CARDIOVASCULAR MANIFESTATIONS IN PATIENTS WITH THYROTOXICOSIS BASED ON AETIOLOGY

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ABSTRACT

BACKGROUND

Thyrotoxicosis may present with different cardiovascular manifestations varying from sinus tachycardia to life threatening arrhythmias and heart failure and prevalence of these features differs with various aetiologies of thyrotoxicosis.

MATERIALS AND METHODS

This cross-sectional study included 75 subjects with thyrotoxicosis. Clinical and biochemical assessment, ECG and echocardiogram were done. The aetiology of thyrotoxicosis was determined by technetium 99 uptake thyroid scan. The cardiovascular manifestations were compared among subjects with different aetiologies.

RESULTS

Thyrotoxicosis was due to Grave's disease in 55 subjects, Multi-Nodular Goiter (MNG) and thyroiditis in 10 subjects each. Sinus tachycardia was the commonest manifestation. Atrial Fibrillation (AF) was observed in 8 subjects and all of them had enlarged atria. Thirty percent of subjects with MNG had AF whereas it was seen only in 5.45% among subjects with Grave's disease.

CONCLUSION

Palpitations and sinus tachycardia were common manifestations of thyrotoxicosis. However serious manifestations were less common and atrial fibrillation was the commonest arrhythmia observed.

KEYWORDS

Thyrotoxicosis, Cardiovascular, Atrial Fibrillation.

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BACKGROUND

Thyrotoxicosis refers to a clinical condition characterized by inappropriately increased thyroid hormone action due to increased levels of thyroid hormone in the circulation. This inappropriate increase in circulation thyroid hormone could be endogenous or exogenous. "Hyperthyroidism" is a form of thyrotoxicosis resulting from excessive synthesis and secretion of thyroid hormone by the thyroid gland.[1] Though the exact prevalence of hyperthyroidism is not available in India, an epidemiological study conducted in Cochin showed a prevalence of subclinical and overt hyperthyroidism to be 1.6% and 1.3% respectively with women being four to five times more commonly affected than men.[2] The prevalence of hyperthyroidism in United States is 0.5%.[3]

Various forms of hyperthyroidism include Grave's Disease (GD), Toxic Multinodular goitre (TMNG) and thyroiditis with GD being most common aetiology.

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Treatment modality ranges from anti thyroid drugs to radioiodine ablation and surgery. Cardiovascular manifestations of thyrotoxicosis range from sinus tachycardia, arrhythmias like atrial extra systoles, atrial flutter, atrial fibrillation, paroxysmal supra- ventricular tachycardia to congestive cardiac failure[4]. The purpose of the current study is to evaluate the cardiovascular manifestations in patients with thyrotoxicosis with different aetiology.

MATERIALS AND METHODS

This cross- sectional study was conducted in a tertiary care hospital with a study population of 75, consisting of inpatients and outpatients under the department of Medicine from September 2015 to August 2017. This study included patients with age more than 18 years who have been diagnosed to have thyrotoxicosis by T3 (>2ng/ml) or T4 (>12.2mcg/dl) and TSH (<0.005micro IU/ml) levels using chemiluminescence method. Patients on anti-thyroid drugs, pre-existing hypertension (BP >140/90mmhg or on antihypertensive drugs before the onset of thyrotoxicosis), coronary artery disease, valvular heart disease, history of intake of illicit drugs, pregnant state and chronic alcohol consumption were excluded. Detailed history from the patient was taken using a standard proforma and routine

examination including cardiovascular system examination was conducted according to standard methods.

ECG, 2D Echo and Technetium 99 scan (99TcM) was done for all the patients. Based on Technetium 99 scan (99TcM), patients were classified into Grave's disease (diffuse increased uptake), thyroiditis (decreased uptake) and multi nodular goiter (Patchy uptake).

Statistical Analysis

Statistical Package for Social Sciences (SPSS, Inc., Chicago, Illinois) version 21.0 was applied to obtain statistical significance of the data thus collected. Descriptive statistics was used to describe the sample in terms of socio-demographic and clinical characteristics. Chi square tests (χ^2) was used for qualitative data analysis. In this study, a level of significance (α) of < 0.05 (2-tailed) was taken to consider a result (group difference) statistically significant.

