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Study of cardiovascular manifestations in hyperthyroidism

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Abstract

Introduction: Excessive activity of the thyroid gland is what we mean when we talk about Hyperthyroidism. The most common causes of hyperthyroidism include Grave's disease, multinodular goitre, and toxic adenomas. There is a broad variety of clinical manifestations signs and symptoms associated with hyperthyroidism. Symptoms might occur in the nervous system, the cardiovascular system, the skin, the eyes, the digestive system, and the endocrine system, among other places. T3, T4 has important impacts on Hemodynamics and cardiac function, and after severe derangement, the heart is the first organ impacted. The elevated LV workload, tachycardia, and SVT-like AF seen with hyperthyroidism. Tachycardia, Atrial fibrillation, wide pulse pressure, loud first heart sound, and a hyperdynamic cardiac apex are all symptoms often associated with hyperthyroidism.

Aim and objective: To evaluate the cardiac manifestations and biochemical features in people with hyperthyroidism, to assess the relationship between thyroid hormone levels and the severity of clinical cardiac manifestations and evaluate the advantages of early detection and treatment in reducing these cardiovascular implications.

Materials and methods: Over a span of one year and five months, from May 2021 and September 2022, a total of 70 cases with hyperthyroidism who visited the outpatient departments of General Medicine and Endocrinology at Patna Medical College and Hospital in Patna were enrolled in this research study.

Results: Of the 70 cases, majority (59%) of hyperthyroid individuals fell within the 30-49 Age group. The average age was 42 years. Patients under the age of 40 with Grave's disease and those age 60 and over with hyperthyroidism were more likely to have multinodular goitre. Female patients predominated.

82% of the patients in the study had abnormalities on their electrocardiograms, with tachycardia being the

most prevalent symptom. 20% of patients were diagnosed with cardiomegaly, and 70% of patients exhibited echocardiographic ally significant cardiac abnormalities.

Hyperthyroidism was shown to be a significant risk factor for diastolic dysfunction in young individuals. Amongst the cardiac valvular abnormality was mitral regurgitation or prolapsed was most common. 85% of the atrial fibrillation was seen between the ages of 30 and 60 in our study.

Both pharmacological and surgical therapeutic approaches were used. Research found that with proper therapy, around 90% of patients with cardiac involvement (atrial fibrillation, angina, or cardiac failure) experienced improvement in cardiac symptoms and signs.

Conclusion: Hyperthyroidism is seen to be associated with tachycardia, Atrial fibrillation, hypertension, diastolic dysfunction and mitral valve regurgitation which are risk factors for cardiovascular disease.

Keywords: Grave's disease, Multinodular goiter, Solitary nodule, Atrial fibrillation, Hypertension, diastolic dysfunction, Mitral regurgitation

Introduction

Thyroid disease is the second most frequent endocrinological ailment seen in clinical

Practice after diabetes mellitus. Excessive activity of the thyroid gland is what we mean when we talk about hyperthyroidism. Clinical symptoms and indicators of cardiac, neurological, ophthalmological, dermatological, gastrointestinal, and endocrinological disorders are associated with thyrotoxicosis, the condition of excess thyroid hormone. The most common causes of hyperthyroidism include grave's disease, multinodular goitre, and toxic adenomas. Sixty percent to eighty percent of thyrotoxicosis (1) cases are caused

By grave's disease. T3, t4 has important impacts on hemodynamics and cardiac function, and after severe derangement, the heart is the first organ impacted. The elevated lv workload, tachycardia, and svt-like af seen with hyperthyroidism. Tachycardia, atrial fibrillation, wide pulse pressure, loud first heart sound, and a hyperdynamic cardia apex are all symptoms often associated with hyperthyroidism patients with hyperthyroidism who develop cardiac complications have a poor prognosis and have high rates of morbidity and death. Early identification and therapy may be able to reverse the condition in all cases. Atrial fibrillation may lead to secondary problems such as cerebral stroke. When anti-thyroid medicines are used to treat hyperthyroidism, the thyroid hormone level returns to normal, and cardiac symptoms improve swiftly. Most hyperthyroidism consequences may be avoided by keeping an eye out for cardiac symptoms and signs and acting quickly to address the

Underlying condition. In addition, hyperthyroidism and thyrotoxicosis often manifest with cardiac characteristics. The cardiac symptoms may be easily identified and diagnosed at an early stage. In order to detect cardiac problems as soon as possible, a thorough electrocardiogram, echocardiogram, and a clinical evaluation are needed.

