

## Cardiovascular Manifestation of Hyperthyroid Disorder in Bangladesh

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Received: March 2021  
Accepted: April 2021

### Abstract

**Background:** Thyroid hormone directly affects the heart and peripheral vascular system. In hyperthyroidism, cardiovascular manifestations are most profound. The cardiovascular symptoms and signs of thyroid disease are some of the most intense and clinically significant to hyperthyroidism. Hyperthyroidism causes and may present with atrial fibrillation. However, there are limited study was found in our country to identify the cardiovascular manifestation of thyroid disorder. Aim of the study: The aim of the study was to identify the clinical manifestations of hyperthyroidism from a cardiovascular point of view. **Methods:** This was a descriptive cross-sectional study, conducted in the Department of Medicine, Sir Salmullah Medical College & Mitford hospital from November 2018 to July 2019. A total of 30 hyperthyroid patients were selected for the study. Statistical data were analyzed by the SPSS-20 version. **Results:** The age of the patients ranged from 16-65 years and the mean age was 38.16±6.56 years. In hyperthyroid cases, the male-female ratio was 1:2.75. The commonest general symptom was found thyroid swelling 93.33%, tremors 90%, weight loss 86.67%, easy fatigability 50%, and heat intolerance 45.33%. The commonest cardiovascular symptom was found palpitation at 86.67%, dyspnoea at 60%, and chest pain 13.3%. Clinical examination of the cardiovascular system revealed tachycardia 90%, wide pulse pressure 73.33%, 36.66% of patients had systolic hypertension, and features of heart failure were found in 10% of patients. The commonest ECG finding was found sinus tachycardia 90%, left ventricular hypertrophy 13.3%, nonspecific ST-T changes 10%, and atrial fibrillation 10%. The commonest abnormal echocardiography findings were chamber enlargement, 3.33% had mitral valve prolapse, and 3.33% had mitral regurgitation. **Conclusion:** This study found that cardiovascular manifestations in hyperthyroidism are quite common and varied which should be observed in management. Females were more commonly affected than males. Since the patients with thyroid disease usually present with cardiovascular manifestation and cardiovascular manifestation may be the only manifestation of thyroid disorder so it can be recommended that all patients with a thyroid disorder should be searched for cardiovascular manifestation and a thyroid function test should be done in all patients with unexplained cardiovascular disease.

**Keywords:** Cardiovascular, Patients, Hyperthyroid, Thyroid, Study, Hyperthyroidism, Found, Manifestation, Cases, Disease.



## INTRODUCTION

Thyroid hormone is very important for normal cardiovascular function, lack of thyroid hormone, neither the heart nor the blood vessels normally functioning.<sup>[1]</sup> Both in its contraction and in its relaxation in hypothyroidism, the heart muscle becomes weak.<sup>[2]</sup> It means that the amount of blood it ejects with each heartbeat is reduced if the heart cannot pump as vigorously as it should.<sup>[3]</sup> Current estimates suggest that it affects as many as 9% to 15% of the adult female population and a smaller percentage of adult males.<sup>[4]</sup> The prime hemodynamic change in hyperthyroidism is an increase in cardiac output, more so than is actually required to accommodate the rise in oxygen consumption.<sup>[5]</sup> By afterload resulting from the drive of thyroid hormones on the myocardial cell itself, the reason for the increased flow is obscure, but it is pertinent that the heart has excessive work to perform arising from both increased preload caused by augmented peripheral flow. The opposite prevails in hypothyroidism where low cardiac output is also sufficient for the body's depressed metabolic needs. In hyperthyroidism, sinus tachycardia, ventricular ectopic beats, paroxysmal, and then persistent atrial fibrillation, are common. There may be a specific predisposition to changes in atrial rhythm in thyroid disease. Five percent of all clinically thyroid patients with paroxysmal or permanent atrial arrhythmias were found to have underlying hyperthyroidism, as

disclosed by routine laboratory screening procedures.<sup>[6]</sup> Wan et al. (1972) have described a high incidence of thyroid disorder in patients with the sinoatrial disease.<sup>[6]</sup> Instances of prolongation of the PR interval have been described by Hoffman and Lowrey, 1960 and the Wolff-Parkinson-White syndrome has been reported in thyrotoxicosis, with reversion to normal conduction after-treatment of the thyroid.<sup>[7]</sup> Transitory and frequently florid inversion of T waves is commonly present in severe hyperthyroidism in younger patients and in the more acutely ill patient.<sup>[8]</sup> By the high output circulatory state, most of the physical signs in hyperthyroidism other than those resulting from arrhythmias can be explained. If there is a snapping first heart sound, apical third sound, or a basal systolic bruit classically scratchy in character, biventricular cardiac enlargement may be present. An apical early peaking systolic murmur is occasionally audible during the phase of powerful isovolumic contraction.<sup>[9]</sup> Signs may be minimal despite the increased cardiac output and the accent is more on chronic rhythm disturbance that is atrial fibrillation in the older patients. Today Cardiac failure is unusual due to earlier diagnosis and an increased index of suspicion in unexplained cardiac disease may be insidious in onset and high-output congestive in type. And is almost invariably accompanied by rapid atrial fibrillation. It is in these cases particularly that an underlying cardiac muscle problem must be sought, but



