Section: General Medicine

Original Research Article

PREVALENCE AND PATTERN OF THYROID DYSFUNCTION IN NEWLY DIAGNOSED TYPE 2 DIABETES MELLITUS PATIENTS: A CROSS-SECTIONAL STUDY

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ABSTRACT

Background: Type 2 diabetes mellitus (T2DM) and thyroid dysfunction are common endocrine disorders that may coexist because of their interrelated effects on glucose metabolism and hormonal regulation. This study aimed to determine the prevalence and pattern of thyroid dysfunction among newly diagnosed patients with type 2 diabetes mellitus attending Shri Lal Bahadur Shastri Government Medical College and Hospital, Mandi, at Nerchowk, Himachal Pradesh, India.

Materials and Methods: This observational study included 116 newly diagnosed patients with T2DM attending the Department of General Medicine at the study center. Clinical and biochemical assessments included measurement of glycated hemoglobin (HbA1c) and serum thyroid hormones (T3 and T4) and thyroid-stimulating hormone (TSH). Thyroid dysfunction was classified as subclinical or overt hypothyroidism or hyperthyroidism according to the study-specific biochemical criteria. Associations of thyroid dysfunction with age, sex, body mass index (BMI), and HbA1c were assessed.

Results: Of the 116 participants, 22 (19.0%) had thyroid dysfunction, while 94 (81.0%) had normal thyroid function. Subclinical hypothyroidism was the most common abnormality, affecting 10 participants (8.6%), followed by overt hypothyroidism in 7 (6.0%), subclinical hyperthyroidism in 3 (2.6%), and overt hyperthyroidism in 2 (1.7%). A statistically significant association was reported between body mass index (BMI) and thyroid dysfunction ($p < 0.001$), whereas no statistically significant associations were observed with age ($p = 0.752$), sex ($p = 0.359$), or glycated hemoglobin (HbA1c) ($p = 0.591$).

Conclusion: Thyroid dysfunction was reported in approximately one-fifth of newly diagnosed T2DM patients, with subclinical hypothyroidism being the most common pattern. These findings highlight the potential importance of evaluating thyroid function in this population.

Keywords: Type 2 diabetes mellitus; thyroid dysfunction; subclinical hypothyroidism; body mass index; HbA1c; Himachal Pradesh.

INTRODUCTION

Diabetes mellitus is a group of metabolic disorders characterized by chronic hyperglycaemia resulting from defects in insulin secretion, insulin action, or both. Type 2 diabetes mellitus (T2DM), which accounts for most cases of diabetes, is characterized by insulin resistance and progressive impairment of pancreatic β-cell function. Diagnostic criteria are based on glycated hemoglobin (HbA1c) and plasma glucose measurements.[1,2]

Thyroid dysfunction and diabetes mellitus are common endocrine disorders that may coexist and influence one another through effects on glucose and lipid metabolism. Thyroid hormones regulate energy expenditure, hepatic glucose production, insulin sensitivity and peripheral glucose utilization. Hypothyroidism may alter lipid metabolism and insulin sensitivity, whereas hyperthyroidism may

increase hepatic glucose production and insulin requirements. These mechanisms provide a physiological basis for the clinical association between thyroid dysfunction and diabetes.[3,4]

The prevalence of thyroid dysfunction among people with diabetes varies across populations and depends on factors such as age, sex, iodine status, assay methods, and the biochemical thresholds used to define thyroid dysfunction. Perros et al. reported thyroid dysfunction in 13.4% of a diabetic outpatient population, with subclinical hypothyroidism being the most frequent newly detected abnormality.[5]

Studies from different countries have reported varying prevalence estimates. Palma et al. described thyroid dysfunction among patients with diabetes, while Jali et al. reported a prevalence of 16.2% in a hospital-based study of 713 patients with T2DM.[6,7]

Studies from India have also documented a substantial burden of thyroid abnormalities, although differences in patient selection and laboratory definitions limit direct comparisons.[8,9]

Khassawneh et al. reported thyroid dysfunction in 26.7% of patients with type 2 diabetes mellitus (T2DM), with subclinical hypothyroidism being the most common abnormality.[10] Ogbonna and Ezeani investigated risk factors associated with thyroid dysfunction in patients with T2DM, including demographic and metabolic factors.[11] A systematic review and meta-analysis published in 2024 estimated the pooled prevalence of thyroid dysfunction among adults with T2DM to be 20.24%, with subclinical hypothyroidism being the most frequent subtype.[12]

Although type 2 diabetes mellitus (T2DM) and thyroid dysfunction have been widely studied, their prevalence varies across populations. Limited data are available on thyroid dysfunction in newly diagnosed T2DM patients from the Himalayan region. Therefore, this study aimed to determine the prevalence and pattern of thyroid dysfunction among newly diagnosed T2DM patients attending Shri Lal Bahadur Shastri Government Medical College and Hospital, Mandi, at Nerchowk, Himachal Pradesh, India, and to assess its association with age, sex, BMI, and HbA1c.

