Clinical Profile and Different Types of Arrythmias among Elderly Patients in a Tertiary Care Hospital in Western Maharashtra – A Prospective Observational Study

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Abstract

Introduction: In the elderly age group, frequency of cardiac arrhythmias is projected to increase and thereby greatly impact health care resource utilization. Several clinical factors are associated with risk of arrhythmias.

Aim: To study clinical profile and different types of arrythmias in elderly patients, identifying various etiologies and complications associated with arrhythmias.

Materials and Methods: A prospective observational study was conducted at H.B.T. Medical College & Dr. R.N. Cooper Hospital, a tertiary care hospital, Mumbai, Maharashtra, India after obtaining institutional ethics committee permission. In this study, 63 patients aged more than 60 years fulfilling eligibility criteria from medicine OPD or admitted to medicine ward/ intensive care unit were enrolled after obtaining prior informed consent from patient or patient's relatives. The study duration was for one year (February 2019 – January 2020). ECG, detailed medical history, clinical examination findings, 2D-Echo and required investigations reports were noted. The collected data was analysed and qualitative data was presented as frequency and percentages and analysed using chi-square test, whereas quantitative data was presented as mean and SD and compared by t-test. P-value < 0.05 was taken as level of significance.

Results: Of the 63 study subjects, there were 48 males (76%) and 15 females (24%). Among them, more than 70 years age group (44%) was the most common affected group and mean age was 68 ± 5.1 years. Alcohol and tobacco chewing was observed in 32% and 36% subjects respectively. The most common symptoms reported was shortness of breath (72%) followed by chest pain (46 %), palpitations (37 %), seizure (12%), altered sensorium (10%), hemiparesis (10%) and hemiplegia (5%). The most common arrhythmia noted amongst studied group was atrial fibrillation (37%). The most common etiology observed, was IHD (39.7%). Most common complications noted in this study, was congestive cardiac failure (44.4%). On analysing the data from different age group of patients, Chi-square test showed a p-value of

0.561 indicating that there was no significant association of age with different types of arrhythmias.

Conclusion: The prevalence of arrhythmias in very elderly patients is rising. Atrial fibrillation was the most common arrhythmia observed in current study. The most common etiology found, amongst study subjects was IHD. The most common complications observed, was congestive cardiac failure followed by embolic stroke, angina, and infective endocarditis. Gaining an appreciation of the epidemiology of arrhythmias in the elderly will assist the clinician in diagnosing and managing such patients.

Keywords: Atrial fibrillation, Ischaemic heart disease, Congestive heart failure

Introduction

Aging is associated with an increased prevalence of cardiac arrhythmias, which contribute to higher morbidity and mortality in the elderly. [1–4] With the aging, the heart undergoes complex degenerative changes, which affects its contractile and conduction systems. In this age group, frequency of cardiac arrhythmias, particularly atrial fibrillation (AF) and ventricular tachyarrhythmia, is projected to increase and thereby greatly impact health care resource utilization. [4] Several clinical factors associated with the risk of arrhythmias have been identified in the population, yet the bases for the increased predisposition to arrhythmogenesis in the elderly are not fully understood [5] and limited therapeutic strategies are available in this age group. Pharmacological treatment can be challenging due to a narrow therapeutic window and risk of toxicity in these patients. The iatrogenic risk associated with antiarrhythmic drugs and antithrombotic drugs is also elevated in the elderly. There is paucity of available epidemiological data regarding arrhythmias in elderly in developing countries like India. [6] This study was conducted to determine the clinical profile, etiologies and complications of arrhythmias among elderly patients in a tertiary care hospital in Western Maharashtra.

Aims and objectives

Primary Objectives:

To study clinical profile and different types of arrythmias in elderly patients.

Secondary Objectives:

- To study various etiologies of arrhythmias.
- To study complications associated with arrhythmias

Material and Methods:

This study was carried out at H.B.T. Medical College & Dr. R.N. Cooper Hospital, a tertiary care hospital in Mumbai, Maharashtra after obtaining institutional ethics committee permission. The study design was prospective, observational & descriptive without any form of intervention.

Sample Size:

Sample size was calculated by the following formula:

$$n = Z\,\alpha2\ 2\ (\%)(\%)\ d$$

where p is the observed incidence

q = 100- p

d is the margin of error $Z\alpha2$ is the ordinate of standard normal distribution at α% level of significance

Calculations:

p (Incidence : as observed by Lindberg T and et al in their study) [7] = 4.1%

q = 95.9%

d = 0.05% $Z2.5\%$ = 1.96 at α = 5% level of significance

n= 60.39

Hence the minimum sample size required in the present study is 60.