both modern hemodynamic data and endomyocardial biopsy material are lacking in this form of thyrocardiac disease. Non-invasive techniques such as the estimation of systolic time intervals and left ventricular ejection times to appear promising in the assessment of myocardial performance in thyroid disease.<sup>[10]</sup> In hypothyroidism, bradycardia with low voltage T waves in the electrocardiogram is common but occasionally the rate may be normal. And instances of arrhythmias that resolve, somewhat paradoxically by treatment with thyroxine.<sup>[11]</sup> Thyroid heart disease including paroxysmal rapid arrhythmias also occur in patients with autoimmune thyroid disease.<sup>[12]</sup> Cardiac enlargements is usually the result of increased diastolic filling from bradycardia and infrequently caused by a large pericardial effusion. Minor degrees of effusion are common but are only detectable by echocardiography.<sup>[13]</sup> Graettingeret al. (1958)<sup>13</sup> found no hemodynamic evidence of cardiac failure in this condition and this accords with the rarity of failure and the generally complete resolution of physical signs on adequate treatment with thyroxine. Significant clinical variation exists, in which thyroid hormones affect the heart and circulation. Generally, the non-cardiac element of the endocrine disorder will overshadow symptoms and signs, and little notice is taken of the cardiovascular status, which will return to normal once treatment of the thyroid condition is affected. An absolute different situation was extant in the

older patients who show evidence of thyroid disease through the underlying metabolic disturbance. Thyroid disease is the precipitating cause of arrhythmias, cardiac failure, and even angina pectoris may go unrecognized for many years before hyperthyroidism is diagnosed.<sup>[14]</sup> Proper treatments clearly indicate of hitherto idiopathic nature of endocrine basis cardiac condition. It is claimed that recognition of subclinical hypothyroidism and treatment with thyroxine of this form may prevent progression to atherosclerotic disease.<sup>[15]</sup> An indication that cardiomyopathy may be allied to the thyroid is suggested from the work of Resnekov and Falicov (1977),<sup>[16]</sup> who described patients with hyperthyroidism and lactate-producing angina pectoris but with normal coronary vessels as assessed by cine angiography. We addressed the clinical manifestation of hyperthyroidism disease from a cardiovascular perspective and the thyroid function tests that are most appropriate to confirm the suspected diagnosis, in the present study.

## **MATERIALS AND METHODS**

It was a descriptive cross-sectional study. The study was done in the Department of Medicine, Sir Salmullah Medical College & Mitford hospital from November 2018 to July 2019. A total of 30 hyperthyroid patients were selected for the study. A total of 30 patients was selected as the study population in this study. Informed written consent was taken from the participants after a full explanation

regarding the study. An ethical clearance certificate was taken from the concerned authorities of the institute. Patients with hypothyroidism were separated from the patients who attended the general medicine OPD and were then undergo a thyroid function test. The patient group comprised 30 individuals who were proven hypothyroid biochemically and with clinical symptoms. All the results were statistically analyzed by were taken by SPSS-20 version and MS-Excel-16.

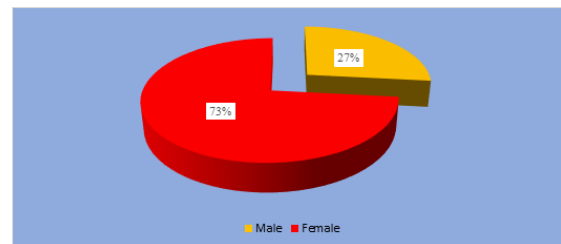
## RESULTS

A total of 30 patients with thyroid disorder coming into the outpatient department of Medicine of Sir Salimullah Medical College & Mitford Hospital, Dhaka, were included in this study. Most cases fell in the age group of 36-45 yrs. The mean age was 35 yrs. There was a female preponderance over all age groups with a mean age of 34.6 yrs. [Table1]. The female was 73.33% of the total but only 26.67% found male [Figure1]. The commonest general symptom of hyperthyroid cases in the present study was found to be thyroid swelling 93.33%, followed by tremors 90%, weight loss 86.67%, easy fatigability 50%, and heat intolerance 45.33% [Table2]. The commonest cardiovascular symptom of hyperthyroid cases in the present study was found to be palpitation 86.67% followed by dyspnoea 60% chest pain 13.3% [Table3]. Clinical examination of the cardiovascular system of hyperthyroid cases revealed tachycardia 90% wide pulse pressure in

