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Research Article

THE POSSIBILITY OF CARDIAC COMPLICATIONS IN PATIENTS WITH THYROTOXICOSIS

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Abstract:

Aim: One of the major complications of thyrotoxicosis (TS) is heart disease, including arrhythmias. This study aims to determine the cardiac complications of thyrotoxicosis.

Methodology: It was a prospective study conducted over a period of 1 year in the Endocrinology department of Jinnah Hospital Lahore for one-year duration from May 2019 to May 2020. All patients with clinical and / or biochemical manifestations of TS were followed up and examined for clinical and laboratory signs of thyrotoxicosis cardiac complications.

Results: A total of 103 people with TS were found, which gives the incidence rate of 27%. The male-to-female ratio in patients with thyroid disease was 1: 5. The incidence of hypertension, arrhythmia, and heart failure was 53%, 25%, and 42%, respectively. Patients with cardiac complications of TS had clinical features of thyrotoxicosis of various severity. Echocardiographic features documented in some people with heart failure include dilation of the heart wall, impaired systolic function, decreased ejection fraction, and fractional shortening.

Conclusion: Thyrotoxicosis is a significant cause of cardiac morbidity.

Keywords: thyrotoxicosis, cardiac complications, atrial fibrillation.

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INTRODUCTION:

Thyrotoxicosis is a common endocrine disorder and an important cause of morbidity and mortality in Pakistani. The symptoms of thyrotoxicosis can be multi-systemic and the clinical symptoms range from soft to ruddy¹⁻². However, thyrotoxicosis can be associated with cardiovascular complications (thyroid disease), which often lead to increased morbidity and mortality in this group of people. Thyroid hormones are known to influence the cardiovascular system, both directly and indirectly, and to cause increased contractility of the heart, increased cardiac output, and decreased systemic vascular resistance [3-4]. The cardiac symptoms of thyrotoxicosis, which were already described in the original description of thyrotoxicosis by Parry and Grave have long been recognized as one of the earliest and most consistent phenomena of all-important endocrine disorders [5-6]. Cardiac symptoms of thyrotoxicosis include tachycardia, hypertension, increased heart rate, arrhythmia and consequent heart failure. Some authors have suggested that there is a specific thyrotoxic cardiomyopathy with decreased myocardial function in the state of hyperthyroidism, which is reversible with treatment [7-8]. Cardiac complications related to thyrotoxicosis remain a largely unexplored and there is a lack of data on thyrotoxicosis and its complications. Ogbera et al. Reported the prevalence of thyrotoxicosis at the level of 1.6% [9]. The aim of the study is to determine the frequency and scope of cardiovascular complications with thyrotoxicosis.

THEMES AND METHODS:

This was a prospective study that was conducted at the Endocrinology department of Jinnah Hospital Lahore for one-year duration from May 2019 to May 2020. Informed oral consent was given by patients after obtaining approval from the Research and Ethics Committee. Laboratory tests for free triiodothyronine (T3), thyroxine (T4) and thyrotropin (TSH) levels were performed in all patients with clinical symptoms of thyrotoxicosis. Elevated levels of free T3 and / or free T4 and decreased levels of TSH were the biochemical criteria necessary to confirm the diagnosis of thyrotoxicosis. Thyroid hormone levels were determined using an immunoassay. Patients who were diagnosed with thyrotoxicosis were monitored and screened for clinical and laboratory signs of thyrotoxicosis cardiac complications. Patients with a history of

hypertension, sickle cell anemia, or any other cause of anemia, or heart disease prior to diagnosis of thyrotoxicosis. History relevant to alcohol consumption and smoking have been recorded. Data sought and collected from these patients include demographic, anthropometric, and clinical features of cardiac morbidity, namely, hypertension, arrhythmia, and heart failure. The diagnosis of heart failure was based on Framingham criteria. The size of the goiter was estimated based on the WHO classification. In some patients with heart failure, electrocardiography, chest radiography and echocardiography were performed. Ultrasound examination was used to confirm the presence of multinodular goiter. Graves' disease is considered to be present if one or more of the following is present.

