

FREQUENCY OF HYPERTHYROIDISM IN PATIENTS PRESENTING WITH ATRIAL FIBRILLATION

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ABSTRACT

Background: Hyperthyroidism is a recognized secondary cause of atrial fibrillation (AF) and contributes to increased morbidity. Early identification is essential for timely management. **Objective:** To determine the frequency of hyperthyroidism in patients presenting with atrial fibrillation and its associated factors. **Study Design:** Cross-sectional study. **Setting:** Department of Cardiology, Khyber Teaching Hospital, Peshawar, Pakistan. **Duration of Study:** From 07-February-2025 to 07-June-2025. **Methods:** A total of 260 patients with ECG-confirmed AF were enrolled. Diagnosis of hyperthyroidism was based on clinical features (weight loss, palpitations, tremors) and laboratory analysis (serum TSH <0.5 mIU/L with either free T3 >450 pg/dL or free T4 >1.8 ng/dL). Data on demographics, BMI, and comorbidities were collected. Statistical analysis was performed using SPSS; p-values <0.05 were considered significant. **Results:** The mean age was 51.05 ± 12.38 years, with 135 males (51.9%) and 125 females (48.1%). Hyperthyroidism was identified in 22 patients (8.5%). Female gender (p = 0.04) and presence of comorbidities (p = 0.003) were significantly associated with hyperthyroidism, while age and BMI showed no significant association. **Conclusion:** Hyperthyroidism was present in 8.5% of patients with AF, showing a significant association with female gender and comorbid conditions. Routine thyroid function screening is recommended in AF patients, particularly in females and those with comorbidities.

Keywords: Atrial Fibrillation, Hyperthyroidism, Thyroid-Stimulating Hormone, Comorbidity

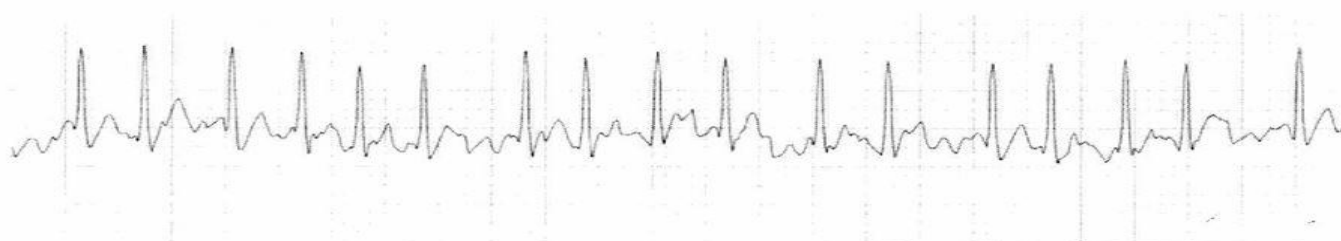
INTRODUCTION

Atrial fibrillation (AF) is due to irregular electrical activity in the heart atria, which results in fibrillation. This condition is known as tachyarrhythmia, suggesting that heart rate can become elevated (1, 2). The heart's irregular rhythm leads to turbulence in the blood flow, raising the possibility of thrombus formation, which may dislodge and result in a stroke (3, 4). AF is the primary cardiac factor contributing to stroke prevalence. The risk factors related to AF encompass advanced age, pre-existing heart and lung conditions, as well as heightened alcohol intake. Symptoms may vary from being asymptomatic to manifesting with various issues, including chest pain, rapid heart rate, shortness of breath, excessive sweating, and general fatigue. AF, whereas potentially a permanent condition, has multiple therapies as well as risk modification strategies accessible to help mitigate the risk of stroke for those who continue to experience this arrhythmia. The options for treatment consist of anticoagulation therapy, rhythm control medications, and various interventional cardiac techniques (5-7). The estimated worldwide incidence of hyperthyroidism within iodine-sufficient countries is 2.5% (8). The probability of overt hyperthyroidism, characterized by low levels of thyroid-stimulating hormone [TSH] in addition to raised triiodothyronine [T3] as well as free thyroxine [T4], has been calculated to be around 1.4%. The incidence of subclinical hyperthyroidism, which includes low TSH levels in addition to peripheral thyroid hormone levels, has been estimated to be around

1.4% (8, 9). Thyrotoxicosis encompasses all conditions that involve an elevated level of thyroid hormones, regardless of the underlying processes involved. Untreated thyroid disorders may lead to congestive heart failure, cardiac arrhythmias, undesirable obstetric outcomes, and metabolic disturbances (10-12). The rationale of our study is to determine the frequency of hyperthyroidism in atrial fibrillation patients in our country. It will add meaningful knowledge to the literature. Moreover, the results will be useful for practitioners, as they will benefit from the locally produced findings.

