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General Medicine

A STUDY OF CARDIAC MANIFESTATIONS IN OVERT AND SUBCLINICAL HYPOTHYROIDISM

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ABSTRACT **BACKGROUND:** Thyroid hormones are very important for the normal functioning of the heart. This study aims at studying the cardiovascular consequences in hypothyroid patients by electrocardiography, lipid profile, and echocardiography.

METHODS: This is a cross-sectional study conducted on 100 cases of hypothyroidism with a structured questionnaire to collect information from subjects regarding history, clinical examination, and investigations. ECG, 2D ECHO, and lipid profile were done to find the cardiac changes and diastolic dysfunction.

RESULTS: Out of the 100 cases, 82 had overt hypothyroidism, and 18 had subclinical hypothyroidism. Females constituted 80%, and the majority of them were in the age group > 50 years (34%). Commonest symptom on presentation was Dyspnea (65%). Dyslipidemia is seen in 34 patients. On ECG, 38% had Bradycardia, 24% had abnormal LVC, 9% had ST-T changes, 10% had long QT, 4% had RBBB. On Echo, 21% had pericardial effusion, 5% had LV Hypokinesia, and among subjects with Overt Hypothyroidism, 45% had diastolic dysfunction and 10% among those with Sub Clinical Hypothyroidism.

CONCLUSION: The study concludes that there is a significant association of hypothyroidism with diastolic dysfunction and pericardial effusion, particularly in the overt hypothyroidism group.

KEYWORDS : overt and subclinical hypothyroidism, bradycardia, pericardial effusion , diastolic dysfunction, dyslipidemia

INTRODUCTION

Thyroid hormones are very important for the normal functioning of the heart. Around 108 million people in India suffer from endocrine and metabolic disorders.[1]

In India, thyroid disorders are the most common among all the endocrine diseases and are more frequent in women.

Primary hypothyroidism accounts for over 99 cases of thyroid gland failures, and less than one percent result from disorders of the pituitary gland or hypothalamus(central hypothyroidism)[2].

Cardiac involvement in myxedema has been a well-established fact.[3]

However, the cardiovascular findings of hypothyroidism are more subtle.

Hypothyroidism and can produce changes in cardiac contraction, myocardial oxygen consumption, cardiac output, blood pressure and peripheral vascular resistance.[4]

Most cardiac abnormalities revert back to normal once a euthyroid state has been achieved[5].

Early identificatioan of patients with overt and sub-clinical hypothyroidism may lead to early treatment and thereby a favorable effect on cardiovascular morbidity and mortality.

This study aims at studying the cardiovascular consequences in hypothyroid patients by electrocardiography, lipid profile, and echocardiography.

MATERIALS AND METHODS

This is a cross-sectional study conducted on 100 cases of hypothyroidism with a structured questionnaire to collect information from subjects regarding history, clinical examination, and investigations.

Overt hypothyroidism is defined as elevated serum thyrotropin (TSH) concentration (>4.68 uIU/ml), and serum T4 (free thyroxine) is below the reference range (<0.78 ng/dl).

Subclinical hypothyroidism is defined as a serum thyroid-stimulating hormone (TSH) above the reference range (>4.68 uIU/ml), with serum-free thyroxine (T4) within the reference range. (0.78-*1.79* ng/dl)

- ECGs, 2D ECHO, and lipid profiles were done to find the cardiac changes and diastolic dysfunction.
- Chi-square was used as a test of significance. p-value <0.05 is considered as statistically significant

Inclusion criteria

- A total of 100 patients, either newly diagnosed or old under-controlled hypothyroidism, were selected, who fit the criteria of age >18 years.

Exclusion Criteria

- a) Patients with known cardiac disease.
- b) Patients with Chronic obstructive pulmonary disorder, severe anemia. Diabetes mellitus or any other endocrinal disorder.
- c) Patients taking medications that alter the thyroid function like beta-blockers, lithium, oral contraceptive pills, steroids, amiodarone and alcohol

RESULTS

- Of the 100 hypothyroid subjects, the Mean age was 45.64 ± 12.4 yrs. The majority of them were in the age group of greater than 50 years (37%).
- Females constituted 80%, and males were 20%. Among them newly detected hypothyroid patients constitute 75% and old under controlled patients constitute 25%
- Commonest symptom on presentation was Dyspnea (65%), Lethargy (35%), edema (30%),chest pain (15%) and palpitations (5%).
- 82% of the cases had Overt Hypothyroidism, and 18% had Subclinical Hypothyroidism.