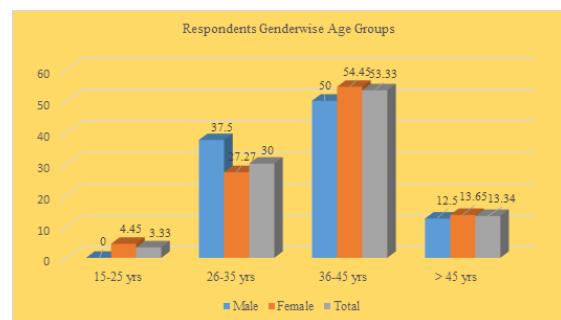
73.33% patients, 36.66% patient had systolic hypertension, features of heart failure was found in 10% patients [Table4]. About 13.33% of the patients of hyperthyroid patient patients had cardiomegaly [Table5].

**Table 1: Age distribution of hyperthyroid cases (N=30)**

Age (years)	Male (n=8)		Female (n=22)		Total (N=30)	
	n	%	n	%	n	%
15-25	0	0.0	1	4.45	1	3.33
26-35	3	37.5	6	27.45	9	30.0
36-45	4	50.0	12	54.45	16	53.33
>45	1	12.5	3	13.65	4	13.34
Base	8	100.0	22	100.0	30	100.0



**Figure 1: Gender wise distribution of hyperthyroid cases (N=30)**



**Figure 2: Gender wise age group distribution of hyperthyroid cases (N=30)**

**Table 2: Distribution of general symptoms of hyperthyroid cases (n=30)**

Symptoms	Male (n=8)	Female(n=22)	Total (N=30)
Heat intolerance	3(37.5)	10(45.45)	13(45.33)
Weight loss	7(87.5)	19(86.36)	26(86.67)
Goitre	7(87.5)	21(95.45)	28(93.33)
Tremor	7(87.5)	20(90.0)	27(90.0)
Easy fatigability	4(50.0)	11(50.0)	15(50.0)

**Table 3: Distribution of cardiovascular symptoms of hyperthyroid cases (N=30)**

Symptoms	Male (n=8)	Female(n=22)	Total (N=30)
Palpitation	7(87.5)	19(86.36)	26(86.67)
Dyspnoea	5(62.5)	13(59.09)	18(60.0)
Chest pain	1(12.5)	20(90.90)	27(90.0)
Easy fatigability	4(50.0)	3(13.6)	4(13.3)

The commonest ECG finding of hyperthyroid patients in the present study was found to be Sinus tachycardia (90%), followed by left ventricular hypertrophy 13.3%, nonspecific ST-T changes 10%, and atrial fibrillation 10% [Table6]. From

echocardiography findings 10% of the patients had chamber enlargement, 3.33% had mitral valve prolapse, and 3.33% had mitral regurgitation [Table7]. The most common causes of hyperthyroidism were multinodular goiter 14 patients 46.67%, followed by Graves' disease 10 patients 33.33%, and thyroid adenoma 3 patients 10%, Post part urn thyroiditis 1 patient 3.33%, Subacute thyroiditis 2 patients 6.67% [Table8].

**Table 4: Distribution of cardiovascular signs of hyperthyroid cases (N=30)**

Signs	Male (n=8)	Female (n=22)	Total (N=30)
Tachycardia	6(75.0)	21(95.45)	27(90.0)
Systolic Hypertension	3(37.5)	8(36.36)	11(36.66)
Wide pulse pressure	6(75.0)	16(72.72)	22(73.33)
Features of Heart failure	1(12.5)	2(9.09)	3(10.0)

**Table 5: Distribution of x-ray findings of hyperthyroid cases (N=30)**

Chest X-ray findings	Male (n=8)	Female (n=22)	Total (N=30)
Normal	7(87.5)	19(86.36)	26(86.66)
Cardiomegaly	1(12.5)	3(13.63)	4(13.33)

**Table 6: Distribution of ECG findings of hyperthyroid cases (N=30)**

ECG findings	Male (n=8)	Female (n=22)	Total (N=30)
Sinus tachycardia	6(75.0)	21(95.45)	27(90.0)

Ventricular tachycardia	0(0.0)	0(0.0)	0(0.0)
Ventricular fibrillation	0(0.0)	0(0.0)	0(0.0)
Atrial fibrillation	1(12.5)	2(9.09)	3(13.6)
Left ventricular hypertrophy	1(12.5)	3(13.6)	4(13.3)
Nonspecific ST-T changes	1(12.5)	2(9.09)	3(13.6)

