

Frequency of Hyperthyroidism in Atrial Fibrillation

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Abstract

Introduction: Incidence of atrial fibrillation is increasing globally, and hyperthyroidism is a known precipitating factor for atrial fibrillation (AF). There are few studies that shown the frequency hyperthyroidism in patients presenting with AF, so we conducted this study. Methods and results: All patients presenting with atrial fibrillation in outpatient department of medicine and NICVD Nawabshah were included. We enrolled 96 patients with atrial fibrillation, out of these 61.5% were males and 38.5% females. Mean age of the subjects was (51.89 ±13.243) years. Mean age of females (45.81± 12.86). Most of subjects were in 41-60 years (52.1%) age group. The hyperthyroidism found in 16.7%. patients presenting with AF. We found statistically significant with presence or absence of thyroid antibodies. Conclusion: We found the hyperthyroidism common in patients presenting AF and need more multicenter studies to check the exact prevalence. All patients presenting with AF, the routine thyroid functions tests recommended.

Keywords: Atrial fibrillation, Hyperthyroidism

1. Introduction

Atrial fibrillation (AF) is most faced cardiac arrhythmia globally. ¹ The burden of AF is increasing globally. ² Global Health Data Exchange database, a comprehensive global inventory of health-related data and statistics showed that from 1997 to 2017, the global incidence rate of AF increased by 31%. ³ This increasing incidence and prevalence cause negative consequences, including reduces the quality of life. ⁴ AF may result severe and disabling symptoms and devastating diseases like stroke, heart failure, dementia, and death, ⁵ with 10%-40% of risk of hospitalization. ⁶

Atrial fibrillation (AF) is a recognized consequence of hyperthyroidism its prevalence is about 9 to 22%. ⁷ Few studies have reported the incidence of thyroid abnormalities in patients with atrial fibrillation. ⁸⁻⁹ The Canadian Registry of Atrial Fibrillation database

report the results of routine thyroid screening in 726 patients with recent-onset atrial fibrillation. ¹⁰ Reddy V and colleagues ¹¹ found in their literature review that 8.3% of patients with thyrotoxicosis diagnosed with new onset of atrial fibrillation or atrial flutter. Selmer and colleagues ¹², in their large cohort study on patients with new onset atrial fibrillation there was significant higher incidence of hyperthyroidism burden for 13 years follow up particularly in the male population. AF in thyrotoxicosis is results higher mortality and morbidity. ¹³ The risk factors for AF in hyperthyroidism almost same as general population e.g., age, male sex, ischemic heart disease, congestive heart failure and valvular heart disease. ¹⁴ Sawin et al ¹⁵ found that 15% of patients with hyperthyroidism have AF as compared to incidence of 4% in general population. ¹⁶ Agner T et al ¹⁷ found that AF in in hyperthyroidism was more in patients over the age of 60 (25%) as compared to patients younger than 60 years (5%)

In Pakistan only few studies are conducted that determined the frequency of hyperthyroidism in patients presenting with AF. So, this study is formulated to determine the frequency of hyperthyroidism in AF patients presenting at medical department of tertiary care hospital in Sindh Pakistan.

2. Materials and Methods

The study was conducted at Outpatient Department of Medicine and National Institute of cardiovascular diseases (NICVD) at Peoples University of Medical and Health Sciences (PUMHSW), Nawabshah Shaheed Benazirabad. Approval was obtained from ethical Review Board of PUMHSW Nawabshah, Shaheed Benazirabad. Study was performed from August 2020 to July 2022. All the patients with proven AF on ECG findings presenting in OPDs of medical and NICVD Nawabshah and aged 18 to 80 years of either gender were enrolled in the research after obtaining a formal written and informed consent. Patients having other risk factors for AF including ischemic heart diseases, valvular heart disease chronic obstructive pulmonary disease, using drugs affecting thyroid profile, having history of thyroidectomy, radioactive iodine ablation of thyroid or antithyroid drugs & having history of head trauma or head surgery or recent cardiothoracic surgery, atrial fibrillation or flutter as a result of left or right heart catheterization or pacemaker insertion and inability to give informed consent were excluded.

