

Original Research Article

Cardiovascular changes in newly detected hypothyroid patients in Eastern India

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ABSTRACT

Background: Present study was carried out with an objective to study all the cardiovascular changes associated with newly detected hypothyroidism, and to know the cardiovascular involvement in sub-clinical hypothyroidism.

Methods: A total number of 60 newly detected hypothyroid patients, diagnosed by clinical evaluation and confirmed by thyroid hormone assay by chemiluminescence immunoassay (CLIA) method, were subjected to cardiovascular examination, electrocardiograph, echocardiography and Tread mill test. It was cross sectional study design based on random sampling method which was conducted for 2 years in the department of General Medicine, MKCG Medical College Hospital, Berhampur, Odisha, India. The work was carried out after approval from the Institutional Ethics Committee of MKCG Medical College Hospital, Berhampur, Odisha. Patients were investigated before thyroid hormone replacement therapy. Statistical data analysis was made on basis of deviation, standard error, t-test and the proportion test. P value of < 0.05 was considered statistically significant.

Results: Out of 60 patients studied 14 were males and 46 were females. Hypothyroidism was newly diagnosed more in females and maximum in age group of 17-47 years (69.9%). Out of 60 patients, 63.3% had symptoms less than 3 months duration. Cardiovascular symptoms were present in 12 (20%) patients. Bradycardia was observed in 7% patients. Stage 1 hypertension was noticed in 13.3% (diastolic high blood pressure). Low voltage complexes in electrocardiogram was present in 40% study group. Pericardial effusion was present in 26.7% patients. Tread mill test was positive for inducible ischaemia in 2 patients. Diastolic dysfunction was noticed in 26.6% study group. Altered lipid profile was present in 16.7% (S. cholesterol) and 53.4% (S. Triglycerides).

Conclusions: Hypothyroidism is common in female, maximum between 17-47 years age group. Majority of the patients did not have any cardiovascular changes. Observed cardiovascular changes were ECG abnormalities, pericardial effusion, diastolic hypertension and diastolic dysfunction. Systematic study was done to know the early effects of hypothyroidism on cardiovascular system. The identification of patients with hypothyroidism is an important individual as well as public health issue. Hence, early detection and initiation of hormone replacement therapy can minimize associated cardiovascular changes.

Keywords: Cardiovascular, Hypothyroid state, Sinus, Subclinical hypothyroidism

INTRODUCTION

The most common functional disorder of the thyroid gland is hypothyroidism.¹ It is a clinical state, due to the

decreased secretion of thyroid hormones or more rarely, from their impaired activity at tissue level.² It is the most common pathological hormone deficiency. Pathology of the thyroid gland (Primary hypothyroidism) accounts for

over 99.5% of cases of thyroid gland failure and < 0.5% result from disorder of the pituitary gland or hypothalamus (central hypothyroidism).² Overt hypothyroidism refers to cases in which the serum thyrotropin (TSH) concentration is elevated and serum T4 (free thyroxine) is below the reference range, while subclinical hypothyroidism is defined as an elevated serum TSH value, associated with a serum free T4 within the reference range.³

Thyroid hormones have a profound effect on a number of metabolic processes in virtually all tissues and hence every tissue is affected to a greater or lesser extent by thyroid hormone deficiency, the heart being particularly sensitive to its effect.⁴

The clinical features dependent on patient's age, rate at which hypothyroidism develops.⁵ As thyroid hormones are universal determinants of organ function, there may be a multiplicity of symptoms.⁶

The cardiovascular risk in hypothyroid patients is related to an increased risk of functional cardiovascular abnormalities.⁷ 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.⁸

Echocardiography changes in hypothyroidism includes sinus bradycardia, prolongation of PR interval, low voltage complex, alteration of ST segments and flattened or inverted T waves, RBBB, LBBB and rarely complete heart block.⁹

ECHO changes in hypothyroidism include pericardial effusion, wall motion abnormalities, diastolic dysfunction and systolic dysfunction.¹⁰

It is important to detect clinical or subclinical thyroid diseases in time for the effective treatment and for prevention of cardiovascular damages.

