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Original Research Article

Prevalence of Cardiovascular Morbidity among Hypothyroid Patients

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Abstract

Background: There remains an association between thyroid disorders and cardiovascular problems. Hypothyroidism is one of the most prominent thyroid disorders which has a proven association with dyslipidemia an independent risk factor for cardiovascular morbidity. This present study is done to highlight the cardiovascular complications in thyroid disease.

Material and Methods: This study is conducted as a Cross-sectional study from the period of January 2020 – June 2021 (1.5 years) in the Department of General Medicine, TMC & Dr. BRAM Teaching Hospital, Agartala, Tripura.

Results: The study included 66 patients of hypothyroidism. The male subset experienced a statistically significant high level of serum cholesterol and serum low-density lipoprotein. Bradycardia was the commonest ECG finding seen in 44% of all patients in the study population. With respect to Echocardiography, only 66% of the study population had normal parameters in echocardiography. The commonest abnormal finding in the sample was Raised interventricular septal dimensions and left ventricular diastolic dysfunction.

Conclusion: This study shows there are various cardiovascular morbidities which remains a concern in hypothyroidism cases. Early diagnosis and correction of hypothyroidism is necessary and along with that physicians should be vigilant about the detection of various cardiovascular morbidity as well so as to prevent future cardiac events.

Keywords: Cardiovascular Morbidity, Hypothyroid, Hypothyroidism.

Introduction

Thyroid hormones regulate a wide array of metabolic parameters including lipoprotein metabolism and cardiovascular disease (CVD) risk factors, thus influencing overall CVD risk [1]. Hypothyroidism is characterized by hypercholesterolemia and a marked increase in low-density lipoprotein and apolipoprotein B.

Besides the classical risk factors for CV disease (CVD), i.e. hypercholesterolemia and diastolic hypertension, some newer risk factors such as a disrupted coagulability and insulin resistance have recently been evaluated [2]. There have been reports of abnormalities in glucose metabolism and in haemostatic parameters, the latter being mainly indicated by the increased activity of factor VII and plasminogen activator inhibitor-1, suggesting that a hypofibrinolytic and hypercoagulable state may play a significant role in the

development of atherosclerosis in patients with sub-clinical hypothyroidism [3].

This study will highlight the cardiovascular complications associated with hypothyroidism. It will assess the CVS parameters in newly or previously diagnosed hypothyroid patients, without any other underlying disorder, by using ECG and ECHO and lipid profile and other biochemical parameter. There are only a few studies done in our country to assess the same. This study will help to understand the need to have a high degree of clinical suspicion for hypothyroidism, management of which can bring about reversibility of the cardiovascular changes brought about by the disease.

Materials and Methods

This study is conducted as a Cross-sectional study from the period of January 2020 – June 2021 (1.5 years) in the Department of General Medicine, TMC & Dr. BRAM Teaching Hospital, a tertiary care referral centre of the state of Tripura in North Eastern part of India.

Ethical clearance for the study was obtained from the institutional ethical committee. Informed consent was taken from all the participants in the prescribed format. The study included newly diagnosed or previously diagnosed patients of both subclinical and overt hypothyroidism of Age Group 18 to 65 years.

The relevant clinical history and examination findings were noted in the pre designed proforma. Their demographic profile was noted. Patients presenting with symptoms of hypothyroidism were screened by FT3/FT4/TSH as per Standardized Protocol.

Routine biochemical parameters of blood such as Complete Blood count, Fasting Lipid Profile, kidney function test, HbA1C, Urine routine examination was done. All patients underwent chest X-ray postero - anterior view (CXR-PA view), 12 leads electrocardiography (ECG) and 2D echocardiography with colour Doppler with tissue Doppler imaging study. Statistical analysis was done using SPSS version 15.

Results

A total of 66 patients participated in the study of which 36 were female and 30 were male patients. In males, the most common age group in which hypothyroidism was encountered was 21-25 years, whereas amongst the females, ages 31-35 years were more frequently found to have hypothyroidism.

This Study showed statistically significant positive association between TSH and Cholesterol level. It was found that 33% of males and 19% of females had high cholesterol level, and 13% of males and females both had borderline high cholesterol level.

Table 1: Frequency distribution of Cholesterol group according to Sex

Cholesterol Group	F	%	M	%	Grand Total	%
Border line high	5	13.88%	4	13.33%	9	13.63%
Desirable	24	66.66%	16	53.33%	40	60.60%
High	7	19.44%	10	33.33%	17	25.75%
Grand Total	36		30		66	

Among the study population most of the patients (i.e.: 42%) both the male and female are found to have high level of serum LDL level. The study found 46% of males and 39% of females had high LDL level, and 20% of males and 25% of females had borderline high LDL level. Regarding triglyceride 6% of males and 5% of females have high triglyceride level. Regarding HDL level 6% of males and 8% of females have borderline low HDL level, and 93% of males and 89% of females have low HDL level

The most common ECG findings was normal ECG in both male and female population. Almost 45% of study population had normal ECG. Whereas other 35% study population showed

bradycardia which was more common in female population. Tachycardia was noted in only 4 persons. P wave amplitude was decreased in 4 patients. Low votage QRS complex was found in 1 patient.

