Clinico-laboratory Profile of Hypothyroidism with Emphasis on Cardiovascular Manifestations

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Abstract

Hypothyroidism is a highly prevalent endocrine disorder. Hypothyroidism affects almost all organs of the body, the cardiovascular system being the most sensitive one. There has been an increased usage of biochemical tests for screening of hypothyroidism. We have studied the clinical and laboratory profile of hypothyroid patients with particular emphasis on their cardiovascular manifestations. 50 patients of hyperthyroidism were included in the study. Patients with other co-morbidities which could contribute to cardiovascular manifestations were excluded from the study. In this study Females (60%) were more than males (40%), commonest general presenting symptoms were fatigue (52%) and weight gain (48%), commonest cardio vascular symptoms were palpitation (78%), followed by dyspnoea (26%) and chest pain (4%), commonest cardio vascular signs were found to be tachycardia (82%), widened pulse pressure (50%) and pedal edema (12%), commonest ECG finding was found to be Sinus tachycardia(46%) followed by atrial Fibrillation(28%), Non-Specific ST-T changes, Left Ventricular Hypertrophy, RV hypertrophy and RBBB. Systolic dysfunction and Chamber enlargement (18%) were the more prevalent echo manifestations. This study shows that because of their high prevalence and constant nature, clinical symptoms and signs of hypothyroidism cannot be over looked for screening and clinical diagnosis. Also the cardiovascular manifestations being increasingly prevalent should be routinely screened in all hypothyroid patients.

Keywords: Hypothyroidism, Clinical profile, Cardiovascular manifestation

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Introduction

Hypothyroidism is a common endocrine disorder which affects approximately one in 10 adults of Indian population[(1)]. Hypothyroidism has been shown to be significantly associated with female gender and old age[(1-2)]. Thyroid hormones have a profound effect on numerous metabolic processes virtually in all tissues and hence every tissue in the body is affected to a greater or lesser extent in thyroid hormone deficiency, the heart being particularly sensitive to its effect[(3-6)]. The common symptoms and signs reported in hypothyroidism are fatigue, lethargy, constipation, weight gain, and cold intolerance, loss of libido, dry skin, anemia, bradycardia, and delayed ankle reflex[(7-9)]. Many of these are non-specific and might have little diagnostic value clinically[(10-12)]. Many authors believe that there is down grading of clinical spectrum of hypothyroidism and now lot of subclinical and overt hypothyroidism is being detected by the means of biochemical profile alone[(13-14)].

Cardiovascular system has been recognized as one of the most important targets of the thyroid hormone. The low serum levels of thyroid hormones are often associated with a decreased cardiac output, heart rate, stroke volume, and myocardial contractility, and increased systemic vascular resistance[(15)]. The cardiovascular manifestations reported in hypothyroidism are dyspnea, pedal edema, bradycardia, atrial fibrillation, diastolic hypertension, cardiac failure and pericardial effusion in a varying proportion[(6-9)]. This might be due to the geographical variation among the population studied.

There are quite a number of studies done on clinical and biochemical profile of hypothyroidism across India[(1-5)]. There has been a lot of variation in the prevalence of symptoms and signs reported among the studies. However there are very few studies which have been focused on cardiovascular manifestations of hypothyroidism. Hence this study is aimed at studying the clinical and laboratory profile of hypothyroidism with particular emphasis on cardiovascular manifestations.

Material and Methods

The study was done in the department of General Medicine and was duly approved by the institutional ethics committee. In this observational study 50 consecutive patients who were newly diagnosed to have either overt or subclinical hypothyroidism based on their thyroid function tests were included. Patients with Hypertension, Diabetes mellitus Coronary artery disease, chronic kidney disease and, who are on anti-arrhythmic drugs were excluded from the study.

All the patients underwent Clinical evaluation and Laboratory Tests which includes FT4, FT3 and TSH CBC, RFT, LFT, Serum Electrolytes, and Fasting lipid profile (which included Serum Triglycerides, LDL, HDL, total Cholesterol) after obtaining consent.