The Rotterdam study in post-menopausal women and a prospective study in Japan have shown increased prevalence of atherosclerosis and IHD in subclinical hypothyroid patients. But Whickham study has failed to find any correction between subclinical hypothyroidism and cardiovascular morbidity and mortality.

The objective of this study was to study all the cardiovascular changes associated with newly detected hypothyroidism and to know the cardiovascular involvement in subclinical hypothyroidism.

METHODS

The present study was conducted for 2 years in the department of General Medicine, MKCG Medical College Hospital, Berhampur, Odisha, India. Cross

sectional study was design. The work was carried out after approval from the Institutional Ethics Committee of MKCG Medical College Hospital, Berhampur, Odisha. 60 newly detected hypothyroid patients were taken for study.

They were selected on basis of random sampling method diagnosed by clinical evaluation and confirmed by thyroid hormone assay by chemiluminescence immuno assay (CLIA) method. Reference ranges [TSH (0.34 - 4.25) microIU / ml, total T4(5.4-11.7) microgm /dl, fT4 (0.7 - 1.24) ng/dl, total T3 (77-135) ng/dl, fT32.4-4.2pg/ml]. Patients with TSH >10micro IU/ml and low fT4 were considered overt hypothyroids, and TSH ranging (4.2-10) microIU /ml and normal fT4 were considered subclinical hypothyroids.

Inclusion criteria

All patients of newly detected hypothyroidism- diagnosed by clinical evaluation and confirmed by serum TSH, FT4 and FT3 level.

Exclusion criteria

Secondary hypothyroid patients, hypothyroid patients who were already on treatment, patients on antiepileptics, OC pills, amiodarone, glucocorticoids, antineoplastic drugs, NSAIDs and patients with other diseases like hypertension, diabetes, pernicious anemia, collagen disorders, primary cardiac and other endocrine disorders and pregnant women were excluded from the study.

Investigations

The following investigations were done to diagnose hypothyroidism (Newly detected) and with associated cardiac profile: complete blood count, FBS, 2hrPGBS, serum FT3, FT4, TSH, Lipid profile, FNAC of thyroid gland (if indicated), chest X-ray, ECG, 2D Echocardiogram, Tread mill test.

Analysis of data was made on basis of parameters like mean deviation, standard error, the t-test and the proportion test. P value of<0.05 was considered statistically significant.

RESULTS

Out of 60 patients 46 (76.7%) were females with mean age of 37.5±14.0 years and 14(23.3%) were males with mean age of 47.4±17.4 years. Out of all maximum (33.3%) were in the age group of 27-37 years. Out of total 12 sub clinical hypothyroid patients 4 were elderly females which constituted 34% of the subclinical group.

Cardiovascular symptoms were seen only in 12 patients (20%) which includes effort intolerance in 6 (10%), chest pain, breathlessness and palpitation in 2 patients each

(3.3%) (Table - 1). In this study 4 (7%) out of 60 patients had bradycardia.

Table 1: Cardiovascular symptoms in study group.

Symptoms	Male	Female	%
Chest pain	2	0	3.3
Breathlessness	0	2	3.3
Effort intolerance	4	2	10
Palpitations	0	2	3.3

Table 2: Prevalence of systolic hypertension (JNC 7 criteria).

	M	F	Total	%
Normal (<120)	8	16	24	40
Prehypertension 120 - 139	6	28	34	56.7
Hypertension stage 1 (140 - 159)	0	2	2	3.3
Hypertension stage 2 (>160)	0	0	0	0
Total	14	46	60	100

Pre-hypertension (Systolic) was present in 6 males and 28 females which constituted

56.7% of total population. Only 3.3% had stage 1 systolic hypertension (Table 2).

