Original Article

THE SCOPE O F CARDIAC COMPLICATIONS OF THYROTOXICOSIS IN LAGOS, NIGERIA

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ABSTRACT

Objective: One of the main complications of thyrotoxicosis (TS) is heart disease, including heart rhythm abnormalities. There is a dearth of reports from sub-saharan Africa hence this study sets out to bridge this gap

Methodology: This was a prospective study carried out for a 24 months period. All subjects with clinical and or biochemical evidence of TS, were followed up and examined for clinical and laboratory features of cardiac complications of thyrotoxicosis.

Results: A total of 103 subjects with TS were seen thus giving an incidence rate of 27%. The Male: Female ratio of the subjects with thyrocardiac disease was 1:5 Frequency of hypertension, arrhythmias and heart failure were 53%, 25% and 42% respectively. Subjects with cardiac complications of TS had florid clinical features of thyrotoxicosis. Echcocardiographic features documented in some of the subjects with heart failure include dilated heart wall, impaired systolic function, reduced ejection fraction and fractional shortening.

Conclusion: Thyrotoxicosis is a notable cause of cardiac morbidity in Nigerians.

KEY WORDS: Thyrotoxicosis, Cardiac complications, Atrial fibrillation.

Pak J Med Sci October - December 2007 (Part-I) Vol. 23 No. 5 671-675

INTRODUCTION

Thyrotoxicosis is a common endocrine disorder and an important cause of morbidity and mortality in Nigerians. The manifestations of thyrotoxicosis may be multisystemic and clinical features range from silent to florid.[1] However, thyrotoxicosis may be associated with cardiovascular complications (thyrocardiac disease) which often lead to increased morbidity and mortality in this group of people.[2,3] Thyroid hormones are known to affect the cardiovascular system both directly and indirectly and result in increased cardiac contractility, enhanced cardiac output and reduced systemic vascular resistance.[4,6] The cardiac manifestations of thyrotoxicosis which were described as far back as at the original description of thyrotoxicosis by Parry and Grave have long been recognized to be among the earliest and most consistent phenomenon of this all important endocrine disorder.[7,8] The cardiac manifestations of thyrotoxicosis include tachycardia, hypertension, increased pulse pressure, arrythmias and resultant heart failure.[9-11] Some authors have proposed that there is a specific thyrotoxic cardiomyopathy, with reduced myocardial function in the hyperthyroid state, reversible after treatment.[12,13]

Cardiac complications of thyrotoxicosis remain largely uncharted territory in people

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* Received for Publication: January 17, 2007
* Revision Received: June 23, 2007
* Revision Accepted: July 5, 2007

in sub-Saharan Africa, there is a dearth of data on thyrotoxicosis and its complications in Nigerians. Ogbera, et al[14] had reported a prevalence rate of thyrotoxicosis as 1.6%. The study sets out to determine the incidence and the scope of the cardiovascular complications that occur in Nigerians with thyrotoxicosis.

SUBJECTS AND METHODS

This was a prospective study which was carried out for a period of two years from January 2005-December 2006 in the Endocrine and Metabolism clinic of the Lagos State University Teaching Hospital (LASUTH) in Nigeria. This is a government owned clinic that caters to a large number of people because health services in this facility are offered at government subsidized rates. Informed verbal consent was given by the patients after approval by the Research and Ethics Committee of LASUTH. All subjects presenting with suggestive clinical features of thyrotoxicosis had laboratory investigations done for Free tri-iodothyronine (T3), thyroxine (T4) and thyrotropin (TSH) levels. Elevated free T3 and or free T4 levels and reduced TSH levels were the biochemical criteria needed to confirm the diagnosis of thyrotoxicosis.[15] The levels of thyroid hormones were determined via immunoassay. Subjects that were confirmed to be thyrotoxic, were followed up and examined for clinical and laboratory features of cardiac complications of thyrotoxicosis.

Patients that had a history of hypertension, sickle cell anaemia or anaemia of any other cause or cardiac morbidity prior to the diagnosis of thyrotoxicosis were excluded. Histories significant for alcohol ingestion and smoking were noted.