ECG AND 2D ECHO were performed in these patients to analyze the presence of any cardiac manifestations.

Statistical analysis

The collected data of the 50 patients was statistically analyzed with SPSS 16.0 version. To describe about the data descriptive statistics, frequency analysis, percentage analysis, cross tabulation were used for categorical variables and the mean & S.D were used for continuous variables. To find the significance in categorical data Chi-Square test was used. In all the above statistical tools the probability value .05 is considered as significant level.

Results

Table 1: Age and sex incidence among hypothyroid patients

			Sex		Total
			F	M	
Age range	Up to 40 yrs	Count	17 (51.5%)	11 (64.7%)	28 (56.0%)
	41 - 60 yrs	Count	15 (45.5%)	2 (11.8%)	17 (34.0%)
	> 60 yrs	Count	1 (3.0%)	4 (23.5%)	5 (10.0%)
Total		Count	33	17	50

P Value-0.012

In this study, 50 cases of hypothyroid was studied, among which 17 females and 11 males were in the age group of less than 40 years and 15 females and 2 males were between 41 to 60 years and 1 female and 4 males were above 60 years (Table 1).

Table 2: General symptoms of hypothyroid patients

General Symptoms	Absent			Present			Total	P Value
	F	M	T	F	M	T		
Hair Loss	33 (100%)	15 (88.2%)	48 (96%)	0 (0%)	2 (11.8%)	2 (4%)	50	0.044
Weight Gain	14 (42.4%)	10 (58.8%)	24 (48%)	19 (57.6%)	7 (41.2%)	26 (52%)	50	0.272
Easy Fatigue	15 (45.5%)	11 (64.7%)	26 (52%)	18 (54.5%)	6 (35.3%)	24 (48%)	50	0.197
Loss of Appetite	26 (78.8%)	15 (88.2%)	41 (82%)	7 (21.2%)	2 (11.8%)	9 (18%)	50	0.380
Excessive Sleep	26 (78.8%)	16 (94.1%)	42 (84%)	7 (21.2%)	1 (5.9%)	8 (16%)	50	0.161
Neck Swelling	25 (75.8%)	17 (100%)	42 (84%)	8 (24.2%)	0 (0%)	8 (16%)	50	0.027
Swelling of Limbs	26 (78.8%)	17 (100%)	43 (86%)	7 (21.2%)	0 (0%)	7 (14%)	50	0.041
Cold Intolerance	25 (75.8%)	17 (100%)	42 (84%)	8 (24.2%)	0 (0%)	8 (16%)	50	0.027

In the study of 50 patients of hypothyroid 52% (26 patients) had weight gain, predominantly females. 48% (24 patients) had easy fatigability predominantly in females. 18% (9 patients) had decreased appetite. 16% (8patients) had excessive sleepiness, neck swelling and cold intolerance. 14%(7patients) had swelling of limbs. 4% (2 patients) had complaints of Hair loss (Table 2).

Table 3: Cardiovascular Symptoms of Hypothyroid Patients

Symptoms	Absent			Present			Total	P Value
	F	M	T	F	M	T		
Breathlessness	18 (54.5%)	13 (76.5%)	31 (62%)	15 (43.5%)	4 (23.5%)	19 (38%)	50	0.130
Palpitation	24 (72.7%)	16 (94.1%)	40 (80%)	9 (27.3%)	1 (5.9%)	10 (20%)	50	0.073
Chest pain	30 (90.9%)	16 (94.1%)	46 (92%)	3 (9.1%)	1 (5.9%)	4 (8%)	50	0.692

In this study 38% of patients i.e. about 19 patients presented with breathlessness predominantly females. 20% (10 patients) had palpitation predominantly females. 8% (4 patients) presented with chest pain (Table 3).

Table 4: General Examination of Hypothyroid Patients

General examination	Absent			Present			Total	P value
	F	M	T	F	M	T		
Pallor	22 (66.7%)	2 (70.6%)	34 (68%)	11 (33.3%)	5 (29.4%)	16 (32%)	50	0.778
Edema	24 (72.7%)	12 (70.6%)	36 (72%)	9 (27.3%)	5 (29.4%)	14 (28%)	50	0.873

In this study group 38% of the patients had pallor, majority being in females that was about 11 patients (33.3%) and 5 males (29.4%). 28% (14 patients) had pedal edema (Table 4).