However, it is difficult to diagnose hyperthyroidism and recognize its clinical implications without first understanding the cardiac symptoms of the disease. One's genetic makeup and environmental setting may both play a role in influencing the severity of symptoms brought on by hyperthyroidism.

Aims and objective

1.to evaluate the cardiac manifestation and biochemical features in people with hyperthyroidism

2. To assess the relationship between thyroid hormone levels and the severity of clinical cardiac manifestations.

3. Evaluate and compare clinical results at six months post-treatment and follow-up

Materials and methods

Place of study: Patna medical college and hospital, Patna.

Source of data: patients attending the outpatient department (OPD) of department of general medicine and department of endocrinology.

Study duration: May 2021 and September 2022 Sample size: 70

Type of study: Cross sectional; observational study.

Study Population: Those who were presenting in the department of General Medicine with clinical sign and symptoms of hyperthyroidism were enrolled for the study.

Sample size: After evaluation of hyperthyroidism cases a total 70 patients were taken according to inclusion and exclusion criteria.

Inclusion Criteria

Patients with untreated hyperthyroidism or thyrotoxicosis who are seen in the

Medicine and endocrine outpatient clinic or hospitalized in the medicine wards at

Patna Medical College and Hospital's Department of Internal Medicine. Definitions of

Hyperthyroidism

Serum TSH< 0.3 mu/ml (As measured by radioimmunoassay) (30)

Serum T3 > 200 ng/dl

Serum T4 > 12 mcg/dl.

Exclusion Criteria

Patients with a confirmed diagnosis of hyperthyroidism who are receiving standard therapy is ineligible.

A patient who has been diagnosed with heart disease.

Patients who were a part of this descriptive and prospective trial but refused to provide informed permission and were not followed up with after six months of therapy.

Data collection

History regarding symptoms of hyperthyroidism along with cardiovascular symptoms was recorded. A detailed clinical examination was performed, and findings were recorded. Selected patients were investigated as per investigations mentioned below.

Methodology

Following the acquisition of ethical approval from the institutional ethics committee at Patna Medical College and Hospital, as well as obtaining written informed consent from the participating patients, they were enrolled in the study. Patients presenting to the outpatient medical clinic (OPD) or medical wards for treatment are clinically evaluated for hyperthyroidism utilizing the biochemical assays and imaging studies listed below.

- A complete blood count and peripheral blood smear.
- Thyroid function test (S. TSH, F.T3, F.T4, including trab);
- Liver function test;
- Lipid profile analysis;
- Urinalysis;
- Serum calcium;
- Serum phosphorus;
- X-ray of the chest in the PA position;
- Electrocardiogram;
- Echocardiogram;

- FNAC of the thyroid gland;
- Ultrasound of the neck.

Patients were reevaluated clinically, with thyroid function tests, chest radiographs, electrocardiograms, and echocardiograms, after 6 months. Pearson's Chi-Square" test formula was used to recognize and elicit the relationship and comparison between various parameters. Statistical significance was defined as a two-tailed P value of less than 0.05.

Results

All individuals under 40 years old were diagnosed with Grave's disease. Graves' disease and multinodular goitre were seen in all individuals aged 70 and above. Between the ages of 30 and 49, you'll find 66% of Grave's disease cases and 32% of MNG.