MATERIALS AND METHODS

This hospital-based cross-sectional study was conducted in the Department of General Medicine at Shri Lal Bahadur Shastri Government Medical College and Hospital, Mandi, at Nerchowk, Himachal Pradesh, India, over a period of one year.

The study included 116 newly diagnosed patients with type 2 diabetes mellitus (T2DM). Patients with type 1 diabetes, gestational diabetes, secondary diabetes, previously diagnosed thyroid dysfunction, or unwillingness to provide informed consent were excluded.

Clinical and demographic details were recorded. Investigations included fasting and postprandial blood glucose, glycated hemoglobin (HbA1c), lipid profile, renal and liver function tests, serum electrolytes, and thyroid function tests. Height and weight measurements were used to calculate body mass index (BMI).

Serum T3, T4, and thyroid-stimulating hormone (TSH) levels were measured using electrochemiluminescence immunoassay (ECLIA) on the COBAS e 411 analyzer. Thyroid status was classified as subclinical hypothyroidism, overt hypothyroidism, subclinical hyperthyroidism, overt hyperthyroidism, or euthyroid status according to the laboratory reference ranges documented in the original study.

Data was analyzed using the statistical software employed in the original study. Continuous variables were expressed as mean ± standard deviation, and categorical variables as frequencies and percentages. Associations between thyroid dysfunction and selected demographic and clinical variables were assessed. A p-value <0.05 was considered statistically significant.

Ethical Considerations: Institutional Ethics Committee approval was obtained, and written informed consent was obtained from all participants. Participant confidentiality was maintained.

RESULTS

A total of 116 newly diagnosed type 2 diabetes mellitus (T2DM) patients were enrolled in the study. The baseline demographic and clinical characteristics, biochemical parameters, prevalence and pattern of thyroid dysfunction and the association of selected variable with thyroid dysfunction are presented below.

Baseline Demographic and Clinical Characteristic: The mean age of the participants was 59.02 ± 13.70 years. Among the 116 patients, 63 (54.3%) were males and 53 (45.7%) were females. Most participants were from Mandi district (112; 96.6%). A history of alcohol consumption was reported in 29 (25.0%) participants, while 41 (35.3%) reported smoking [Table 1].

Table 1: Background information of study participants (N = 116)

Variable	Value
Age (years), mean ± SD	59.02 ± 13.70
Male Sex, n (%)	63 (54.3)
Female Sex, n (%)	53 (45.7)
District (Mandi), n (%)	112 (96.6)
Other Districts, n (%)	4 (3.4)
Alcohol consumption (Yes) n (%)	29 (25.0)

Alcohol consumption (No) n (%)	87 (75.0)
Smoking (Yes) n (%)	41 (35.3)
Smoking (No) n (%)	75 (64.7)

Biochemical Parameters: The mean fasting blood glucose (FBS) was 200.16 ± 72.85 mg/dL, and the mean postprandial blood glucose (PPBS) was 276.33 ± 85.12 mg/dL. The mean HbA1c level was 9.69 ± 2.51%. The mean thyroid hormone levels were: T3, 100.41 ± 44.66 ng/dL, T4, 6.80 ± 4.05 µg/dL, and TSH, 5.97 ± 12.75 µIU/mL [Table 2].

Table 2: Blood Investigations (N-116)

Test	Mean ± SD
Fasting Blood Sugar (mg/dL)	200.16 ± 72.85
Post-Prandial Blood Sugar (mg/dL)	276.33 ± 85.12
HbA1c (%)	9.69 ± 2.51
T3 (ng/dL)	100.41 ± 44.66
T4 (µg/dL)	6.80 ± 4.05
TSH (µIU/mL)	5.97 ± 12.75

Table 3: Distribution of Thyroid dysfunction (N-116)

Thyroid Status	Frequency	Percentage
Normal Thyroid Function	94	81.0%
Overt Hyperthyroidism	2	1.7%
Overt Hypothyroidism	7	6.0%
Subclinical Hyperthyroidism	3	2.6%
Subclinical Hypothyroidism	10	8.6%
Total	116	100.0

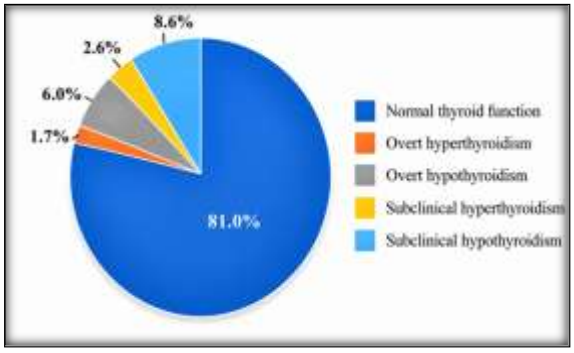


Figure 1: Distribution of thyroid function status among study participants (N = 116).