Table 5: BMI range of hypothyroid patients

			Sex		Total
			F	M	
BMI range	18.5-24.99	Count	9 (27.3%)	4 (23.5%)	13 (26.0%)
	25-29.99	Count	14 (42.4%)	12 (70.6%)	26 (52.0%)
	> 30	Count	10 (30.3%)	1 (5.9%)	11 (22.0%)
Total		Count	33	17	50

P value-0.090

In this study of 50 patients with hypothyroidism, 13 patients (26%) had BMI in the range of 18.5–24.99. 26 patients (about 52%) had in the range of 25-30. 11 patients (22%) had above 30. Female's patients being predominant in each group (Table 5).

Table 6: Pulse range of hypothyroid patients

			Sex		Total
			F	M	
Pulse rate range	< 60	Count	10(30.3%)	4(23.5%)	14(28.0%)
	60 – 100	Count	20(60.6%)	13(76.5%)	33(66.0%)
	> 100	Count	3(9.1%)	0(0.0%)	3(6.0%)
Total		Count	33	17	50

P value-0.340

Among the total of 50 hypothyroid patients, 14(28%) patients of whom 10 females and 4 males had a pulse rate less than 60. 33(66%) patients of whom 20 are females and 13 are males had a pulse rate ranging from 60-100 and 3(6%) females had above 100 (Table 6).

Table 7: Systolic blood pressure of hypothyroid patients

			Sex		Total
			F	M	
SBP Range	< 120	Count	6(18.2%)	5(29.4%)	11(22.0%)
	120 – 139	Count	25(75.8%)	10(58.8%)	35(70.0%)
	140 – 159	Count	2(6.1%)	2(11.8%)	4(8.0%)
Total		Count	33	17	50

P Value- 0.459

Among the total of 50 hypothyroid patients 11(22%) patients of whom are 6 females and 5 are males had systolic blood pressure of less than120. And 35(70%) of them, of whom 25 are females and 10 are males had in the range of 120-139. 4 (8%) patients (2 females and 2 males) had in the range of 140-159 (Table 7).

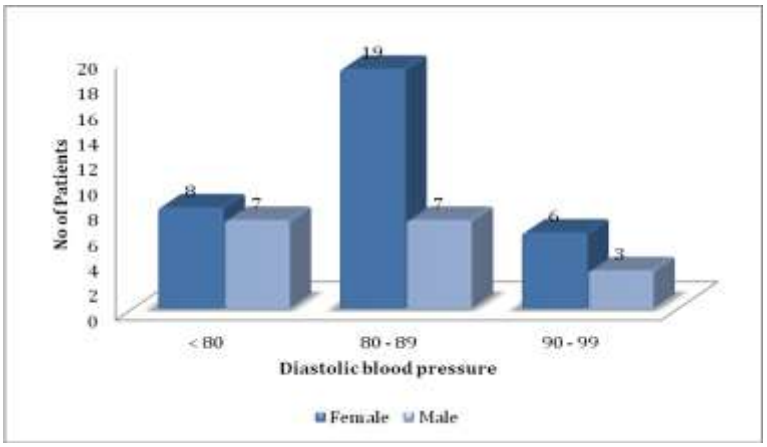

Fig. 1: Diastolic blood pressure of hypothyroid patients

Among the total of 50 hypothyroid patients 15(30%) patients of whom 8 are females and 7 are males had diastolic blood pressure of less than 80. And 26(52%) of them, of whom 19 are females and 7 are males had in the range of 80-89 and 9(18%) patients including 6 females and 3 male patients had in between 90-99 (Fig. 1).