METHODOLOGY

This cross-sectional study was conducted in the Department of Cardiology at Khyber Teaching Hospital, Peshawar, from February 7, 2025, to June 7, 2025, after obtaining ethical approval from the hospital. The sample size was calculated for 260 patients, using an anticipated proportion of hyperthyroidism in atrial fibrillation patients of 6.5% (13), a margin of error of 3%, and a 95% confidence level. Participants were selected via non-probability consecutive sampling. The study included patients aged between 30 and 70 years of both genders who had been diagnosed with atrial fibrillation. Atrial fibrillation was confirmed through clinical examination, revealing an irregular radial pulse and an electrocardiogram (ECG) showing the absence of P waves with irregularly irregular QRS complexes, as verified by a consultant cardiologist using the following:



Patients with a prior history of thyroidectomy, those taking beta-blockers, patients with valvular heart disease identified on trans-thoracic echocardiography, patients diagnosed with chronic obstructive pulmonary disease, those taking medications known to affect thyroid function profiles, those who had undergone radioactive iodine ablation of the thyroid, and those with a history of head trauma or head surgery were not included in the study. All patients provided their consent to participate in the study. A structured proforma was used to record baseline demographic and clinical data.

To assess thyroid function, a 5-cc venous blood sample was drawn from the major vein in the antecubital fossa of the participant's non-dominant arm. Each sample was transported to the hospital laboratory within thirty minutes of collection to ensure sample integrity. The biochemical analysis was performed using the Chemiluminescent Immunoassay (CLIA) method on a Roche Cobas e6000 analyzer. All laboratory analyses were conducted by a senior biochemist with over 10 years of experience in the field of biochemistry. Hyperthyroidism was diagnosed if the presence of any three clinical signs or symptoms such as weight loss, palpitations, tremors, anxiety, heat intolerance, sweating, changes in bowel habits or fatigue were observed, along with biochemical evidence of a serum Thyroid Stimulating Hormone (TSH) level below 0.5 mIU/L and either an elevated Triiodothyronine (free T3) level greater than 450 pg/dL or an elevated Thyroxine (free T4) level greater than 1.8 ng/dL. A consultant endocrinologist confirmed the final interpretation of the thyroid function tests.

Data analysis was performed with IBM SPSS version 25. Age, height, weight, BMI, and thyroid hormone levels were assessed using mean \pm standard deviation. Gender, residence, education, profession, socioeconomic status, comorbidities, and the presence of hyperthyroidism were evaluated using frequencies and percentages. Age, gender, BMI, and comorbidities were stratified with hyperthyroidism using the Chi-square test. A p-value ≤ 0.05 was considered statistically notable.

RESULTS

The mean age of our cohort was 51.05 ± 12.38 years. Their average Body Mass Index (BMI) was 25.40 ± 1.55 kg/m². Regarding thyroid functions, the mean Free T3 level was 404.76 ± 22.52 pg/dL, the mean

Free T4 level was 1.46 ± 0.26 ng/dL, and the mean Serum TSH level was 0.75 ± 0.16 mIU/L.

There were 135 males (51.9%) and 125 females (48.1%) in our cohort. In terms of comorbidities, 161 (61.9%) cases had no reported comorbidities. However, hypertension was present in 58 (22.3%) cases, and diabetes was found in 41 (15.8%) cases (Table 1).

Hyperthyroidism was observed in 22 (8.5%) cases of our cohort, while 238 (91.5%) cases did not have the condition (Table 2).

A significant association was found with gender, as hyperthyroidism was more frequently observed in females (15, 68.2%) than in males (7, 31.8%) ($p = 0.04$). No significant association was observed between age ($p = 0.18$) and BMI ($p = 0.37$). The presence of comorbidities showed a substantial association with hyperthyroidism ($p=0.003$). Around 11 (50.0%) hyperthyroid patients had hypertension, and 4 (18.2%) had diabetes (Table 3).

Table 1: Demographics and comorbidities

Demographics and comorbidities		Frequency	%
Gender	Male	135	51.9%
	Female	125	48.1%
Education status	Literate	127	48.8%
	Illiterate	133	51.2%
Profession status	Employed	127	48.8%
	Unemployed	133	51.2%
Residence	Urban	114	43.8%
	Rural	146	56.2%
Socioeconomic status	Lower class	62	23.8%
	Middle class	147	56.5%
	Upper class	51	19.6%
Comorbidities	Diabetes	41	15.8%
	Hypertension	58	22.3%
	None	161	61.9%

