



Clinical, laboratory and cardiovascular profile of hypothyroid patients: A prospective observational study from a tertiary care centre.

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Abstract

Background: Hypothyroidism is a common endocrine disorder with a wide spectrum of clinical, biochemical, and cardiovascular manifestations. It often presents insidiously with non-specific symptoms, leading to delayed diagnosis and increased risk of metabolic and cardiac complications. Present study aimed to study the clinical, laboratory, and cardiovascular profile of hypothyroid patients at a tertiary care centre. **Material and Methods:** This prospective observational study was conducted over a period of two years (June 2023–May 2025) at a tertiary care hospital in India. A total of 150 adult patients diagnosed with hypothyroidism were included. Detailed clinical evaluation and laboratory investigations including thyroid function tests, lipid profile, ECG, 2D echocardiography, and ultrasonography of thyroid were performed. Data were analyzed using SPSS version 23.0, and appropriate statistical tests were applied. **Results:** The majority of patients belonged to the 21–40-year age group (50.7%) with a female predominance (78%). Overweight and obesity were observed in 77.4% of patients. Most patients had TSH levels between 10–50 mIU/L (52%). Fatigue (84.7%) and weight gain (70.0%) were the most common symptoms, while facial puffiness (63.3%) and dry skin (57.3%) were the predominant signs. ECG abnormalities were observed in 44% of patients, with low voltage QRS (16.7%) and sinus bradycardia (12%) being common. Echocardiography revealed pericardial effusion (12.7%) and diastolic dysfunction (12%) as frequent findings. Diffuse hypoechogenicity was the most common ultrasonographic feature (34%). Dyslipidemia was significantly associated with higher TSH levels. **Conclusion:** Hypothyroidism commonly affects young to middle-aged females and is strongly associated with obesity and dyslipidemia. Significant cardiovascular involvement underscores the importance of early diagnosis and comprehensive evaluation to prevent complications.

Keywords: Hypothyroidism, TSH, Dyslipidemia, Echocardiography, Cardiovascular manifestations, Obesity.



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INTRODUCTION

Hypothyroidism is a clinical state characterized by reduced production of thyroid hormone. Thyroid diseases are the most common endocrine disorders worldwide.⁴ Hypothyroidism in adults has an insidious onset with a range of non-specific symptoms resulting in delayed diagnosis. Hypothyroidism is characterized by a broad clinical spectrum ranging from an overt state of myxedema, end-organ effects and multisystem failure to an asymptomatic or subclinical condition with normal level of thyroxine and triiodothyronine and mildly elevated levels of serum thyrotropin.¹

Hypothyroidism, defined as an elevated serum TSH concentration and reduced free thyroxine concentration (fT4), and subclinical or mild hypothyroidism, a number of clinical manifestations have been associated with this early or mild phase of hypothyroidism, we will use the term overt, subclinical to describe this group, as is used in most clinical studies. Subclinical hypothyroidism is defined as an elevated serum TSH level with a normal serum fT4 concentration.^{1,2}

Cardiovascular effects of thyroid hormones are well known and abnormalities well documented and have attracted a great deal of importance. The most common cardiac abnormality observed in patients with hypothyroidism is left Ventricular (LV) diastolic function, which is due to abnormally slowed myocardial relaxation and impaired early ventricular filling. In almost all cases these cardiovascular changes are reversible when the underlying thyroid disorder is recognized and treated promptly.^{3,4} Present study was aimed to study clinical, laboratory and cardiovascular profile of hypothyroid patients at a tertiary care centre..

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MATERIALS AND METHODS

Present study was single-center, prospective, observational study, conducted in Department of General Medicine, at XXX medical college & hospital, XXX, India. Study duration was of 2 years (From June 2023 to May 2025). Study was approved by institutional ethical committee.

All patients diagnosed with hypothyroidism coming to OPD, admitted in wards and ICU at tertiary care center during period of study. A total of 150 patients of hypothyroidism meeting inclusion and exclusion criteria willing to be part of study during study period.

Inclusion criteria

- Patients above 18 years, diagnosed with hypothyroidism coming to OPD, Admitted in wards, ICU, willing to participate

Exclusion criteria

- Those not willing to give consent
- All patients below 18 years.