Inclusion criteria:

- Patients aged more than 60 years presenting with arrhythmias on ECG.
- Giving informed consent

Exclusion Criteria:

- Patients aged less than 60 years
- Those not willing to participate

Procedure

By using universal sampling all patients aged more than 60 years visiting medicine OPD or admitted to medicine ward/ intensive care unit for any medical or surgical comorbidity were enrolled for the study duration of one year (February 2019 – January 2020). The study adhered to Tenets of Declaration of Helsinki and total of 63 patients fulfilling the eligibility criteria were included in the study after obtaining prior informed consent from patient or patient's relatives.

Following parameters were noted:

- Detailed history about the disease complaints, past history of illness or medications taken, personal history (addiction)
- Clinical examination findings
- Electrocardiogram
- Chest X-ray
- 2D-Echo
- Complete blood count
- Renal function test and serum electrolytes
- Thyroid profile (T3 T4 TSH)
- Fasting blood sugar /Post lunch blood sugar

Definitions of various arrhythmia:

a. Supraventricular tachycardia: Electropathologic substrate arising above the bundle of His and causing heart rates exceeding 100 beats per minute.

b. Atrial Fibrillation: A very common irregular heart rhythm. Many impulses begin and spread through the atria, competing for a chance to travel through the AV node. The resulting rhythm is disorganized, rapid and irregular. Because the impulses are traveling through the atria in a disorderly fashion, there is a loss of coordinated atrial contraction.

c. Ventricular premature complex (VPC): Lower chambers of heart contract before they should and heartbeat becomes out of sync. There is a regular heartbeat, an extra heartbeat, a pause, and then a stronger heartbeat. The extra heartbeat is the ventricular premature complex.

d. Atrial premature complex (APC): Heart arrhythmia characterized by premature heartbeats originating in the atria. There is heart palpitation or unusual awareness of your heartbeats. Palpitations are heartbeats that are extra fast, extra slow, or irregularly timed.

e. Sinus bradycardia (SB): There is a slow, regular heartbeat. It happens when heart's pacemaker, the sinus node, generates heartbeats less than 60 times in a minute.

f. Sinus tachycardia (ST): Elevated sinus rhythm characterized by an increase in the rate of electrical impulses arising from the sinoatrial node. Heart rate is greater than 100 beats/min (bpm).

ECG definitions of various types of arrhythmias

1)**ECG Features of Atrial Fibrillation** • Irregularly irregular rhythm. • No P waves. • Absence of an isoelectric baseline. • Variable ventricular rate. • QRS complexes usually < 120 ms 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).

2)**ECG Features of Atrial premature complex (APC):** APCs usually have the following features: • An abnormal (non-sinus) P wave is followed by a QRS complex. • The P wave typically has a different morphology and axis to the sinus P waves. • The abnormal P wave may be hidden in the preceding T wave, producing a "peaked" or "camel hump" appearance. • APCs arising close to the AV node ("low atrial" ectopics) activate the atria retrogradely, producing an inverted P wave with a relatively short PR interval ≥ 120 ms (PR interval < 120 ms is classified as a PJC). • APCs that reach the SA node may depolarise it, causing the SA node to "reset" — this results in a longer-than-normal interval before the next sinus beat arrives ("post-extrasystolic pause"). Unlike with VPCs, this pause is not equal to double the preceding RR interval (i.e. not a "full compensatory pause"). • APCs arriving early in the cycle may be conducted aberrantly, usually with a RBBB morphology (as the right bundle branch has a longer refractory period than the left). They can be differentiated from VPCs by the presence of a preceding P wave. • Similarly, APCs arriving very early in the cycle may not be conducted to the ventricles at all. In this case, you will see an abnormal P wave that is not followed by a QRS complex ("blocked APC"). It is usually followed by a compensatory pause as the sinus node resets.

3)Electrocardiographic Features of Ventricular premature complexes VPCs have the following features: • Broad QRS complex (≥ 120 ms) with abnormal morphology. • Premature — i.e. occurs earlier than would be expected for the next sinus impulse. • Discordant ST segment and T wave changes. • Usually followed by a full compensatory pause. • Retrograde capture of the atria may or may not occur.