1. Clinical and biochemical features of thyrotoxicosis.
2. Goiter
3. Ophthalmopathy
4. Dermopathy (pre-shin myxedema).

The data was analyzed using the statistical package for the social sciences version of the SPSS. The results are presented as mean and standard deviation (SD). The test statistic used is the Student's t-test for quantitative data.

RESULTS:

Of the 103 people with thyrotoxicosis observed during the study period, 28 of them had different cardiac symptoms of thyrotoxicosis, resulting in a thyroid disease incidence rate of 27%. The ratio of men to women among people with thyroid disease was 1: 5. Diffuse enlargement of the thyroid gland and toxic multinodular goiter were found in 25 (93%) and 2 (7%) subjects, respectively. One patient had no palpable thyroid enlargement. To estimate the size of the goiter based on the WHO classification, 2 (7%) of all subjects with palpable thyroid gland were graded I, 18 (69%) II, and 7 (24%) III. None of the subjects had obstructive symptoms. Grave's ophthalmopathy occurred in 6 (22%) subjects. All subjects with cardiac complications of thyrotoxicosis had clinical flushing of thyrotoxicosis, and additionally two men had psychosis. None of the subjects had significant smoking history and only one significant alcohol history. The demographic and anthropometric indices of patients with thyrotoxicosis with and without heart disease are compared in Table I.

Table-I: Demographic and anthropometric indices in Subjects with thyrotoxicosis variable with cardiac morbidities and without cardiac morbidities

No *(M:F)	28(5:23)	75(13:62)	>0.05
Age (years)	40.8±14.6	39.3±12.6	>0.05
Age range	12-69	13-73	--
**BMI Kg/m ²	25.6±6.1	25.4±4.4	>0.05
BMI range	14.3-43.6	16.5-36.5	--
Weight Kg	67.8±18.6	65.6±13.0	>0.05
Weight range	76-103	63-99	--

The rates of cardiac complications of thyrotoxicosis, such as arrhythmia, heart failure and hypertension, are presented in Table II.

Table-II: Pattern of cardiac morbidities detected in Subjects with thyrotoxicosis

Variable	Freq%	Mean Age	Age Range	M:F
*CCF	12 (42)	48.9	30-69	3:9
**AF	7 (25)	42	12-69	3:4
***HTN	15(53)	41.4	23-69	4:11
CCF,AF	5(18)	42	38-69	2:3

Atrial fibrillation was a widely documented arrhythmia, with premature ventricular beats reported in one patient with a significant history of alcoholism. Of those with arterial hypertension, 7 (47%) had systolic hypertension and 3 (20%) had severe hypertension. Echocardiographic features found in people with heart failure included dilation of the heart wall in one patient, impaired systolic function, decreased ejection fraction, and fractional shortening. The mean ejection fraction was 55.5% and the range was 36-56%. In some of these patients, chest X-rays generally showed an increased cardio-thoracic index suggestive of cardiomegaly.

MANAGEMENT:

All patients with atrial fibrillation and without heart failure achieved sinus rhythm three months after treatment with carbimazole and beta-blockers. However, people with heart failure associated with atrial fibrillation required digoxin, and in one case, amiodarone was required to restore sinus rhythm. Prophylactic heparin was administered to all hospitalized patients with heart failure. One patient, a 34-year-old female, developed symptomatic persistent bradycardia after initial use of 40 mg of a beta-blocker for two months. Two patients with heart failure had relapses of Graves' disease at the time of reporting - they had previously been treated for thyrotoxicosis with carbimazole for 18-24 months. All patients hospitalized for heart failure did well,

except one who underwent a thyrotoxic crisis and died a few days after being admitted to the ward. Treatment-resistant hypertension persisted in two patients despite treatment with carbimazole, beta-blockers and treatment with antihypertensive drugs. This report shows the prevalence of thyrotoxicosis in women where Grave's disease is the primary cause. Grave's disease - An autoimmune disease is the most common form of thyrotoxicosis, and the cause is unknown.