Confounders were controlled by meticulously following the inclusion and exclusion criteria.

After all aseptic measures, 5 ml blood was drawn from left cubital vein with low sucking pressure and

were deposited to diagnostic and research laboratory PUMHSW at Nawabshah for thyroid function tests. Serum Thyroid Stimulating Hormone (TSH), Thyroxine (T4) and Triiodothyronine (T3) levels were noted. Patients with TSH less than 0.27 ug/dl and T4 more than 14.1 ug/dl were diagnosed as hyperthyroidism. Data were collected by the researchers himself and were noted on a specially designed proforma and presented in the form of tables and diagrams. Data were analyzed with IBM SPSS version 27. Categorical variables like gender and presence or absence of hyperthyroidism were presented as frequencies and percentages. Data outcome variable was stratified by age, gender and Chi-square test was used with 5% level of significance.

3. Results

We examined total of 96 patients with atrial fibrillation, out of these 61.5% were males and 38.5% females. Mean age of the subjects was (51.89 ±13.243) years. Mean age of females (45.81± 12.86) was slightly lower than males (55.69 ±12.09) years, that was not found significant (p 0.70). Most of subjects were in 41-60 years (52.1%) age group followed by more than 60 years age (Table 01). Out of 96 diagnosed as Atrial fibrillation the hyperthyroidism found in 16.7%. the mean TSH was 0.28 ± 0.63 uIU/ml. The mean value T3 was 5.03± 0.86 nmol/L. Mean value of T4 was 14.90± 2.57 ug/dl. (Table 02) In our study, 9 (9.1%) patients had hyperthyroidism, out of these 5 (5.2%) had shown positive Stratification results of hyperthyroidism with gender and age scale showed non-significant results but it was found statistically significant with presence or absence of thyroid antibodies. (Table 01)

Table 1: Association of hyperthyroidism with age scale and gender (116)

Factor	Construct	Hyperthyroidism		total	P-value
		Yes	No		
Gender	Male	5 (5.2%)	54 (56.3%)	59 (61.5%)	0.70
	Female	4 (4.2%)	33 (34.4%)	37 (38.5%)	
Age (years)	20-40	0(0%)	15 (15.6%)	15 (15.6%)	0.052
	41-60	3 (3.1%)	47 (49%)	50 (52.1%)	
	>60	6 (6.3%)	25 (26%)	31 (32.3%)	
Antibodies	Present	05 (5.2%)	0 (0%)	5 (5.2%)	<.001
	Absent	04 (4.2%)	1 (01%)	5 (5.2%)	
	Not Done	0(0%)	87 (90%)	87 (89.6)	

Table 2: Laboratory Parameters (116)

Parameters	Minimum	Maximum	Mean	Std. deviation
TSH (uIU/ml)	0.001	2.10	5.03	.86
T3 (nmol/L)	3.99	7.01	5.0975	0.858
T4 (ug/dl)	12.01	20.00	14.90	2.57

4. Discussion

New-onset AF is a usually common presentation during hospital admission.¹⁸ and there was no protocol for routine thyroid screening for hyperthyroidism because of past evidence showed

no link between these.^{7,19}

There are direct and indirect effects of thyroid hormones on cardiovascular system, through genomic and nongenomic mechanisms. These hormones especially T3 binds to nuclear receptor and affects the transcription of various genes, and

these genes have important roles in cardiovascular function. The cell membrane transport of calcium and other ions is mostly function of nongenomic effects. In addition, T3 also has heart indirectly via effects on the peripheral circulation. All these effects the hearts hemodynamics, cardiac filling, and myocardial contractility.²⁰⁻²³