4)ECG features of normal sinus rhythm • Regular rhythm at a rate of 60-100 bpm (or age-appropriate rate in children) • Each QRS complex is preceded by a normal P wave • Normal P wave axis: P waves upright in leads I and II, inverted in aVR • The PR interval remains constant • QRS complexes < 100 ms wide (unless co-existent interventricular conduction delay present)

a) Sinus Tachycardia Sinus rhythm with resting heart rate (HR) > 100 bpm in adults.

b) Sinus Bradycardia Sinus rhythm with a resting heart rate of < 60 bpm in adults

Statistical Analysis

All the collected data was entered in Microsoft Excel sheet and then transferred to SPSS software ver. 17 for analysis. Qualitative data was presented as frequency and percentages and analyzed using chi-square test. Quantitative data was presented as mean and SD and compared by t-test. P-value < 0.05 was taken as level of significance.

Results

Among 63 participants enrolled in the study, it was observed that more than 70 years (44%) was the most common age group amongst study population followed by 66 to 70 years (38%) and 60 to 65 years (18%).[Table 1] Figure-2 denotes, there was male predominance (76%) amongst study population as compared to female (24%). Alcohol and tobacco chewing was observed in 32% and 36% of study population respectively.[Table -2] The most common clinical features amongst study population was Shortness of breath (72%) followed by chest pain (46 %), palpitations (37 %), seizure (12%), altered sensorium (10%), hemiparesis (10%) and hemiplegia (5%).[Table - 3] Mean age (years), Body mass in dex (BMI), Creatinine, FBS, Total Cholesterol , Triglycerides, HDL-C and LDL-C was 68 ± 5.1 years, 28.44 ± 3.6, 1.28 ± 0.9, 135.32 ± 60.8, 157.58 ± 24.0, 130.24 ± 34.7, 43.18 ± 9.2 and 89.36 ± 23.3 respectively in studied group.[Table - 4] The most common arrhythmia noted amongst study population was atrial fibrillation (37%)

followed by sinus tachycardia (ST) (14 %), sinus bradycardia (SB) (11%), supraventricular tachycardia (5%), ventricular premature complex (VPC) (3%) and atrial premature complex (APC) (3%). [Table - 5] The most common etiology amongst study population was IHD (39.7%) followed by dilated cardiomyopathy (25.4%), hyperthyroidism (19%), hypokalemia (14.3%), hypothyroidism (12.7%), COPD (9.5%), valvular heart disease (4.8%) and myocarditis (4.8%) [Table- 6] and among sinus bradycardia subjects, most common etiology was beta blocker therapy followed by raised intracranial tension(ICT) and hypothyroidism while among subjects having sinus tachycardia, the most common etiology was anemia followed by acute febrile illness, congestive cardiac failure (CCF) and hyperthyroidism.[Table- 7] Most common complications noted in study population was congestive cardiac failure (44.4%) followed by Embolic stroke (23.8%), Angina (20.6%), and Infective endocarditis (11.1%).[Table - 8] On analysing the data from different age group of patients, Chi-square test showed a p-value of 0.561 indicating that there was no significant association of age with different types of arrhythmias. [Table - 9]

Table 1: Age group amongst study population

Age group	Frequency	Percent
60 to 65 years	11	18%
66 to 70 years	24	38%
More than 70 years	28	44%
Total	N=63	100%
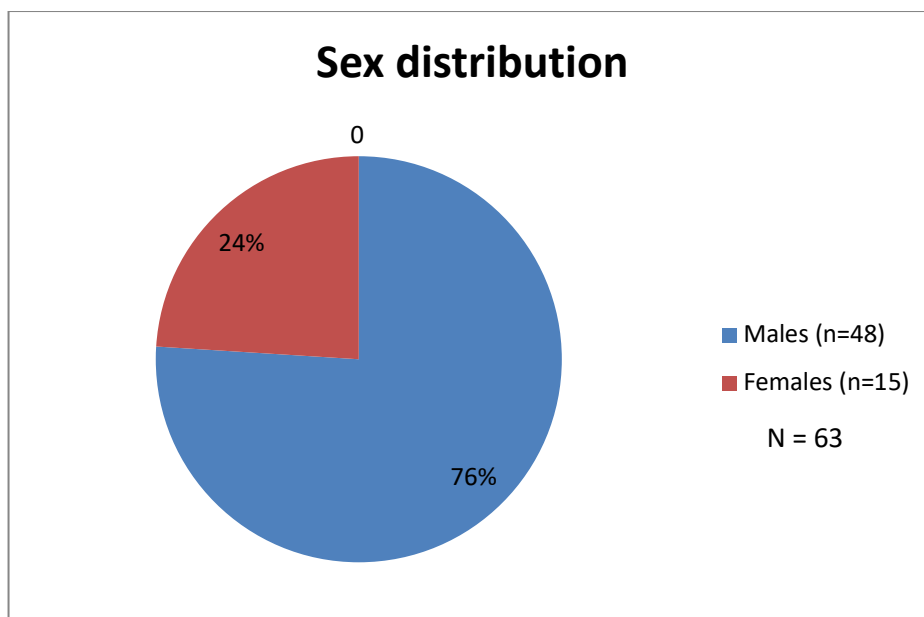
Figure 2: Sex distribution amongst study participants