Data sought for and collected from these patients include demographic, anthropometric indices, clinical features of cardiac morbidity viz, hypertension, arrythmias and heart failure. The diagnosis of heart failure was made using the Framingham's criteria.[16] Goiter size was estimated using the WHO's grading.[17]

Electrocardiography, chest radiography and echocardiography were carried out in some of the subjects with heart failure. Ultrasound scan was used to confirm the presence of multinodular goiters. Graves disease is said to be present if one or more of the following are present.[15]

1. Clinical and biochemical features of thyrotoxicosis.
2. Goiter
3. Opthalmopathy
4. Dermopathy (pretibial myxedema).

Data were analyzed using the statistical package for social sciences SPSS version. Results are presented as Means and standard deviation. (SD). The test statistic used is Student's t test for quantitative data.

RESULTS

Of a total of 103 subjects with thyrotoxicosis seen during the period of the study, 28 of them had varying cardiac manifestations of thyrotoxicosis thus giving an incidence rate of thyrocardiac disease as 27%. The Male: Female ratio of the subjects with thyrocardiac disease was 1:5. Diffusely enlarged thyroid gland and toxic multinodular goiter were seen in 25(93%) and 2(7%) of the subjects respectively. One subject had no palpable enlarged thyroid gland.

For estimation of goiter size using the WHO grading, 2(7%) of all the subjects with palpable thyroid gland had Grade-I, 18 (69%) had Grade-II and 7(24%) had Grade-III goitre. None of the subjects had obstructive symptoms. Grave's opthalmopathy was present in 6 (22%) of the subjects.

All the subjects with cardiac complications of thyrotoxicosis had florid clinical features of thyrotoxicosis and two males had in addition psychosis. None of the study subjects had a significant smoking history and only in one, significant alcohol history was obtained. The Demographic and Anthropometric Indices in Subjects with thyrotoxicosis presenting with cardiac morbidities and those without cardiac morbidities are compared in Table-I.

The frequency of the cardiac complications of thyrotoxicosis viz arrythmias, heart failure and hypertension are shown in Table-II.

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

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	- -

*Male:Female, **Body mass index. Quantitative data are given in Means and Standard deviations.

Atrial fibrillation was the commonly documented arrhythmia, ventricular premature beats was noted in one patient with significant alcohol history. Of the subjects with hypertension, 7(47%) had systolic hypertension and 3(20%) had severe hypertension. The echocardiographic features noted in those who presented with heart failure included dilated heart wall in one patient, impaired systolic function, reduced ejection fraction and fractional shortening. The mean ejection fraction was 55.5% while the range was 36-56%. The chest radiographic finding noted in some of these patients was essentially that of increased cardiothoracic ratio suggestive of cardiomegaly.

MANAGEMENT

All the subjects with atrial fibrillation and without heart failure attained sinus rhythm at the end of by three months after treatment with carbimazole and betablockers. However those with heart failure in conjunction with atrial fibrillation required digoxin usage and in one case, amiodarone had to be given to achieve restoration of sinus rhythm.

Prophylactic Heparin was administered to all those with heart failure that were hospitalized. One subject- a 34 year old female developed symptomatic persistent bradycardia after initial usage of 40mg of a beta blocker for a period of two months. Two of the patients with heart failure as at presentation had relapses of Graves disease-they were previously managed for thyrotoxicosis with carbimazole for a period of 18-24 months. All the patients hospitalized for heart failure did well except one who came in thyrotoxic crisis and died a few days after admission to the ward.

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

*Congestive cardiac failure, **Atrial fibrillation, ***Hypertension.

Two of the subjects had persistent refractory hypertension despite treatment with carbimazole, beta blockers and inclusion of anti hypertensive agents.