Table 3: Prevalence of diastolic hypertension (JNC 7 criteria).

	M	F	Total	%
Normal (<80)	8	16	24	40
Prehypertension (80 - 89)	4	24	28	46.7
Hypertension stage 1 (90 - 99)	2	6	8	13.3
Hypertension stage 2 (>100)	0	0	0	0
Total	14	46	60	100

Pre-hypertension (diastolic) was present in 4 males and 24 females which constituted 46.7% of total population. Similarly stage 1 diastolic hypertension was present in 13.3% of study group (Table 3).

Lipid profile in this study revealed 16.7% of patients had high serum cholesterol, (Male 214.3±33.3 mg/dl, Female 199.1±28.6 mg/dl). 53.4% had high serum triglyceride (Male 202.2±50.2, Female 210.1±51.3 mg/dl) and 10% had high LDL levels (Male 113.8±26.7, Female 103.3±29.6 mg/dl). Mean HDL was (Male 53.7±6.1, Female 54.5±6.4mg/dl).

In the sub-clinical group 6 out of 12 had raised triglyceride level that constituted 50% of all lipid abnormalities. Only 16.6% had raised LDL cholesterol. In the study group 4 out of 60 patients (7%) showed cardiomegaly in chest X-ray (PA) view.

Table 4: Low voltage complexes in ECG in study group.

Sex	Present	%
Male	6	10
Female	18	30
Total	24	40

Table 5: Echocardiographic changes in study population.

Echo Findings	Number (n=60)	%
Pericardial effusion	16	26.6
Systolic dysfunction	4	6.6
Diastolic dysfunction (mild)	14	23.3
Diastolic dysfunction (moderate)	2	3.3
Diastolic dysfunction (severe)	0	0
IVS thickness	4	6.6

In this study, low voltage complexes in ECG were found in 24 (60%) of patients, out of which 6 (10%) were males, 18(30%) were females. Similarly, 15% males had T-inversion in V3 - V6 leads and RBBB was seen in 29% patients (Table - 4). 2 (3.3%) out of 60 patients showed positive test for inducible ischemia in Tread mill study. All were males. None of the females were positive in this test.

2D Echo findings were normal in 33% cases. Diastolic dysfunction and pericardial effusion was found in 16 (26.6%) cases followed diastolic dysfunction in 16 (26.6%), systolic dysfunction in 4 (6.6%) and increased inter IVS spectrum thickness 4 (6.6%) cases. Majority of the diastolic dysfunction being mild dysfunction. No cases found to have severe diastolic dysfunction (Figure 1).

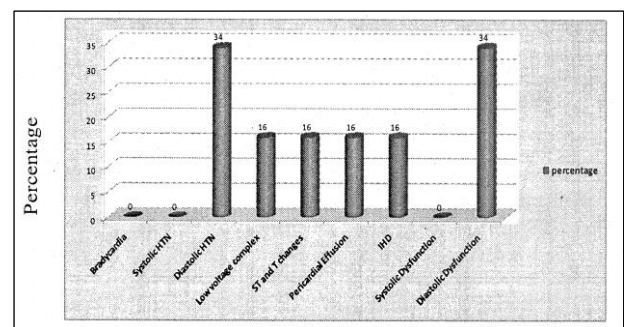


Figure 1: Overall cardiovascular involvement in subclinical hypothyroid group (no. 12 cases).

DISCUSSION

Majority of the patients were in the age group of 17-47 years (69.9%). Maximum incidence was in the third decade (33.3%). Mean age of the patients was 42.45 years with range from 17 to 70 years.

Male : Female ratio in the study was 1 : 3.2.

Comparing with other studies, Watanakunakorn et al, had got maximum prevalence in 6th decade i.e., 25%.