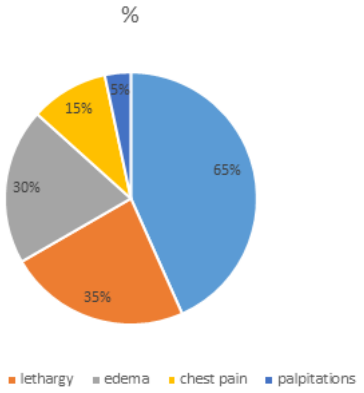
Mean T3 levels was 1.04 ± 0.80 ng/ml , mean T4 levels was 0.64 ± 0.82 mcg/ml and mean TSH levels was 36.67 ± 7.34 mIU/ml

FIGURES AND TABLES

1. Age And Sex Distribution

	MALE-n -20	FEMALE-n-80
LESS THAN 30 yrs	1	14
30-40 yrs	6	20
41-50 yrs	5	17
More than 50 yrs	8	29

2. SYMPTOMS AT PRESENTATION



3. ECG CHANGES :

ECG Changes	Overt Hypothyroidism (82)	Subclinical Hypothyroidism (18)	Total-100
Sinus Bradycardia	32 (39%)	6(33%)	38
Low Voltage Complexes	20 (24%)	4 (22%)	24
ST –T Changes	8 (9%)	1(5%)	9
QT Prolongation	10 (12%)	0	10
RBBB	4 (4.8%)	0	4

4. THYROID STATUS AND LEFT VENTRICULAR DIASTOLIC DYSFUNCTION :

P-value- 0.007 (significant if <0.05)

	Overt hypothyroidism -(n-82)	Subclinical hypothyroidism-(n-18)	Total-100
Diastolic Dysfunction +	37 (45%)	2 (10%)	39
Diastolic Dysfunction -	45 (55%)	16(90%)	61

5. OTHER ECHO CHANGES : -

P-value- 0.10

Echo Changes	Overt Hypothyroidism (82)	Subclinical Hypothyroidsim (18)	Total-100
Pericardial Effusion	19 (23%)	2(11%)	21
RWMA / LV Hypokinesia	4	1	5
LVH	4	2	6
EF<50%	4	0	4

6. DYSLIPIDEMIA -

Lipid profile	Overt hypothyroidism	Subclinical hypothyroidism
Serum Cholesterol- >200 mg/dl	24	10
LDL >130 mg/dl	15	15
TGL >200 mg/dl	6	4
HDL <40 mg/dl	6	5

DISCUSSION

The cardiovascular system is the most important target of thyroid hormones and is very sensitive to a minimal decrease of circulating thyroid hormones

In our study, more than 60% of cases were found to have clinically significant cardiovascular changes

- Hemodynamic alterations in hypothyroidism include narrowing of pulse pressure, prolongation of circulation time, and decreased blood flow to tissues. In severe primary hypothyroidism, the cardiac shadow is enlarged on chest x-ray, heart sounds decrease in intensity, and low voltage complexes can be seen in ECG due to pericardial effusion.
- These cardiovascular changes can occur across the entire spectrum of thyroid disease.
- Cardiac output may decrease by almost 30-40% in hypothyroidism. Cardiovascular findings of hypothyroidism are more subtle.
- Signs and symptoms of hypothyroidism include bradycardia, diastolic hypertension, narrowed pulse pressure, cold intolerance, and quiet precordium.
- In the present study, sinus bradycardia was the commonest ECG finding; accounting for total 38% of patients in the study population
- In a previous study by Ramesh et al[4], it was found to be 40%. Bradycardia reported in different studies has been 30% by Shashikanth[6], 14.3% by Kumar et al[7], 13.7% by Crowley et al[1].
- In this study, low voltage complexes were seen in 24% of cases. Whereas in a previous study by Ramesh et al., it was 30%, in a study by Rajasekhar et al[8] it was seen in 24% cases, while in a study by Sharath Shah[9], it was seen in 33% cases.
- In a study conducted by Al-Farttoosi et al.[10] sinus bradycardia was found in 47.2%, 33.3% had low voltage complexes, 27.8% had ST-T changes, 19.5% had long QT and prolonged PR. In our study, ST-T changes and QT prolongation were seen in 9 and 10% respectively
- In this study, diastolic dysfunction was seen in 45 % of overt hypothyroid and 10% of subclinical hypothyroid patients, and pericardial effusion was seen in a total of 21% patients
- Gupta et al.[11], in their study, observed that 18.18% had diastolic dysfunction, 45.5% had pericardial effusion.
- Similarly, Hardisty et al. [12] and Rawat et al[13] observed that 32.5% and 72% had pericardial effusion, respectively. Verma et al. [14] concluded from his study that pericardial effusion and diastolic dysfunction was seen in significant cases of hypothyroidism.
- In this study, hypercholesterolemia is seen in 34 % of cases. Majumder et al. [15] in their study also noted that total cholesterol, LDL cholesterol, and TG's were significantly increased in hypothyroid patients.

CONCLUSION

- The study concludes that there is a significant association of hypothyroidism with diastolic dysfunction and pericardial effusion, particularly in the overt hypothyroidism group.
- Early diagnosis in patients with hypothyroidism will diminish the extent of cardiac complications which accompanies it
- Any unexplained pericardial effusion should be screened for Hypothyroidism
- The LV diastolic dysfunction found even in subclinical hypothyroidism patients, as shown in our study, may warrant the use of hormone replacement even without overt symptoms.

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