Table 2: Frequency of hyperthyroidism

Hyperthyroidism	Frequency	Percentage
Yes	22	8.5%
No	238	91.5%

Table 3: Stratification of hyperthyroidism with demographics and comorbidities

Demographics and comorbidities		Hyperthyroidism				P value
		Yes		No		
		Frequency	Percentage	Frequency	Percentage	
Age groups (Years)	30 to 45	6	27.3%	89	37.4%	0.18
	46 to 60	6	27.3%	85	35.7%	
	> 60	10	45.5%	64	26.9%	
Gender	Male	7	31.8%	128	53.8%	0.04
	Female	15	68.2%	110	46.2%	
BMI (kg/m²)	18.5 to 24.9	7	31.8%	99	41.6%	0.37
	> 24.9	15	68.2%	139	58.4%	
Comorbidities	Diabetes	4	18.2%	37	15.5%	0.003
	Hypertension	11	50.0%	47	19.7%	
	None	7	31.8%	154	64.7%	

DISCUSSION

The findings of the present study, which identified hyperthyroidism in 8.5% of 260 patients with atrial fibrillation, contribute valuable insights. A similar prevalence has been reported by Heeringa et al. in their study, as they reported around 6.5% patients having hyperthyroidism presenting with AF (13). This prevalence is notably higher than the 3.6% reported by Bakarmom et al (14). Our findings are similar to 7.82% reported by the Pakistani study by Ullah et al (15). A higher 29.4% prevalence of hyperthyroid patients in Pakistan

was reported by Hussain et al (16). This variability highlights that the relationship between hyperthyroidism and atrial fibrillation (AF) is not fixed but is significantly influenced by regional factors, including iodine deficiency, genetic predispositions, access to healthcare, and the specific clinical setting in which patients are recruited. A particularly strong and consistent finding across studies and our study is the gender distribution of hyperthyroidism. Our analysis revealed a significant association ($p = 0.04$) with 68.2% of hyperthyroidism cases observed in females. A Saudi study reported that 58% of the AF-hyperthyroidism cohort was female (14). This also aligns with the

results from Ethiopia, where female sex was a powerful independent predictor of AF in hyperthyroid patients (17). However, it is crucial to note that the underlying cohort in our study had a nearly equal gender distribution (51.9% male and 48.1% female), making the over-representation of women in the hyperthyroid subgroup even more noticeable. The influence of age was also evident in our results. The mean age of our cohort was 51.05 ± 12.38 years, and we observed a trend where hyperthyroidism was most prevalent (45.5%) in patients aged 60 years or older. This finding aligns with different studies. Bakarmom et al. reported a mean age of 62 years for patients with both conditions, with 95% of cases occurring in those over 41 years old (14). Tefera et al. identified an age greater than 61 years as a significant risk factor for AF, and the Swedish study, which focused on new-onset AF, also had a considerably older median age of 73.1 years (18).

Regarding metabolic factors, the mean BMI of our cohort was 25.40 ± 1.55 kg/m², classifying it within the overweight range. We found no significant association ($p=0.37$) between BMI category and hyperthyroidism. However, the high prevalence of comorbidities in hyperthyroid patients was a striking and statistically significant ($p=0.003$) finding. Half of our hyperthyroid patients had hypertension compared to only 19.7% of non-hyperthyroid AF patients. This suggests a potential relationship where the hyperadrenergic state induced by hyperthyroidism worsens underlying hypertensive tendencies. This aligns with the broader understanding that hypertension is a major risk factor for AF itself and its presence likely compounds the cardiovascular strain caused by thyrotoxicosis.

Our finding of an 8.5% prevalence of hyperthyroidism in AF patients suggests routine thyroid function screening in this population, particularly in women and older adults. The significant comorbidity with hypertension indicates that management of AF in hyperthyroid patients should include blood pressure control. Future research should focus on longitudinal studies within specific regions to determine the impact of treating subclinical and overt hyperthyroidism on the long-term burden and recurrence of atrial fibrillation.

CONCLUSION

In conclusion, the frequency of hyperthyroidism found in our study in patients with atrial fibrillation was 8.5%. We noted a significant association of female gender and comorbidities with thyroid dysfunction.

DECLARATIONS

Data Availability Statement

All data generated or analysed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by the department Concerned. (IRB-648/DME/KMC)

Consent for publication

Approved

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Not applicable

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

AUTHOR CONTRIBUTION

IMADULLAH KHAN (Postgraduate Resident)

Data Collection, Data Analysis, Review of Literature.

Study Design, Review of manuscript, and Manuscript drafting.

AMBER ASHRAF (Professor).

Conception of Study, Critical Guidance, and Final approval of manuscript.

QINNAT ULLAH

Literature Search, and Critical Guidance

NAZIA SULTAN

Literature Search, and Critical Guidance

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