatic Atrial fibrillation patients were enrolled and non valvular AF population was not represented. Though drug combinations were compared, drug dosages of individual drugs differed between the study group which may act as confounding factor in determining the results.

## CONCLUSION:

The study clearly showed that 24 hour ambulatory Holter monitoring gives more precise information about heart rate control in patients with atrial fibrillation.

## CONFLICTS OF INTEREST:

The authors have no conflicts of interest

## REFERENCES:


1. Lip GYH, Bawden L, Hodson R, Rutland E. Atrial Fibrillation amongst Indo-Asian general practice population.The West Birmingham Atrial Fibrillation Project.Int J Cardiol. 1998; 65: 187 – 92.
2. Go AS, Hylek EM, Philips KA, Chang Y, Selby JV,Singer DE.Prevalence of diagnosed AF in adults: The Anticoagulation and Risk factors in Atrial Fibrillation ( ATRIA ) Study.JAMA 2001 ; 285 (18):2370
3. Lloyd – Jones DM, Way TJ, Leip EP, Lanton MG, Levy D, Vaan RS, Benjamin EJ. Lifetime risk of development of AF; The Framingham Heart Study. Circulation 2004; 110(9):1042
4. Diker E, Aydogodu S, ozalemir M, Kirel T, PolatK,Goksel S: Prevalence and Predictors of Atrial fibrillation in Rheumatic Valvular Heart Diseases Am.J.Cardiol.1996 ; 77(1):96
5. Narasimhan C, Verma JS, Kishore AGR, ET AL. Cardiovascular Risk profile and management of AF in India: Real World Data from REALIZE – AF survey.Indian Heart J, 2016:E pub
6. Moe G. on the multiple wavelet hypothesis of Atrial Fibrillation, Arch IntPharmacologTher. 1962; 140:183-8
7. Vaziri SM, Larson MG, BenjaminEJ, Lewy D. Echocardiographic predictors of non rheumatic atrial fibrillation. J Am coll Cardiol. 1993; 21:A394
8. Vora A, Goyal V, Naik A et al. Control of Rate vsRhythmin Rheumatic AF trial: CRRAFT ; PACE 2001. Indian Heart J. 2004; 56:110-6
9. Holter NJ. New method for Heart Studies science. 1961; 134:1214-20