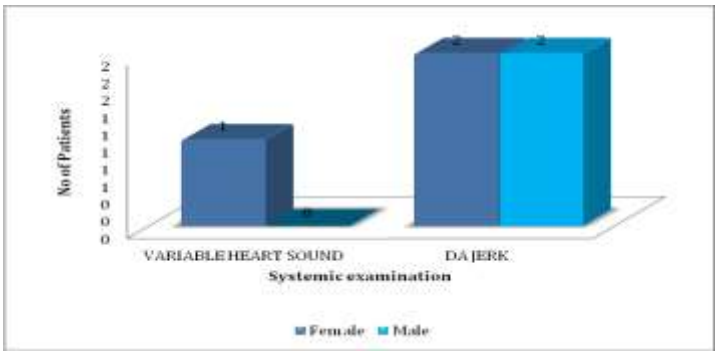

Fig. 2: Systemic examination of hypothyroid patients

In this study one female patient had variable heart sound: 2 female and 2 male patients had DA jerk. None had cardiomegaly (Fig. 2).

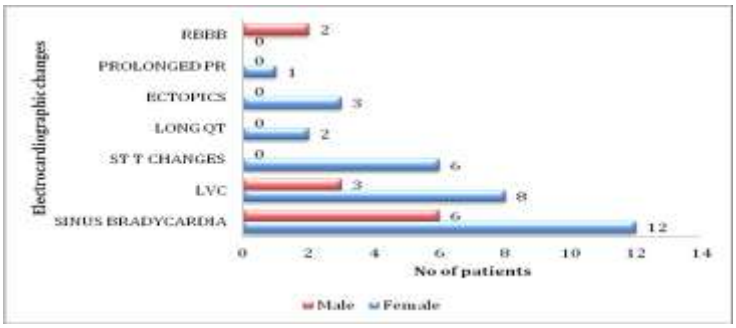

Fig. 3: ECG changes of hypothyroid patients

Among ECG changes, sinus bradycardia was commonest being present in 36% of patients, followed by Low voltage complexes in 22%, ST-T changes in 12%, Ectopics in 6%, Long QT in 4%, RBBB in 4% patients, and Prolonged PR in 2% (Fig. 3).

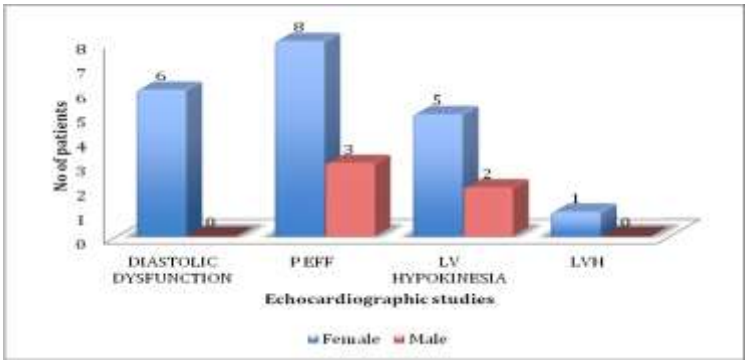

Fig. 4: Echocardiography findings of hypothyroid patients

In this study pericardial effusion (22%), Diastolic dysfunction (12%) being commonest echocardiographic changes in hypothyroid patients followed by, left ventricular hypokinesia in 14%, LVH in 2% of patients (Fig. 4).

Table 8: Descriptive statistics of hypothyroid patients

	N	Minimum	Maximum	Mean	Std. Deviation
AGE	50	21	75	39.34	13.039
SBP	50	100	144	125.84	10.543
DBP	50	60	94	80.68	7.726
HB	50	7	16	11.58	2.214
Cholestrol	50	147	345	233.18	43.431
SE TRI	50	79	589	198.06	82.415
HDL	50	30	86	42.54	11.620
LDL	50	88	254	148.02	40.679
FT3	50	0	3	1.60	1.069
FT4	50	0	1	.74	.443
TSH	50	5	151	49.26	44.690
BMI	50	21	33	26.84	3.099
Valid N (list wise)	50				

Discussion

Hypothyroidism is one of the most prevalent endocrine disorders. Many of the clinical symptoms and signs of hypothyroidism are nonspecific and most of the times the diagnosis is made with the help of thyroid function tests[16,25-26]. Often there is a difference of opinion regarding the best method of diagnosis as whether clinical or biochemical[14-15,25-26]. Hypothyroidism has various effects on cardiovascular system the prevalence of which has been studied earlier and reported in a varying proportion. There are very few studies which have focused on this issue in Indian population. Hence this study was done including 50 patients of hypothyroidism in a tertiary care hospital of south India.