RESULTS

A total of 75 patients with history and clinical features suggestive of thyrotoxicosis and serum TSH <0.005 micro IU/mL were enrolled in the study. All these patients were evaluated and data was captured using the standard investigations mentioned in methodology. (Table 1)

In this study, 32% of the study population belonged to age group between 41 to 50 years. Majority of the patients with thyrotoxicosis were females. Palpitation was the commonest cardiac symptom (49%).Technetium scan was done in all patients and based on the findings we have classified the patients into Grave's disease (n=55), thyroiditis (n=10) and multinodular goiter (n=10).

Tachycardia was observed in 61.3% of the study population. Among patients with Grave's disease tachycardia was observed in 60% (33 out of 55 cases), 70% in thyroiditis (7 out of 10cases) and 60% in MNG (6 out of 10 cases) and this difference was statistically not significant.

Atrial fibrillation was present in8 patients (10.7 %) of study population (Table 2). Among them, 7 patients (87.5%) were found to have fast ventricular rate (heart rate>100/min). Among the 8 cases of atrial fibrillation, 3 patients were older than 60 years and all of them had MNG.

Among the age group 41-60 yrs., 2 patients with atrial fibrillation had Grave's disease and 1 patient had thyroiditis. Remaining 2 patients with atrial fibrillation were younger than 40years, one each had Grave's disease and thyroiditis.

Echocardiographic findings showed bi-atrial enlargement in 6 cases and all these patients were having atrial fibrillation (Table no 3). It was relatively common in patients with MNG (20%, 2 out of 10 patients).

Left Ventricular Ejection fraction was <50% in 8 patients with thyrotoxicosis.

In this study enhanced left ventricular ejection fraction (LVEF) of >70% was found in patients with thyrotoxicosis. Among these, 14 had Grave's disease, three had thyroiditis and two had MNG.

Mitral regurgitation was seen in 16 patients of Grave's disease, 2 patients with MNG and 1 patient with thyroiditis. Among the patients with mitral regurgitation, 4 (21.05%) patients were found to have Mitral valve prolapse. Myxomatous mitral leaflet and sclerotic aortic valve disease was observed in 1.33%, and 2.67% of patients respectively.

Presence of Left ventricular hypertrophy was seen in 16% (12 out of 75) of patients with thyrotoxicosis. Among these 12 patients with left ventricular hypertrophy, 7 patients had Grave's disease, 2 patients had thyroiditis and 3 patients had MNG.

Parameters	Grave's Disease (n=55)	Thyroiditis (n =10)	MNG (n =10)
Age(mean)	**43.49 yrs.**	**48.8 yrs.**	**46.9 yrs.**
Male	26	4	3
Female	29	6	7
Palpitation	29	6	2
Dyspnea	3	1	2
Chest pain	1	1	0
Thyroid swelling	16	1	8
T3(mean)	3.39	2.55	2.79
T4	14.36	14.38	13.30
TSH	0.0093	0.0154	0.0050

Table 1. Baseline Parameters

			Diagnosis			Total
			Grave Disease	Thyroiditis	MNG	
Atrial fibrillation	Present	number	3	2	3	8
		% within diagnosis	5.5%	20%	30%	10.7%
	Absent	number	52	8	7	67
		% within diagnosis	94.5%	80%	70%	89.30%
Total		Number	55	10	10	75
		% within diagnosis	100%	100%	100%	100.0%

Table 2. Presence of Atrial Fibrillation in different Etiology of Thyrotoxicosis

			Diagnosis			Total
			Grave Disease	Thyroiditis	MNG	
Atrial Size	Normal	n	52	9	8	69
		% within diagnosis	94.50%	90.00%	80.00%	92.00%
	Enlarged	n	3	1	2	6
		% within diagnosis	5.50%	10.00%	20.00%	8.00%
Total		n	55	10	10	75
		% within diagnosis	100.00%	100.00%	100.00%	100.00%

Table 3. Comparison of Atrial Size in different Aetiology of Thyrotoxicosis

DISCUSSION

The present study was conducted at tertiary care hospital with an aim to study the cardiovascular manifestations in patients with thyrotoxicosis and to compare these features in patients with thyrotoxicosis based on different aetiology. All these patients underwent a TC99m thyroid scan to differentiate the aetiology of thyrotoxicosis. They also underwent an ECG and 2D ECHO for the cardiovascular manifestations. Many studies have been done on the clinical presentation and laboratory manifestations of hyperthyroidism. However there are very few studies which address the most important cardiovascular manifestations particularly in the Indian population[5].

Thyroid hormones have a profound effect on numerous metabolic processes, virtually in all tissues and hence every tissue in the body gets affected to a greater or lesser extent in thyroid hormone disturbances, the heart being particularly sensitive to its effect.