All of the people who had a single nodule were adults. Women accounted for 80 percent of those diagnosed with Multi nodular Goitre and 90 percent of those diagnosed with Grave's disease.

70%of individuals admitted reported some kind of cardiac symptom. Eleven individuals had edoema, and 15% of those people had palpitations The majority of patients presented with heat intolerance and fatigue. Only 10% of patients showed tremor as symptoms.

Atrial fibrillation was seen in 19%. Hypertension in 44%. Patients younger than 60 years old accounted for 42% of the systolic hypertension cases. Average pulsation pressure was 58 mm Hg. Forty-two percent of Patients had a wide pulse pressure.

63% of the cases were due to Grave's disease, whereas 31% were due to multinodular goitre. In this analysis, we found that 6% of patients had a single nodule.

In 76% of patients, abnormalities in the electrocardiogram were found. Sinus tachycardia was seen in 76%. Atrial fibrillation was found in 19% of cases.

70% had abnormalities on echocardiogram. Diastolic dysfunction seen in 26%; Mitral regurgitation 13%; Left ventricular hypertrophy in 11%; 7% of patients with Pulmonary hypertension; Aortic and tricuspid regurgitations in 5%, or four individuals; Mitral valve prolapsed in 2%.

The relationship between age and heart dysfunction in this study

Table 1: Cardiac symptoms & signs in relation to age reveals.

Age (Years)	Cardiac Symptoms	Tachycardia	Atrial Fibrillation	Systolic hypertension	Wide Pulse pressure
<20 years (no of cases-3)	1	0	0	0	0
20-29 years (no of cases-6)	2	2	1	3	2
30-39 years (no of cases-23)	22	22	6	10	11
40-49 years (no of cases-18)	17	18	4	7	9
50-59 years (no of cases-9)	5	5	1	6	3
60-69 years (no of cases-7)	3	4	1	5	3
>70 years (no of cases-5)	2	2	0	0	1

Table 2: Heart abnormalities in relation with age reveals

Age (Years)	ECG abnormalities	CXR abnormalities	Echo abnormalities
<20 years (no of cases-3)	1	0	0
20-29 years (no of cases-6)	2	1	3
30 -39 years (no of cases - 23)	21	7	17
40-49 years (no of cases-18)	18	4	12
50-59 years (no of cases-9)	6	1	8
60-69 years (no of cases-7)	3	1	7
>70 years (no of cases-5)	2	0	2

Table 3: Treatment Plan to Manage Cardiac Symptoms and Signs reveals.

Treatment	No of patients	Percentage
Drugs alone	50	71.42%
Surgery	20	28.57%

Six-month follow-up on cardiac symptoms

Only 9% out of the total reported persistent heart symptoms such as palpitations after the follow-up assessment. Two individuals had symptoms of edema.

Table 4: Evaluation of pre- and post-treatment study differences in the occurrence of Cardiac symptoms and signs.

Physical sign	No of patients	Percentage
Tachycardia	5	7.35%
Systolic hypertension	2	2.94%
Atrial fibrillation	1	1.47%

Table 5: Six-month follow-up echocardiography reveals

Abnormality	No of Patients	Percentage
Diastolic dysfunction	3	4%
Mitral regurgitation	3	4%
Left ventricular hypertrophy	7	10%
Pulmonary hypertension	2	3%
Aortic regurgitation	2	3%
Tricuspid regurgitation	0	-
Mitral valve prolapsed	1	3%

Discussion

Cardiac symptoms, signs and abnormalities

Our results indicating that palpitation is the most prevalent sign of heart disease are in agreement with those from other studies. Cardiac symptoms were evident in 79% of individuals in our research. Patients were mostly affected by tachycardia (76%) followed by atrial fibrillation (19%), and systolic hypertension (44%). In 42% of patients, a broad pulse pressure was seen the prevalence of af described in literature is between 2% and 20%; our research showed that 19% of patients had af. 67% of patients had abnormalities in their systems, the most frequent of which was a loud s1. presenting among the murmurs 20% of patients had a pulmonary ejection systolic murmur caused by hyperdynamic circulation. Cardiac failure affected 12% of individuals.