Prevalence and Pattern of Thyroid Dysfunction: Out of 116 participants, 22 (19.0%) had thyroid dysfunction, while 94 (81.0%) had normal thyroid function. Subclinical hypothyroidism 10 (8.6%), overt hypothyroidism in 7 (6.0%) were most common types, followed by subclinical hyperthyroidism in 3 (2.6%), and overt hyperthyroidism in 2 (1.7%) [Table 3, Figure 1].

Age-Wise Distribution: The distribution of thyroid dysfunction across age groups is shown in Table 4 and Figure 2. There was no statistically significant association between age groups and thyroid dysfunction (P=0.752).

Table 4: Age-wise distribution of thyroid dysfunction.

Age group (Years)	Overt Hyperthyroidism		Overt Hypothyroidism		Subclinical Hyperthyroidism		Subclinical Hypothyroidism	
	n	%	n	%	n	%	N	%
31-40	0	0.0	1	14.3	0	0.0	1	10.0
41-50	1	50.0	3	42.9	0	0.0	4	40.0
51-60	1	50.0	0	0.0	1	33.3	1	10.0
61- 70	0	0.0	2	28.6	1	33.3	1	10.0
71- 80	0	0.0	1	14.3	1	33.3	3	30.0
≥81	0	0.0	0	0.0	0	0.0	0	0.0
Total	2	100.0	7	100.0	3	100.0	10	100.0

Association with Thyroid Dysfunction: The association of selected variables with thyroid dysfunction is shown in Table 5. There was no statistically significant association between age group (p=0.752), sex (p=0.359), or HbA1c levels (p=0.591) and thyroid dysfunction. A significant association was observed between BMI and thyroid dysfunction (p<0.001)

Table 5: Association of selected variables with thyroid dysfunction

Variable	p-value	Statistical Significance
Age Group	0.752	Not Significant
Sex	0.359	Not Significant
HbA1c	0.591	Not Significant
BMI	<0.001	Significant

The distribution of body mass index (BMI) categories across the different thyroid status groups is illustrated in [Figure 3]. Among participants with normal thyroid function, most were in the normal BMI category, followed by those classified as obese or overweight. The distribution of BMI categories varied across the thyroid dysfunction groups. The association between BMI and thyroid dysfunction was statistically significant ($p < 0.001$).

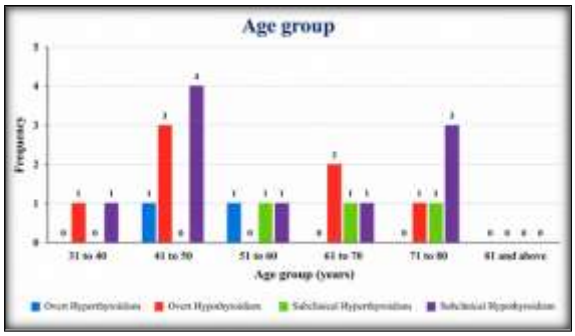


Figure 2: Distribution of age group based on thyroid dysfunction.

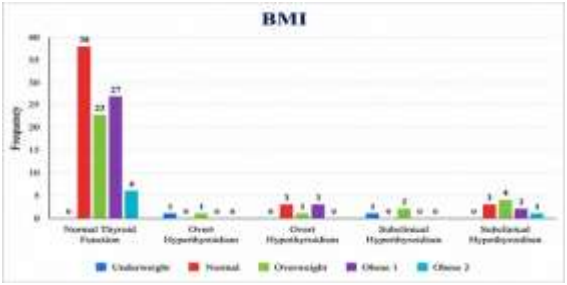


Figure 3: Distribution of BMI categories by thyroid status

DISCUSSION

In this study, 116 newly diagnosed patients with type 2 diabetes mellitus (T2DM) were assessed. Thyroid dysfunction was found in 22 patients (19.0%), while 94 (81.0%) had normal thyroid function. Subclinical hypothyroidism was the most common abnormality. The prevalence of thyroid dysfunction in our study (19.0%) was similar to that reported in a recent systematic review (20.24%). However, differences in study populations and diagnostic criteria should be considered when comparing the findings.[12]