Table 2: Frequency Value of ECG changes according to Sex

ECG	F	M	Grand Total
Bradycardia	14	9	23
Bradycardia, decreased P wave amplitude	1	1	2
Bradycardia, decreased P wave amplitude, Prolonged QT		1	1
Bradycardia, Low volt	1		1
Bradycardia, Prolonged QT		1	1
Bradycardia, Prolonged QT, RBBB (right bundle branch block)	1		1
Normal	15	15	30
Normal, decreased P wave amplitude	1		1
Normal, low volt	1		1
Normal, RBBB		1	1
Tachycardia	2	1	3
Tachycardia, RBBB		1	1
Grand Total	36	30	66

In this study normal Echocardiographic findings were noted in most of the patients, whereas left ventricular diastolic dysfunction with increased interventricular septal thickness was noted among 10% of patients either alone or in combination. Almost 6% of patients had pericardial effusion.

Table 3: Frequency Value of Echo findings according to SEX

Echo Findings	F	M	Grand Total
Increased Interventricular Septal Thickness	3	4	7
Increased Left Ventricle Posterior Wall Thickness	3	1	4
Left Ventricular Diastolic Dysfunction	2	1	3
Left Ventricular Diastolic Dysfunction, Increased Interventricular Septal Thickness	1	1	2
Left Ventricular Diastolic Dysfunction, Increased Left Ventricle Posterior Wall Thickness	1	1	2
Mild Pericardial Effusion	1	1	2
Normal	24	20	44
Pericardial Effusion	1	1	2
Grand Total	36	30	66

Discussion

Hypothyroidism is known to be associated with dyslipidemia, an independent risk factor for cardiovascular morbidity. The cardiovascular system is one of the most important targets of thyroid hormones and is very sensitive to a minimal decrease of circulating thyroid hormones. It has long been recognized that hypothyroidism may cause cardiac pathologies, such as impaired cardiac contractility, decreased cardiac output, increased systemic vascular resistance, and cardiac electrical abnormalities Electrocardiographic changes such as bradycardia, low voltage,

and varying degrees of heart block are commonly recognized in hypothyroid patients [4-7].

The present study found a statistically significant correlation between serum TSH and lipid profile parameters. Data collected in The Multiple Risk Factor Intervention Trial (MRFIT), was of high precision and showed that the relationship between serum cholesterol and coronary artery disease is not a threshold one, but rather is a continuously graded one that powerfully affects risk for the great majority of middle-aged American men [8].

Hypothyroidism is known to be a state of raised lipid profile parameters, and treatment with L-thyroxine therapy has been found to decrease the same. Studies including that done by Alka M. Kanaya *et al* in 2002, showed elevated thyrotropin level (>5.5 mIU/mL) was associated with a 9 mg/dl (0.23 mmol/L) higher cholesterol level [9].

In the present study bradycardia was the commonest abnormal finding (44%) in ECG. On initial assessment by 2-dimensional echocardiogram raised interventricular septal dimensions and left ventricular diastolic dysfunction were the common findings (10%) in males and females alike. In a study by R. Verma in 1995 it was seen that 27% of patients had diastolic dysfunction. In Dr. R. Verma's study, increased numbers of pericardial effusion and diastolic dysfunction, as well as increased interventricular septal dimensions in both subclinical and overt hypothyroidisms were noted [10].

The cardiovascular risk in patients with hypothyroidism is related to an increased risk of functional cardiovascular abnormalities and to an increased risk of atherosclerosis. The pattern of cardiovascular abnormalities is similar in subclinical and overt hypothyroidism, suggesting that a lesser degree of thyroid hormone deficiency may also affect the cardiovascular system.

Conclusion

The hypothyroid patients present clinically with a myriad of symptoms and signs which are nonspecific. Hence a high index of suspicion is the key for early diagnosis of hypothyroidism. The identification of hypothyroid patients is an important individual and public health issue. Early diagnosis and correction of hypothyroidism is necessary, so that early effects on cardiovascular system can be minimized. In the present study 66 newly diagnosed hypothyroid patients presented with an abundance of features suggestive of raised cardiovascular morbidity in the form of raised fasting lipids, bradycardia, raised interventricular septal dimensions and diastolic dysfunction. Treatment in the form of levothyroxine therapy may improve different parameters to a different extent, and other studies have in fact, shown a long-term benefit. This study proves the need to diagnose and treat hypothyroidism at an early stage. Similar studies require to be done on a large-scale basis with follow up for a prolonged duration to reiterate the benefits of treatment of hypothyroidism.

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