Table 2: Addiction amongst study population

Addiction	Frequency	Percent
Alcohol	20	32%
Tobacco chewing	23	36%

Table 3: Clinical features amongst study population

Clinical features	Frequency	Percent
Chest pain	29	46%
Shortness of breath	45	72%
Palpitations	23	37%
Seizures	8	12%
Altered sensorium	6	10%
Hemiplegia	3	5%
Hemiparesis	6	10%

Table 4: Various parameters amongst study population

Various parameters	Mean	Std. Deviation
Age	68	5.1
BMI	28.44	3.6
Creatinine	1.28	0.9
FBS	135.32	60.8
Total cholesterol	157.58	24
Triglyceride	130.24	34.7
HDL-C	43.18	9.2
LDL-C	89.36	23.3

Table 5: Arrhythmias amongst study population

Type of Arrhythmia	Frequency	Percent
Supraventricular tachycardia	3	5%
Atrial fibrillation	23	37%
Ventricular premature complex	2	3%
Atrial premature complex	2	3%
Sinus bradycardia	7	11%
Sinus tachycardia	9	14%

Table 6: Etiology of arrhythmias

Etiology	Frequency	Percent
IHD	25	39.7%
Dilated cardiomyopathy	16	25.4%
Valvular heart disease	3	4.8%
Myocarditis	3	4.8%
Hypokalemia	9	14.3%
COPD	6	9.5%
Hyperthyroidism	12	19%
Hypothyroidism	8	12.7%

Table 7: Etiology of sinus bradycardia and tachycardia

Etiology	Frequency	Percent
Sinus bradycardia (n=7)		
• Beta blocker therapy	4	57.14%
• Raised ICT	1	14.29%
• Hypothyroidism	2	28.57%
Sinus tachycardia (n=9)		
• Anemia	4	44.45%
• Acute febrile illness	2	22.22%
• Congestive cardiac failure	1	11.11%
• Hyperthyroidism	2	22.22%

Table 8: Complications

Complications	Frequency	Percent
Congestive cardiac failure	28	44.4%
Embolic stroke	15	23.8%
Infective endocarditis	7	11.1%
Angina	13	20.6%

Table 9: Arrhythmias in different age group in study subjects

Arrhythmia	60 to 65 years	66 to 70 years	More than 70 years	Total	P- value
Supraventricular tachycardia	2	1	0	3	
Atrial fibrillation	5	7	11	23	
Ventricular premature complex	1	1	0	2	P - value = 0.561
Atrial premature complex	1	1	0	2	
Sinus bradycardia	2	6	1	7	
Sinus tachycardia	0	8	1	9	

Discussion

The global population of people ≥80 years of age is currently 137 million and is expected to triple by 2050. [8] Previous studies report, that there is a high prevalence of cardiovascular disease in this elderly age group, including arrhythmias. The prevalence of arrhythmias in individuals ≥80 years of age will likely continue to rise, presenting significant treatment challenges to clinicians and an economic burden to society. India, the world's second most densely populated country, has noticed a dramatic demographic change in the past 50 years, entailing a tripling of the population over the age of 60 years (i.e., the elderly) (Government of India, 2011). This pattern of rising elderly population is poised to continue and it is projected that the proportion of Indians aged 60 and older will rise from 7.5% in 2010 to 11.1% in 2025 (United Nations Department of Economic and Social Affairs [UNDESA], 2008). [9]