Etiological profile

In our studies, grave's disease was the leading cause of hyperthyroidism. Grave's disease was the underlying cause of 63% of our cases with hyperthyroidism. Toxic adenoma was quite rare.

Correlation between age, illness severity, and an etiology with

Cardiac dysfunction

Even in comparison to older individuals, atrial fibrillation was prevalent in younger patients with hyperthyroidism. Patients with atrial fibrillation were most often between the ages of 30 and 60. Our analysis shows that “atrial fibrillation is more frequent in younger people with hyperthyroidism.” Patients with grave's disease have been found to have severe illnesses than those with hyperthyroidism from other reasons. The primary risk factors of af in hyperthyroidism were advanced age and Severe illness. In addition, people with graves' illness were more likely to have systolic hypertension than those with other causes. Patients with grave's disease were younger and their illness was more severe. Patients with grave's disease tended to have a wider than average pulse pressure. Therefore, the severity of graves' disease is evident in this study.

Response to the study's intervention reveals

Tachycardia, palpitations, atrial fibrillation, systolic hypertension, and other heart abnormalities were all significantly improved after therapy. All patients treated and followed regularly had improvement in their cardiac failure. Follow-up patients with cardiac failure continued to have left ventricular hypertrophy despite standard treatment.

Conclusions

The majority (59%) of hyperthyroid individuals fell within the 30-49 age group. The average age was 42.08 years. Patients under the age of 40 with Grave's disease and those age 60 and over with hyperthyroidism were more likely to have multinodular goitre. In this study, female patients predominated. The male: female ratio 1:4.

Most people with hyperthyroidism exhibit palpitations (75%). The most prevalent cardiac symptom in this research was tachycardia (76%). One-in-five (19%) patients had atrial fibrillation.

Heat intolerance, fatigue, an increase in hunger, and weight loss were other frequently reported presenting symptoms in this study. Eighty-two percent of the patients in the study had abnormalities on their electrocardiograms, with tachycardia being the most prevalent symptom. Twenty percent of patients were diagnosed with cardiomegaly, and seventy percent of patients exhibited echocardiographic ally significant cardiac abnormalities. In this analysis, hyperthyroidism was shown to be a significant risk factor for diastolic dysfunction in young individuals. Additionally, but less often, we found valvular anomalies. The most prevalent cardiac valvular abnormality was mitral regurgitation or prolapse.

The most common cause of hyperthyroidism is Grave's disease with thyrotoxicosis accounting for around 66% of all cases. Patients of all ages with hyperthyroidism were shown to be at risk for developing atrial fibrillation. In this analysis, individuals between the ages of 30 and 60 made up 85% of the atrial fibrillation population. The presence of atrial fibrillation was shown to correlate positively with both high Triiodothyronine and low TSH levels. Systolic hypertension was substantially related with both high Thyroxine and low TSH.

In this analysis, the greatest risk variables for atrial fibrillation in hyperthyroidism were advanced age and illness severity. Hyperthyroidism from other causes, such as Multi nodular goitre and toxic adenoma, was found to be less severe than that from patients

With Grave's disease. Atrial fibrillation was more common in those with Graves' disease.

Graves is responsible for 70% of all cases of AF among the causes of hyperthyroidism.

Most of the individuals in this research showed improvements in cardiac symptoms and signs after receiving treatment for hyperthyroidism. Clinical, electrocardiographic (ECG), and echocardiographic (ECHO) indicators all showed considerable improvement after therapy. Patients who were younger when diagnosed with atrial fibrillation had a greater likelihood of converting to sinus rhythm. All individuals treated in this trial group showed improvement in their cardiac failure. The favorable response to therapy seen in the analyzed group was related to both the therapeutic approach used and the underlying cause of hyperthyroidism.

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