DISCUSSION:

It is well known that one of the major complications of thyrotoxicosis is heart disease, including arrhythmias. Thyroid hormones are known to influence the cardiovascular system, both directly and indirectly, and to cause increased contractility of the heart, increased cardiac output, and decreased systemic vascular resistance [10-11]. The prevalence of thyrotoxic heart disease in sub-Saharan Africa ranges from 6.2-8%. The rate of cardiac complications of thyrotoxicosis, as seen in this report, is 27%. This is much more than previous Pakistani reports. The operational definition of the thyroid gland in this report, which included thyrotoxic hypertension, may account for the high incidence rates noted in this report. Another potential contributing factor to this scenario could be increased awareness of the disorder and better accessibility to healthcare facilities as more people go to hospitals

for specialist care [12-13]. While more frequent cardiac complications related to thyrotoxicosis have been reported in the elderly, Nigerian reports have shown the opposite. The mean age of onset of cardiac complications of thyrotoxicosis according to this report is 40.8 years. The mean age of this group of people in this report, although lower than that reported by Famuyiwa, is comparable to a more recent report by Danbauchi et al. In this report, cardiac complications of thyrotoxicosis were reported in a patient aged 12 years and over. The mean age of people with thyrotoxicosis and cardiac complications was comparable to those without cardiac complications. It is noteworthy that no significant differences were found in the mean body mass indexes and body weight in people with and without thyrotoxic heart disease. All subjects with cardiac complications of thyrotoxicosis had overt signs of thyrotoxicosis, and only one lacked a palpable goiter. There have been cases of recurrent thyrotoxicosis with congestive heart failure. Thyrotoxicosis is associated with arrhythmias, among which atrial fibrillation is the most common arrhythmia. The incidence of atrial fibrillation ranges from approximately 10-21% in patients with thyrotoxicosis, compared with 0.4% in the total adult population. Although atrial fibrillation has been reported to be more common in men with thyrotoxicosis, this report shows a predominance of women, consistent with previous Nigerian reports. This report showed that atrial fibrillation with thyrotoxicosis can occur in both young and old people [14]. This study also noted that restoring atrial fibrillation to sinus rhythm is eminently achievable with beta-blockers and the treatment of the underlying thyrotoxicosis with antithyroid drugs, especially in the younger age group and in those without complications of heart failure. It should be noted, however, that there was no case of apathetic thyrotoxicosis in this study. This may be due to the fact that only clinically suspicious cases of thyrotoxicosis are referred to the LASUTH Endocrinology Clinic. Cases of apathetic thyrotoxicosis in this system, manifested by atrial fibrillation, most often occur in the departments of patients under the care of cardiologists. In this report, the patient experienced symptomatic bradycardia. There have been reports of this phenomenon and it has been postulated that it may be the result of repeated inflammation of the heart's conductive system. In thyrotoxicosis, the dominant type of hypertension is systolic hypertension, which is associated with hyperdynamic circulation and high cardiac output, making the blood vessels unable to adapt to the increase in cardiac output and stroke volume [15]. Elevated blood pressure, found in more

than 50% of the subjects, is the most common heart abnormality noted in this report. The report highlights the importance of thyrotoxicosis as a secondary cause of hypertension as well as the cause of refractory and severe hypertension, especially in Africans. Heart failure, the second most common cardiac complication of thyrotoxicosis, was diagnosed in 42% of respondents. Atrial fibrillation, a recognized factor in heart failure in thyrotoxicosis, also occurred in 42% of patients with heart failure.

CONCLUSION:

The report highlights the importance of thyrotoxicosis as a cause of cardiac morbidity and mortality in patients with thyrotoxicosis. It has also been shown that this can affect both young and old people, and that these cardiac complications are easily reversible if timely and optimal treatment is offered.

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