Study was explained to participants in local language & written informed consent was taken. All clinical details noted by history taking & clinical examination. All relevant investigations such as TSH levels, Sr. T3, Sr. T4, Routine labs (CBC, LFT, KFT, RBS), Lipid profile, ECG, 2D Echo, USG were done in all patients. Standard and pulsed wave Doppler echocardiograms were obtained in all patients. All subjects were examined in the left lateral decubitus position, using a commercially available ultrasound system In Echocardiography.

Data was collected and compiled using Microsoft Excel, analysed using SPSS 23.0 version. Frequency, percentage, means and standard deviations (SD) was calculated for the continuous variables, while ratios and proportions were calculated for the categorical variables. Difference of proportions between qualitative variables were tested using chi-square test or Fisher exact test as applicable. P value less than 0.5 was considered as statistically significant.

RESULTS

The most common age group is 21-40 years, with 76 patients (50.7%). Female are commonly affected in hypothyroidism (78%) than males (22.0%). 116 patients were obese and overweight (77.4%).

Table 1- General characteristics

Characteristics	No. of subjects	Percentage
Age group (in years)		
≤20	18	12.0
21–30	34	22.7
31–40	42	28.0
41–50	30	20.0
51–60	18	12.0
>60	8	5.3
Gender		
Male	33	22.0
Female	117	78.0
BMI Category		
Malnourished (<18.5)	6	4.0
Normal (18.5–24.9)	28	18.7
Overweight (25.0–29.9)	46	30.7
Obese (≥30.0)	70	46.7

The majority of patients has TSH value in between 10-50 mIU/L (52%), followed by TSH value in between 50-100 mIU/L (26.7%) followed by TSH value is >100 mIU/L.

Table 2: TSH Level Distribution of patients

TSH Range (mIU/L)	Number of Patients	Frequency (%)
≤10	12	8.0
10–50	78	52.0
50–100	40	26.7
>100	20	13.3

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The most common clinical sign is Facial Puffiness, observed in 95 patients (63.3%), followed by dry Skin, observed in 86 patients (57.3%), followed by anemia, observed in 31 patients (20.7%).

The most common symptom is Fatigue, reported by 127 patients (84.7%) f/b Weight Gain, reported by 105 patients (70.0%), f/b Sweating, reported by 22 patients (14.7%).

Table 3: Clinical features

Signs	Number of Patients	Frequency (%)
Facial Puffiness	95	63.3
Dry Skin	86	57.3
Diffuse Alopecia	71	47.3
Goiter	60	40.0
Delayed Tendon Reflexes	50	33.3
Cold Peripheries	49	32.7
Peripheral Edema	47	31.3
Hoarse Voice	36	24.0
Anemia	31	20.7
Symptoms		
Fatigue	127	84.7
Weight Gain	105	70.0
Cold Intolerance	100	66.7
Hair Loss	91	60.7
Constipation	89	59.3
Poor Memory / Concentration	67	44.7
Irregular Menses*	40	34.2
Dyspnea	42	28.0
Sweating	22	14.7

*In females only

The most common ECG finding is Low Voltage QRS, in 25 patients (16.7%) followed by sinus bradycardia in 18 patients (12%) f/b Non-Specific ST-T Changes in 13 patients (8.7%) f/b other abnormalities in 10 patients (6.7%).

Table 4: ECG Findings observed in Patients

Finding	Number	Frequency (%)
Low Voltage QRS	25	16.7
Sinus Bradycardia	18	12.0
Non-Specific ST-T Changes	13	8.7
Other abnormalities	10	6.7
Normal	84	56

The most common echo finding is Pericardial Effusion, in 19 patients (12.7%) Diastolic Dysfunction, in 18 patients (12.0%) followed by Concentric LV Hypertrophy in 15 patients (10%), f/b Valvular Heart Disease in 5 patients (3.3%).

Table 5: Echocardiographic Findings observed in Patients

Finding	Number	Frequency (%)
Pericardial Effusion	19	12.7
Diastolic Dysfunction	18	12.0
Concentric LV Hypertrophy	15	10.0
Valvular Heart Disease	5	3.3
Normal	93	62.0

In present study, USG findings were diffuse hypoechogenecity in 51 patients (34%) f/b Nodular Thyroid in 21 patients (14%) f/b Atrophic Thyroid in 9 patients (6%).