**Table 7: Distribution of Echocardiography findings of hyperthyroid cases (N=30)**

Echocardiography findings	Male (n=8)	Female (n=22)	Total (N=30)
Chamber enlargement	1(12.5)	2(9.09)	3(10.0)
Mitral valve prolapse	0(0.0)	1(12.5)	1(12.5)
Mitral regurgitations	0(0.0)	1(12.5)	1(12.5)

**Table 8: Distribution of causes of hyperthyroidism (N=30)**

Causes of hyperthyroidism	n	%
Graves' disease	10	33.33
Toxic multinodular goiter	14	46.67
Toxic adenoma	3	10.0
Post partum thyroiditis	1	3.33
Sub-acute thyroiditis	2	6.67
Base	30	100.0

## DISCUSSION

The heart is among the most responsive organ in thyroid disease, and cardiovascular symptoms and signs are therefore important clinical features of

thyroid disorder.<sup>[17]</sup> Involvement of cardiovascular system in hyperthyroid patients still provides some of the most common and conspicuous clues for diagnosis: palpitation, chest pain, tachycardia, and systolic hypertension.<sup>[18]</sup> In contrast to the dramatic clinical symptoms and signs of hyperthyroidism, the cardiovascular findings of hypothyroidism are more subtle. The age of the patients with hyperthyroidism was ranged from 16-65 years. The mean age was  $38.16 \pm 6.56$  years, the highest number of patients were in the 36-45 years' group. The mean age in the Zargar et al,<sup>[19]</sup> was  $39.98 \pm 14.4$  years. Vijaya,<sup>[20]</sup> in India found the mean age of  $32.52 \pm 8.36$  years. A study conducted in the National Institute of cardiovascular disease (NICVD), Dhaka by Ahsan,<sup>[21]</sup> found the mean age of  $37.21 \pm 11.65$  years. In some other studies, the peak incidence of disease was in the third and fourth decade which was almost similar to our population.<sup>[22,23]</sup> This is the present study the commonest general symptom of hyperthyroid cases was found to be thyroid swelling 93.33%, followed by tremors 90%, weight loss 86.67%, easy fatigability 50%, heat intolerance 45.33%. the finding was in accordance with the Colorado study.<sup>[24]</sup> The most prevalent cardiovascular symptom of hyperthyroid cases in the present study was found to be palpitation 86.67% followed by dyspnoea 60%, chest pain 13.3%. Klein et al,<sup>[25]</sup> found palpitation, dyspnoea, chest pain in 85%, 45%, and 5% respectively. Ahsan,<sup>[26]</sup> found palpitation in 70% of patients, dyspnoea in 61% of patients, and chest pain in 11% of patients. This finding

was almost correlated to our study. Cardiovascular signs of hyperthyroid cases were tachycardia in 90% of patients followed by wide pulse pressure in 73.33% patients, 36.66% patients had systolic hypertension, features of heart failure was found in 10% of patients. Klein et al,<sup>[25]</sup> found tachycardia in 95% of patients, widened pulse pressure in 75% of patients, and pedal edema in 5% of cases. The outmost ECG finding of hyperthyroid cases in the present study was found to be Sinus tachycardia 90%, followed by left ventricular hypertrophy 13.3%, non-specific ST-T changes 10%, and atrial fibrillation (10%) which almost similar to the following study population. Klein et al,<sup>[25]</sup> found tachycardia and fibrillation in 95% and 15% of cases respectively. Gupta et al,<sup>[26]</sup> found sinus tachycardia 74%, left ventricular hypertrophy 14.6%. The most common causes of hyperthyroidism were multinodular goiter 14 patients 46.67%, followed by Graves' disease 10 patients 33.33%, and thyroid adenoma 3 patients 10%, Post-partum thyroiditis 1 patient 3.33%, subacute thyroiditis 2 patients 6.67%. Mirna Abraham-Nordling,<sup>[27]</sup> found 75% Graves' disease, 10% multinodular goiter, and 15% toxic adenoma. Diez JJ,<sup>[28]</sup> found the most common causes of spontaneously occurring hyperthyroidism were multinodular goiter 43%, Graves' disease 21%, and thyroid adenoma 12% which was almost similar to our study.

## CONCLUSION

According to this study, hyperthyroidism was common in the third & fourth decade of life. Females were more commonly affected than males. The common cardiovascular manifestations of thyroid disorders were palpitation, chest pain, dyspnea, and hypertension. Since the patients with thyroid disease usually present with cardiovascular manifestation and cardiovascular manifestation may be the only manifestation of thyroid disorder so it can have recommended that all patients with a thyroid disorder should be searched for cardiovascular manifestation and thyroid function tests should be done in all patients with unexplained cardiovascular disease. As a small number of patients were studied so findings of this study should be cautiously extrapolated into the broader context.

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Source of Support: Nil, Conflict of Interest:  
None declared