In the present study, 63 patients of age 60 years and above were included. It was found that, more than 70 years (44%) was the most common age group amongst study population followed by 66 to 70 years (38%) and 60 to 65 years (18%). According to Lip Gy, Golding DJ in their study majority of people fibrillated after the age of 50 years. [10] PT Onundarson et al showed that the prevalence of chronic AF is low in randomly selected population 32-64 years of age. [11] In the present study, there was male predominance (76%) amongst study population as compared to female (24%). On the contrary study conducted by Dharma Rao V et al., the sex ratio of female

to male is 1.22:1, Atrial fibrillation with valvular disease being more frequent among women than men[12]. According to Lok NS, Lan CP, the ratio is 1.8:1. In these studies the female predominance is there [13]. In the present study, habit like alcohol and tobacco chewing was observed in 32% and 36% of study population respectively. In the present study, the most common clinical features amongst study population was Shortness of breath (72%) followed by chest pain (46 %), palpitations (37 %), pedal edema (31%), seizure (12%) and altered sensorium (10%). Similarly in the study conducted by Dharma Rao V et al., dyspnea (83.67%), palpitations (53.06%) and chest pain (30.61%) are the most common presentations. [12] In Lok NS, Lau CP study dyspnea and palpitation were the most common symptoms. [13] We also noticed that the symptoms are of longer duration in rheumatic etiology and are of shorter duration in other causes. In the present study, the most common arrhythmia amongst study population was Atrial Fibrillation (37%) followed by Sinus tachycardia (ST) (14 %), Sinus bradycardia (SB) (11%) , Ventricular arrhythmias (7%), Supraventricular tachycardia (5%), Ventricular premature complex (VPC) (3%) and Atrial premature complex (APC) (3%) In the present study, the most common etiology amongst study population was IHD (39.7%) followed by dilated cardiomyopathy (25.4%), Hyperthyroidism (19%), hypokalemia (14.3%), Hypothyroidism (12.7%), COPD (9.5%), Valvular heart disease (4.8%) and Myocarditis (4.8%). This findings is in agreement with the study conducted by Ngai-Sang Lok et al., in IHD was the common etiology and was significantly associated with arrhythmias. [13] While in the study conducted by Dharma Rao V et al [12] , rheumatic heart disease (75.51%) is the most common cause followed by ischemic heart disease (10.20%) [12]. In the present study, the most common complications amongst study population was CCF (44.4%) followed by Embolic

stroke (23.8 %), Angina (20.6%), and Infective endocarditis (11.1%). Similarly in the study conducted by Dharma Rao V et al, congestive heart failure was the most common associated condition, nearly in 50% cases. [12] Congestive heart failure was a powerful independent predictor of the occurrence of atrial fibrillation in the Framingham study [14], in both symptomatic and asymptomatic LV dysfunction. Atrial fibrillation is diagnosed in 10% to 35% of patients with congestive heart failure during the course of the disease and is related to the clinical severity of its symptoms. Similarly in the study conducted by Dharma Rao V et al, stroke is seen in 13.33% of cases only. [12] In a study from Trieste, Italy, 34% of patients with chronic atrial fibrillation had a significantly higher rate of thrombo-embolism, suggesting that in addition to age, chronicity may be a risk factor for stroke in the lone atrial fibrillation population. In the present study, mean age (years), BMI, Creatinine, FBS, Total Cholesterol, Triglycerides, HDL-C and LDL-C was 68 ± 5.1 years, 28.44 ± 3.6, 1.28 ± 0.9, 135.32 ± 60.8, 157.58 ± 24.0, 130.24 ± 34.7, 43.18 ± 9.2 and 89.36 ± 23.3 respectively. An earlier study conducted by Raj SA et al., reported higher prevalence of 60.7% of hypercholesterolemia amongst geriatric subjects. [15] High prevalence of hypercholesterolemia (57.5%), hypertriglyceridemia (45.5%) and high LDL (66.7%) was reported by a study conducted by Agrawal A et al., among elderly population. [16] This is concordance to the present study. [17]

Conclusion

The prevalence of arrhythmias in very elderly patients is rising. Atrial fibrillation followed by sinus tachycardia, sinus bradycardia, ventricular arrhythmias, supraventricular tachycardia, ventricular premature complex were the most common arrhythmia observed in current study. The most common etiology amongst study population was IHD followed by dilated

cardiomyopathy, hyperthyroidism, hypokalemia, hypothyroidism, COPD, valvular heart disease. In patients presenting with sinus tachycardia and sinus bradycardia, most common causes were found to be anaemia and beta blocker therapy respectively. The most common complications amongst study population was CCF followed by embolic stroke, angina, and infective endocarditis. The management of arrhythmias in the very elderly is complex due to altered pharmacology, limited life expectancy, competing comorbidities, frailty, and varied treatment goals. Gaining an appreciation of the epidemiology of cardiac conduction disorders and arrhythmias in the elderly will assist the clinician in diagnosing and managing such patients.