Among 50 patients studied 16 patients had subclinical hypothyroidism and 34 patients had overt hypothyroidism. The age of patients in this present study ranged between 20-75 years, with the maximum number of patients lying in the age group between 20-40 years, which was about 56%. Hypothyroidism seems to be more common in middle aged females similar to studies done by Wg Cdr S Sampath et al[8] and Darshan Savery M et al[16].

In this present study, number of females was more than the number of males, similar to many earlier studies[1-5]. Among the general symptoms easy fatigability (52%) and weight gain (48%) were the commonest ones observed in our study population. In the study by Kawther T et al[11], fatigue was the commonest symptom (25%) followed by constipation (20%).

Wg Cdr S Sampath et al[8] had reported from his large study that fatigue (65%) and weight gain (62%) were the commonest symptoms of hypothyroidism. Darshan Savery et al[16] from south India has reported the same. Hence our study shows similar clinical picture of hypothyroidism as reported by most other authors.

In this present study, among the cardio vascular symptoms, dyspnoea (38%) was commonest, followed by palpitation (20%) and chest pain (8%). Edema was seen in 28% of the patients. Sinus bradycardia was seen in 36% of the patients, whereas many patients had a pulse rate in the lower normal limit. In Al-Farttoosi et al[17] study, 75% of the patients had breathlessness, which was seen in around 38% of patients in the current study. Angina was present in 11.1% of patients in Al-Farttoosi et al[17] study, whereas present study showed 8%. In Al-Farttoosi et al[17] study, bradycardia was present in 47.2% of patients, whereas the present study showed 36% of patients had bradycardia. They also found in their study that there was a significant elevation in the diastolic blood pressure, similar to the present study where 70% of patients had DBP>80.

Al-Farttoosi et al[17] stated that in their study that sinus bradycardia was the commonest ECG finding among the hypothyroid patients similar to the present study. Similar to Al-Farttoosi et al[17] study, current study also showed next common findings were low voltage complexes and ST-T changes respectively. In Agarwal et al[15] study, it was found that 15% of the patients had low voltage complex which was around 22.2% patients in the present study and around 10% of patients had ST-T changes which was around 12% in present study.

Pericardial effusion was seen in 32.5% patients in Hardisty et al[18] study and in Rawat B et al[19] study around 72% and in Gupta et al[20] study, it was 45.45% among hypothyroid patients. In this current study it was present in 22% among the 50 patients. Verma et al[21] stated from his study that pericardial effusion and diastolic dysfunction were the common cardiac problems prevalent in hypothyroidism. Diastolic dysfunction was present in 12% of our patients. Gupta et al (20) found there was a significant increase in interventricular septum (IVS) and left ventricular posterior wall (LVPW) thickness, whereas in this study only 2% of patients had LVH.

The mean LDL in this study group was 148.02 (STD = 40.679) with higher values seen in patients with higher TSH values similar to earlier studies done by John P Walsh et al (22) and Archana Prakash et al[23].

The mean TGL value was also high in this study group 198.06 (STD = 82.415) similar to the previous studies[22-24]. The mean HB value in this study group was 11.58 (std = 2.214), which is lower than normal but well known to be associated with hypothyroidism as reported earlier by Chanchal Das et al[25] where prevalence of anemia in subclinical and overt hypothyroid groups was 26.6% and 73.2%, respectively.

Conclusion

Based on the results it can be said that clinical findings being constant and more prevalent cannot be ignored for diagnosing hypothyroidism, however it should be well supported by biochemical tests. More importantly, the cardiovascular manifestations being increasingly prevalent should be always screened for while managing hypothyroid patients.

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