Prevalence and Pattern of Thyroid Dysfunction: In the present study, subclinical hypothyroidism was observed in 10 participants (8.6%), while overt hypothyroidism was found in 7 (6.0%). Subclinical and overt hyperthyroidism were observed in 3 (2.6%) and 2 (1.7%) participants, respectively. Perros et al. reported thyroid dysfunction in 13.4% of diabetic outpatients, with subclinical hypothyroidism being the most common newly detected abnormality.[5] Palma et al. also reported thyroid dysfunction among patients with diabetes.[6] Similarly, Jali et al. reported a prevalence of 16.2% in a study involving 713 patients with T2DM, with hypothyroidism being prominent.[7] A study from Eastern India also reported a high frequency of subclinical hypothyroidism among patients with T2DM, although differences in the study population and clinical setting should be considered when comparing the findings.[8]

Khassawneh et al. reported thyroid dysfunction in 26.7% of patients with T2DM, with subclinical hypothyroidism being the most common type.[10] A 2024 systematic review and meta-analysis by Hadgu et al. reported a pooled prevalence of thyroid dysfunction of 20.24%, including 11.87% for subclinical hypothyroidism and 7.75% for hypothyroidism.[12] The prevalence in our study (19.0%) was similar to the pooled estimate. However, these findings should be compared cautiously because our study included only newly diagnosed patients and used total T3, total T4, and TSH levels with the laboratory reference ranges specified in the study protocol.

Association with Age and Sex: No, statistically significant association was observed between thyroid dysfunction and age group ($p = 0.752$) or sex ($p = 0.359$). However, this does not mean that age and sex are unrelated to thyroid dysfunction, as the relatively small number of affected participants may have limited the ability to detect significant associations. In contrast, Khassawneh et al. reported a higher likelihood of thyroid dysfunction among participants aged 50 years or older and women.[10] Jali et al. also reported a higher prevalence among women and participants aged 50 years or older.[7] The 2024 meta-analysis similarly identified female sex as an associated factor.[12] Differences in sample size, patient characteristics, and diagnostic criteria may partly explain these variations in findings.

Association with Glycaemic Control: The mean HbA1c level in the present study was 9.69 ± 2.51%, indicating generally poor glycaemic control. No, statistically significant association was observed between HbA1c levels and thyroid dysfunction ($p = 0.591$). However, this finding does not establish that glycaemic control is unrelated to thyroid dysfunction. Khassawneh et al. reported an association between HbA1c levels greater than 7% and thyroid dysfunction, while Ogbonna and Ezeani identified poor glycaemic control as a risk factor in their study population.[10,11] Similarly, the meta-analysis by Hadgu et al. found that HbA1c levels ≥7% were associated with thyroid dysfunction.[12]

Association with Body Mass Index: A statistically significant association was observed between BMI and thyroid dysfunction ($p < 0.001$). Previous studies have examined obesity and central obesity as potential correlates of thyroid dysfunction in patients with T2DM.[10,11] However, the present study cannot establish an independent association without an appropriate adjusted statistical analysis.

Clinical Implications: Thyroid hormones play important roles in glucose homeostasis, lipid metabolism, and energy expenditure. Coexisting thyroid dysfunction may complicate the assessment and management of diabetes.[3,4,13] The identification

of thyroid abnormalities in 19.0% of participants highlights the importance of considering possible thyroid disease in newly diagnosed patients with T2DM, particularly when symptoms or biochemical findings suggest thyroid dysfunction. However, as this cross-sectional study did not assess whether universal thyroid screening improves clinical outcomes, its findings alone do not establish the need for a universal screening policy.

A major strength of this study is its focus on newly diagnosed patients with type 2 diabetes mellitus (T2DM), providing data on the prevalence and pattern of thyroid dysfunction in a tertiary-care population in Himachal Pradesh. The study describes both overt and subclinical thyroid abnormalities and includes relevant demographic, clinical, and biochemical parameters. These findings contribute regional data to the existing literature on thyroid dysfunction in newly diagnosed patients with T2DM.

CONCLUSION

In this hospital-based study, thyroid dysfunction was identified in 22 of 116 patients (19.0%) with newly diagnosed type 2 diabetes mellitus (T2DM). Subclinical hypothyroidism was the most common abnormality, followed by overt hypothyroidism. No statistically significant associations were observed with age, sex, or HbA1c, whereas a statistically significant association was observed between BMI and thyroid dysfunction. These findings provide regional data on thyroid dysfunction in newly diagnosed patients with T2DM and highlight the need for further research in this population.

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