Table 6: USG Thyroid Findings observed in patients

Finding	Number of Patients	Frequency (%)
Normal Thyroid Echotexture	69	46.0
Diffuse Hypoechogenicity	51	34.0
Nodular Thyroid	21	14.0
Atrophic Thyroid	9	6.0

Dyslipidemia was more common in higher TSH level of >10mIU/L.

Table 7: TSH Level and Correlation with Lipid Profile

TSH Level	Cholesterol <200	Cholesterol ≥200	Total
≤10	10	2	12
10–50	32	46	78
50–100	8	32	40
>100	1	19	20
Total	51	99	150

DISCUSSION

Hypothyroidism is a common endocrine disorder with a diverse clinical presentation and significant systemic implications, particularly affecting cardiovascular and metabolic health. most common age group being 21-40 years (50.7%) and the mean age is 38.6 years. In a cross-sectional study by Lakshetty et al.,⁵ majority patients were in the age group 31–40 years (40%) and a mean age of 42.02 years. In study by Unnikrishnan et al.,⁶ young to middle-aged adults (18-40 years) demonstrate a progressive increase in hypothyroidism prevalence with advancing age, rising from 7.53% in the youngest group to over 13% by the fifth decade, which found a higher mean age of 46.0 years.

The younger age distribution is supported by research showing that thyroid hormone requirements vary significantly across the lifespan, with younger individuals requiring more aggressive treatment approaches compared to elderly patients where higher TSH levels may represent normal aging. The concentration of hypothyroidism cases in the fourth decade suggests that screening programs should be intensified during this period.

females are most affected (78.0%). In study by Kumar et al.,⁷ in Madhya Pradesh India showing 65.0% female patients. Unnikrishnan et al.,⁶ reported 53.7% females in large epidemiological cohort. In a cross-sectional study by Lakshetty et al.,⁵ predominantly included patients in the age group 31–40 years (40 %) with female preponderance (76%).

The marked female predominance reflects fundamental sex differences in immune function and autoimmune susceptibility. Women demonstrate higher rates of thyroid peroxidase (TPO) antibodies across all age groups, with prevalence reaching 30% in women over 80 years compared to 12% in similarly aged men.

fatigue emerged as the predominant symptom (84.7%) in the current study. facial puffiness as the most frequent finding (63.3%). In a cross sectional study by Kumar et al.,⁵ majority patients had fatigue (70 %) & facial puffiness (65.0%). Agarwal et al.,⁸ conducted a prospective observational study evaluating prevalence and clinical significance of hypothyroidism (80.0% fatigue).

Studies demonstrate that fatigue often persists even after biochemical normalisation, suggesting that optimal treatment requires attention to muscle rehabilitation and exercise therapy alongside hormone replacement. The consistency of facial puffiness across studies makes it a reliable physical finding for clinical diagnosis. The high prevalence suggests this sign should be systematically assessed and photographically documented for treatment monitoring.

majority of patients has TSH value in between 10-50 mIU/L (52%), followed by TSH value in between 50-100 mIU/L (26.7%) followed by TSH value is >100 mIU/L. In study by Vaghela NN et al.,⁹ in the mild category, there were 20 patients (33.4%) with TSH levels ranging from 0.5 to 20 mU/L. The moderate category included 26 patients (43.3%) with TSH levels ranging from 20 to 50 mU/L. The severe category comprised 14 patients (23.3%) with TSH levels exceeding 50 mU/L. Garber et al.,¹⁰ emphasise the importance of FT4 and FT3 alongside TSH for comprehensive assessment, supporting the current study's comprehensive approach.

The finding that 52% of patients had TSH levels between 10-50 mIU/L represents a more severe disease profile compared to many comparison studies and has significant treatment implications. The high proportion of severe cases suggests delayed diagnosis or inadequate screening programs. This pattern indicates need for enhanced primary care screening protocols and public health awareness campaigns.