Reference

1. Go AS, Hylek EM, Phillips KA, Chang Y, Henault LE, Selby JV, Singer DE: Prevalence of diagnosed atrial fibrillation in adults: national implications for rhythm management and stroke prevention: The Anticoagulation and Risk Factors in Atrial Fibrillation (ATRIA) Study. JAMA. 2001; 285: 2370 –2375.

2. Carson PE, Johnson GR, Dunkman WB, Fletcher RD, Farrell L, Cohn JN: The influence of atrial fibrillation on prognosis in mild to moderate heart failure: The V-HeFT Studies. The V-HeFT VA Cooperative Studies Group. Circulation. 1993; 87: VI102–VI110.

3. Dries DL, Exner DV, Gersh BJ, Domanski MJ, Waclawiw MA, and Stevenson LW: Atrial fibrillation is associated with an increased risk for mortality and heart failure progression in patients with asymptomatic and symptomatic left ventricular systolic dysfunction: A retrospective analysis of the SOLVD trials. Studies of Left Ventricular Dysfunction. J Am Coll Cardiol. 1998; 32: 695–703.

4. Maisel WH, Rawn JD, Stevenson WG: Atrial fibrillation after cardiac surgery. Ann Intern Med. 2001; 135: 1061–1073.

5. Robinson K, Frenneaux MP, Stockins B, Karatasakis G, Poloniecki JD, McKenna WJ: Atrial fibrillation in hypertrophic cardiomyopathy: A longitudinal study. J Am Coll Cardiol. 1990; 15: 1279 –1285.

6. Nitish Naik, Rakesh Yadav and Rajnish Juneja. Epidemiology of arrhythmias in India: how do we obtain reliable data? Current Science. 10 August 2009; 97(3): 411-415.

7. Lindberg T, Wimo A, Elmståhl S, Qiu C, Bohman DM, Sanmartin Berglund J. Prevalence and incidence of atrial fibrillation and other arrhythmias in the general older population: findings from the Swedish National Study on Aging and Care. Gerontology and geriatric medicine. 2019;5:2333721419859687

8. United Nations Department of Economic and Social Affairs, Population Division. World population prospects: the 2017 revision, key findings and advance tables. [Accessed March 28, 2022]; Working Paper No. ESA/P/WP/ 248. 2017 Available at: https://esa.un.org/unpd/wpp/Publications/Files/WPP2017_KeyFindings.pdf.

9. Dey S, Nambiar D, Lakshmi JK, et al. Health of the Elderly in India: Challenges of Access and Affordability. In: National Research Council (US) Panel on Policy Research and Data Needs to Meet the Challenge of Aging in Asia; Smith JP, Majmundar M, editors. Aging in Asia: Findings from New and Emerging Data Initiatives. Washington (DC): National Academies Press (US); 2012. 15.

10. Lip GY. Golding DJ – A survey of atrial fibrillation in general practice. British Jr . of general practice. 1997; 47 (418): 285 – 289.

11. Onundarson PT, Thorgeirsson G, Jonmundsson E, Sigfusson N, Hardarson TH. Chronic atrial fibrillation—epidemiologic features and 14 year

follow-up: A case control study. Eur Heart J. 1987; 8(5): 521-527.

12. Dharma Rao V. To study the prevalence and clinical profile of chronic atrial fibrillation in hospitalized patients. NUJHS 2014;4(2): 2249-7110.

13. Lok NS, Lau CP. Presentation and Management of patients admitted with atrial fibrillation. International Jr. of Cardiology.1995; 48 (3): 271 – 278.

14. Lloyd-Jones DM, Wang TJ, Leip EP, et al. Lifetime risk for development of atrial fibrillation: the Framingham Heart Study. Circulation. 2004;110:1042–6

15. Raj SA, Sivakumar K, Sujatha K. Prevalence of dyslipidemia in South Indian adults: an urban-rural comparison. Int J Community Med Public Health. 2016;3:2201-

16. Agrawal A, Varma K, Gupta R. Lipid profile and prevalence of dyslipidemia in urban women of Jaipur district, Rajasthan, India. Nutrition & Food Science. 2015;45(3):412-22.