The mean age of subjects in our study was 51.89 + 13.24 and males were 59(61.5%) and female were 37 (38.5%). The common age in our study was 41-60 years (52.1%) followed by more than 60 years age (32.3%), almost same findings were observed by Arshad et al⁸ observed 42.6%) subjects in 41-60 years age group and 38.3% patients were in >61 years age group. Another study in Peshawar by Ullah S et al⁹ also observed same findings. Selmer and colleagues¹² in nationwide cohort study in Denmark found significantly higher incidence of hyperthyroidism in males and common age group was between the ages of 51–60. Another study also found male predominance.¹⁴ This male predominance exists in AF as other cardiovascular diseases. This higher incidences in males also demonstrated in population studies.²⁴

We in our study the 9.4 % of subjects diagnosed as hyperthyroidism in those who were presenting with AF. There are limited data nationally and internationally about the frequency/incidence of Hyperthyroidism in patients presenting AF with variable percentage. "Though Hyperthyroidism is a well-known cause of atrial fibrillation"¹¹ The Arshad et al⁸ in their study showed 42.6% patients had hyperthyroidism, this is very high frequency may be due to smaller population, on the other hand study by Ullah et al⁹ found only 7.82% patients with hyperthyroidism presenting with AF. The study by Selmer et al¹² observed their cohort study that one in twenty-five patients admitted with AF developed hyperthyroidism over of thirteen years follow-up, that only 3% subjects as compared to individuals in general population (1%).

Risk of hyperthyroidism will be doubled with especially increased risk of up to 3-fold in middle-aged males as compared to general population¹² and new-onset AF established as a risk factor for hyperthyroidism in this study.

"The Canadian Registry of Atrial Fibrillation¹⁰ did not show an increased risk of hyperthyroidism following recent onset AF (<3 months) in a cohort of 707 patient with a follow-up time of 1.7 years"⁷ this cross-sectional study didn't follow these subjects as did by Selmer et al.¹² Most importantly the overall risk of hyperthyroidism in the euthyroid was higher ~80% in new-onset AF cohort it was 3-fold higher for the male population as compared to female population (~30%).⁷ It means all the patients with normal thyroid function tests should be observed closely with regular follow-up and more cohort studies are needed to fill this gap in our population.

We performed thyroid autoantibodies in subject who were diagnosed as hyperthyroidism and 5.2% were positive for autoantibodies no other studies as

described above did these tests. Studies validated that these autoantibodies often found in hyperthyroidism caused by Graves' disease, and these can trigger the AF.²⁵ Moreover, the Selmer his colleagues¹² also concluded that these β 1-adrenergic and M2-muscarinic receptor autoantibodies may trigger AF before abnormal thyroid function tests. It means patients with AF having no other risk factors these patients may be advised by thyroid antibodies and those having positive these subjects should be closely followed for development of new onset AF. Heeringa et al²⁶ hypothesized the threefold chance of atrial fibrillation hyperthyroid patients. the binding of active T3 (triiodothyronine) with T3 nuclear receptors in serum results in specific cardiac gene expression that leads reduction in vagal tone, and this may result in increased risk for cardiac arrhythmias. The T3 also causes peripheral vasodilation, that leads to enhance preload alteration of contraction of heart that ultimately may leads to AF. Additionally, the TSH is found as independent risk factor of atrial fibrillation in elderly patients (>60years) despite of normal free thyroxine levels.²⁷

5. Conclusion

This with limited data study showed that hyperthyroidism is common in patients presenting AF, so the routine thyroid functions tests recommended in every patient presenting with recent acute atrial fibrillation, and more multicenter cohort studies are needed to check actual prevalence of hyperthyroidism in AF patients.

6. Limitations

This is the first research in our tertiary hospital to identify the frequency of hyperthyroidism in patients presenting AF. All subjects were from a single institution and the sample size was limited and less heterogeneous. Second, hyperthyroid in AF could not be assessed in follow up because the study was cross-sectional.

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