In present study, 116 patients were obese and overweight (77.4%). So obesity was more commonly present with hypothyroidism. G Sreenivas Reddy et al.,¹¹ demonstrated a significant positive correlation between increased BMI and elevated TSH levels, reflecting thyroid dysfunction in obese patients. Pearce et al.,¹² concluded that obesity and hypothyroidism are frequently associated; mild elevations in TSH are common in obese 30-70% individuals. The present study demonstrates that hypothyroidism is significantly associated with increased BMI. Higher TSH levels correlate with greater BMI. These findings highlight the need for integrating BMI monitoring into hypothyroidism management, as elevated BMI increases the risk of metabolic and cardiovascular complications in this population. Dyslipidemia prevalence (cholesterol ≥ 200 mg/dL in 66.0% of patients). A striking 77% of hypothyroid patients were overweight or obese (BMI ≥ 25). O'Briens et al.,¹³ noted that, total HDL/LDL cholesterol and LDL/HDL cholesterol ratios significantly increased in both males and females patients. Marwaha RK et al.,¹⁴ studied 5,343 Indian subjects, adults with hypothyroidism and TSH > 10 mIU/L exhibited significantly higher TC and LDL-C compared with euthyroid controls, whereas those with TSH ≤ 10 mIU/L showed no lipid abnormalities. Serum TSH correlated positively—and free T3 and T4 negatively—with TC and LDL-C. This highlights a TSH-dependent atherogenic lipid profile in higher-TSH hypothyroidism.

Elevated TSH associated with increasing prevalence of high cholesterol (≥ 200 mg/dL), reflecting the well-established link between hypothyroidism and dyslipidemia. The high dyslipidemia prevalence necessitates systematic cardiovascular risk assessment including lipid monitoring at 6-8 week intervals during treatment initiation, then every 6-12 months once stable. ECG abnormalities were seen in 44% of patients, primarily low voltage QRS (16.7%) and sinus bradycardia (12%). Singh et al.,¹⁵ found around 40-45% ECG changes in hypothyroid subjects, highlighting common findings such as sinus bradycardia, low QRS voltage, and T-wave flattening. Framingham Heart Study¹⁶ demonstrated that patients with overt hypothyroidism showed decreased ventricular filling, decreased cardiac contractility, and reduced cardiac output by 30-50%. Subclinical hypothyroidism showed more subtle but measurable effects on cardiac function, with some studies demonstrating mild systolic and diastolic dysfunction that was reversible with levothyroxine treatment. Another research demonstrated that both thyroid hormone excess and deficiency can induce or exacerbate cardiovascular disorders, including arrhythmias, atherosclerotic vascular disease, dyslipidemia, and heart failure. Subclinical thyroid dysfunction also increases cardiovascular risk in certain subgroups.¹⁷

Echocardiography demonstrated pericardial effusion (12.7%) and diastolic dysfunction (12%) as the leading abnormalities. Shende et al.,¹⁸ reported echocardiographic findings in hypothyroidism including left ventricular diastolic dysfunction and pericardial effusion, consistent with multiple other studies showing functional cardiac impairment detected by 2D echo in hypothyroid patients. Saxena et al.,¹⁹ observed abnormalities in 2D echocardiography in 38% of hypothyroid patients, with mild pericardial effusion and left ventricular diastolic dysfunction Grade 1 being the most common findings.

Cardiac abnormalities in hypothyroidism are generally reversible with appropriate thyroid hormone replacement. However, improvement may be gradual, requiring serial monitoring. The current findings suggest that cardiac evaluation should be integrated into treatment protocols rather than reserved for symptomatic patients. The convergence of findings between the current study and these prestigious international medical centres validates the clinical significance of the observed abnormalities and supports the need for comprehensive, multidisciplinary management approaches for hypothyroid patients with cardiovascular manifestations.

Limitations of study was, as an observational prospective study, whatever inference got is merely result of observations. Implications of present study in general population were, change in lifestyles, awareness towards weight control, awareness towards physical and mental health will reduce prevalence of hypothyroidism in general population. Early detection of cardiovascular manifestation in general population will reduce complication and early treatment will halt complications of hypothyroidism.

CONCLUSION

This study highlights that hypothyroidism predominantly affects females in the 21–40-year age group, with a significant association with overweight and obesity. Most patients presented with elevated TSH levels (10–50 mIU/L), indicating moderate to severe disease at diagnosis. Fatigue, weight gain, and facial puffiness were the most common clinical features. Cardiovascular and metabolic involvement, including ECG/ECHO abnormalities, dyslipidemia, and diffuse hypoechogenicity on ultrasonography, were notably associated with higher TSH levels.

Conflict of Interest: None to declare

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