In the present study, maximum percentage (32%) of patients with thyrotoxicosis belonged to the age group of 41 to 50 years. While in the study conducted by Hashmi et al,[4] 24% patients belonged to this age group. I n the present study, female patients with thyrotoxicosis contributed to 56 % of total patients, while in the studies done by Banzal et al[6] and Kandan et al[5] the contribution from female gender was 65% and 60% respectively. This difference could be due to the gender wise difference in number of patients visiting our hospital.

The common cardiovascular symptoms in the study conducted by Kandan et al[5] were palpitation (78%), followed by dyspnea (26%) and chest pain (4%). Though the most common symptom was palpitation in our study too, the percentage was less (49.3%).

In the present study, tachycardia (heart rate >100/min) was present in 65.3%, which was similar to the study conducted by Zarger et al.[7] This finding correlated well with the study conducted by Kandan et al,[5] in which tachycardia was found in 46% patients.

Prevalence of tachycardia was observed in 65.45% in Graves' disease, 70% in thyroiditis and 60% in patients with multinodular goiter. This difference was statistically not significant as the sample size was too small. In the study conducted by Zarger et al,[7] tachycardia was seen in 71.4% of patients with Grave's disease, 55.3% patients with MNG and 100% patients with thyroiditis.

In the present study, atrial fibrillation was present in10.7 % of study population. The prevalence of atrial fibrillation in the study conducted by Zarger et al[7] was 8.9%, Osman et al[8] was 6% and Dhadke et al[9] was 11.4% among patients with thyrotoxicosis. Kandan et al[5] reported atrial fibrillation in 28% and Bar-Sela et al[10] reported in 21%. Prevalence of atrial fibrillation was observed in 5.5 % (3 out of 55 cases) of Grave's disease , 20 % of Thyroiditis (2 out of 10cases) and 30 % of MNG (3 out of 10 cases) amongst study population and this difference was statistically significant. The study conducted by Zarger et al[7] reported presence of atrial fibrillation in 4.6% patients with Grave's disease, 14.8% with MNG and no patients with thyroiditis had atrial fibrillation.

Bi- atrial enlargement was seen in 6 patients, which constitutes 3 patients with Grave's disease, 2 patients with MNG and 1 patient with thyroiditis. In the study conducted by Kandan et al[5] cardiac chamber enlargement was observed in 18% of study population. Twelve patients (16%) had left ventricular hypertrophy. it was more commonly observed in patients with Grave's disease (7) than MNG (3) and thyroiditis (2). This finding could be correlated with studies conducted by Zarger et al[7] and Kandan et al[5] who have found LVH in 5.4% and 8% of patients respectively.

In our study, left ventricular ejection fraction (LVEF) of >70% was found in 19 patients with thyrotoxicosis. Among these, 14 had Grave's disease, 3 had thyroiditis and 2 had MNG.A Study done by Anakwue et al showed the presence of cardiac function abnormalities in the following proportion of thyrotoxicosis patients: left ventricular enhanced systolic function in 30%, heart failure with reduced ejection fraction in 6%, and left ventricular hypertrophy in 34%.[11]

Mitral regurgitation was seen in 16 patients of Grave's disease, 2 patients with MNG and 1 patient with thyroiditis. Among patients with mitral regurgitation (MR), 4 patients were found to have Mitral valve prolapse (21.05%). A study done by Kumi Kage et al stated that MR in hyperthyroidism has been inferred to be a consequence of mitral annular dilatation due to left ventricular dilatation or that of MVP, but there are other causative mechanisms involved and less than half of the patients with MR had a concomitant MVP.[12]

CONCLUSION

1. Grave's disease was found to be the commonest aetiology of thyrotoxicosis with the peak incidence in the age group of 41-50 years with a female preponderance.
2. Tachycardia was found to be the most common cardiac finding in patients with thyrotoxicosis.
3. Eight patients had atrial fibrillation. The prevalence of atrial fibrillation was more in patients with MNG (30%) compared to that of thyroiditis (20%) and Grave's disease (5.45%).
4. Six patients had bi-atrial enlargement, all of them were associated with atrial fibrillation.
5. Left ventricular hypertrophy was more commonly observed in Grave's disease than MNG and thyroiditis. Enhanced LVEF (>70%) was noted in 19 patients.
6. Mitral regurgitation was noted in 19 patients of thyrotoxicosis and was more common in patients with Grave's disease.

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