This report shows the female preponderance of cases of thyrotoxicosis in which the predominant underlying cause is Grave's disease. Grave's disease-an autoimmune is the most common form of thyrotoxicosis and the cause is unknown.[15]

DISCUSSION

It is well known that one of the main complications of thyrotoxicosis is heart disease, including heart rhythm abnormalities. Thyroid hormones are known to affect the cardiovascular system both directly and indirectly[18] and result in increased cardiac contractility, enhanced cardiac output and reduced systemic vascular resistance. Incidence of thyrotoxic heart disease in sub-Saharan Africa range from 6.2-8%.[19-21]

The incidence rate of the cardiac complications of thyrotoxicosis as seen in this report is 27%. This is much higher than previous Nigerian reports.[19,20-22] The operational definition for thyrocardiac in this report which included thyrotoxic hypertension may account for the high incidence rates noted in this report. Another potential contributory factor to this scenario may well be the increased awareness of this

disorder and improved accessibility to health care facilities with more people presenting to the hospitals for specialized care. Though cardiac complications of thyrotoxicosis have been reported to be commoner in the elderly,[2] Nigerian reports[19,20-22] have shown the contrary. The mean age of occurrence of cardiac complications of thyrotoxisis as seen from this report is 40.8 years. The mean age of this group of people in this report though lower than that reported by Famuyiwa[19] is comparable to the more recent report by Danbauchi[23] et al. In this report, cardiac complications of thyrotoxicosis were noted in a patient as young as 12 years. The mean age of the subjects with thyrotoxicosis with cardiac complications was comparable to those without cardiac complications. Of note is the fact that there were no significant differences in the mean Body Mass Indices and body weights of people with thyrotoxic heart disease and those without thyrotoxic heart disease.

All the subjects with cardiac complications of thyrotoxicosis had overt features of thyrotoxicosis, and only in one there was absence of a palpable goiter. There were there cases of relapses of thyrotoxicosis presenting with congestive heart failure.

Thyrotoxicosis is associated with arrhythmias, of which atrial fibrillation is the most commonly encountered arrhythmia.[23] The incidence of atrial fibrillation ranges from about 10-21% in patients with thyrotoxicosis,[24-25] compared with 0.4% in the overall adult population.[26,27] Though atrial fibrillation has been noted to occur more commonly in males with thyrotoxicosis,[28-29] this report shows a female preponderance which is in line with previous Nigerian reports.[19,22] This report has shown that atrial fibrillation with thyrotoxicosis can occur in the young as well as in the old. It has also been noted in this study that restoration of atrial fibrillation to sinus ryhythm is eminently achievable using beta blockers and treating the underlying thyrotoxicosis with antithyroid agents especially in the younger age group and those without heart failure complications. It is however of note that there was no case of apathetic thyrotoxicosis in this study. This may be due to the fact that usually only suspected clinical cases of thyrotoxicosis are referred to the Endocrine clinic of LASUTH. Cases of apathetic thyrotoxicosis in this setting presenting as atrial fibrillation are most likely to be encountered in the wards in patients under the care of the cardiologists. Persistent symptomatic bradycardia was encountered in a female patient in this report. There has been some reports on this phenomenon and it has been postulated that this might be as a result of repeated inflammation of the cardiac conducting system.[30,31]

In thyrotoxicosis, systolic hypertension is the predominant type of hypertension and this is attributable to the hyperdynamic circulation and high cardiac output resulting in an inability of the vasculature to accommodate the increase in cardiac output and stroke volume.[32,33] Elevated blood pressure-occurring in over 50% of the study subjects-is the commonest cardiac abnormality noted in this report. This report has highlighted the importance of thyrotoxicosis as a secondary cause of hypertension and also a cause of refractory and severe hypertension especially in Africans.

Heart failure, the second commonest cardiac complication of thyrotoxicosis was diagnosed in 42% of the study subjects. Atrial fibrillation, a recognized precipitant of heart failure in thyrotoxicosis was also present in 42% of the patients presenting with heart failure.

CONCLUSION

This report has emphasized the importance of thyrotoxicosis as a cause of cardiac morbidity and mortality in Nigerians with thyrotoxicosis. It has also shown that the young as well as the old may be affected and that these cardiac complications are readily reversible if there is timely optimal treatment offered.

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