Streeten et al, had noted mean age of prevalence was 49.8 with SD of 2.5.¹¹ Similarly comparing sex distribution Vanhaelst L and William FC et al had noted a female to male ratio of 4:1 which is consistent with the present study findings i.e., 3.2 : 1.¹²

63.3% patients had symptoms less than 3 months duration. Mean duration of the symptoms before the patients reported was 3.5 months. About 26% of the cases had goitrous hypothyroidism, observed only in female patients. Six most common symptoms were general weakness and lethargy pain in muscles and joints, Facial puffiness, limbs swelling, skin changes, hoarseness of voice and cold intolerance.

Cardiovascular symptoms like chest pain, effort intolerance and palpitation were present in less number of patients. Bradycardia was present in only 7% of the patients. This finding correlate with other study (Wayne et al). As per JNC 7 criteria, stage - I systolic hypertension was present in 3.3% and stage I Diastolic hypertension in 13.3%. The incidence of hypertension in the present study correlates with incidence reported by Saito I et al.¹³

High serum cholesterol levels were present in 16.7%. Serum triglycerides high level was seen in 53.4%.

In ECG changes, 40% low voltage complexes was present, followed by 'T'-wave changes (23.3%) and RBBB in 6.6%. This finding is consistent with other studies like by Varma R et al, except conduction disturbances.¹⁴ Nikoo MH et al, also documented sinus tachycardia, QT prolongation and ventricular tachycardia which was not found in our study.¹⁵

2D Echo findings were normal in 30% cases. Pericardial effusion was common finding seen in 16 cases accounting to 26.7%. The study by Varma R et al, showed the prevalence of effusion to be 22.75%. Pericardial effusion is reported to occur in 30% to 80% of patients with hypothyroidism [Rawat B1 and Satyal A2, KUMJ (2003 Volume 2)]. Relatively low incidence of pericardial effusion may be due to selection of new hypothyroid cases. Diastolic dysfunction seen in 26.67%, majority of them being mild dysfunction. No cases found to have severe diastolic dysfunction. IVS thickness was found only in 4 cases. In a study by Varma R et al, it was seen that 27% of patients had diastolic dysfunction. Systolic dysfunction seen in 6.67% of patients. Forfar et al, and others have described low systolic function indices in hypothyroid patients. However small ridge Et al, have argued that this could be related to relatively elderly patients included in the above studies. They found no such alteration in systolic function in their younger

patients (aged 20-48years). This was further supported by Fouron et al, Grossman et al and Verma R et al, who did not find any evidence of systolic dysfunction in hypothyroid patients. Rawat B1 and Satyal A2, KUMJ (2003 volume 2) showed no systolic dysfunction. IVS thickness found in only in 4 cases in our cases. Rawat B1 and Satyal A2 reported LVPW to occur. Bennet et al, Lee et al, and Bernstein et al, did not find similar incidences.

TMT was positive for inducible ischaemia was present in 14.3% of the patients. The incidence of IHD in the present study correlates with the incidence reported by Wayne EJ, and Watanakunakorn et al.

In the subclinical hypothyroid group major manifestation was diastolic hypertension and diastolic dysfunction on echocardiography. Higher triglyceride level was the most common lipid abnormality. Ischemic heart disease was significantly associated with this group.

In the present study, statistically significant association was found between degree of hypothyroidism and diastolic hypertension and low voltage complex in ECG. But no significant association was found between severity of hypothyroidism and prevalence of bradycardia, diastolic dysfunction and peripheral effusion.

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. Cardiovascular symptoms are less commonly associated with newly detected hypothyroidism. The occurrence of pericardial effusion in hypothyroidism is significantly related to the duration of disease, hence the need for early diagnosis of hypothyroidism. X-ray chest is not a reliable tool for the diagnosis of peripheral effusion. Hence echocardiogram is the investigation of choice for the diagnosis of pericardial effusion. Altered lipid profile was found in the hypothyroid patients. Quite a significant number of patients were in pre-hypertension group. Various life style modification can be advised preventing them going for stage I hypertension. 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.

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