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Original Article

PREVALENCE OF SUBCLINICAL THYROID DYSFUNCTION AMONG PATIENTS WITH TYPE 2 DIABETES MELLITUS ATTENDING A TERTIARY CARE HOSPITAL

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ABSTRACT

Background: Thyroid dysfunction, especially subclinical thyroid abnormalities, is more prevalent in patients with type 2 diabetes mellitus (T2DM) due to complex metabolic and endocrine interactions. Early detection is crucial to optimize metabolic control and reduce long-term complications. This study evaluates the prevalence, pattern, and determinants of subclinical thyroid dysfunction among T2DM patients in northeastern West Bengal.
Methods: A cross-sectional study was conducted among 172 T2DM patients attending a tertiary care hospital. Demographic, clinical, biochemical, and thyroid parameters (TSH, FT3, FT4, Anti-TPO) were assessed. Thyroid dysfunction was classified as per ATA guidelines. Statistical analysis was performed using SPSS; $p < 0.05$ was considered significant.
Results: Thyroid dysfunction was present in 55.8% of patients. Subclinical hypothyroidism (32.6%) was the most prevalent subtype. Thyroid dysfunction was significantly higher in females ($p = 0.017$). Dyslipidemia (77.9%), neuropathy (57%), nephropathy (30.2%), and Anti-TPO positivity (31.4%) were more common among thyroid-abnormal patients. Longer diabetes duration was associated with subclinical hypothyroidism.
Conclusion: Subclinical thyroid dysfunction is highly prevalent in T2DM patients. Routine thyroid screening should be integrated into diabetes follow-up, particularly in females, patients with long-standing diabetes, and those with poor metabolic control.

Keywords*: Type 2 diabetes mellitus, Subclinical hypothyroidism, Thyroid dysfunction, Anti-TPO, Prevalence.*

INTRODUCTION:

Type 2 diabetes mellitus (T2DM) is a major global public health concern, with India currently ranking among the countries with the highest burden [1]. Chronic hyperglycemia in T2DM leads to metabolic derangements affecting multiple organs and endocrine axes [2]. Thyroid dysfunction (TD) is the most common endocrine disorder coexisting with diabetes, and both conditions influence each other through several hormonal and metabolic pathways [3].

The thyroid gland regulates metabolic rate, lipid metabolism, glucose homeostasis, and thermogenesis. Even mild alterations in thyroid function—termed **subclinical thyroid dysfunction**—can affect insulin sensitivity, lipid metabolism, and cardiovascular function [4]. Subclinical hypothyroidism, characterized by elevated TSH with normal free T4, is particularly common in T2DM and is associated with dyslipidemia, endothelial dysfunction, and increased cardiovascular risk [5].

Studies across the world have reported varying prevalence of thyroid dysfunction among T2DM patients, ranging from 10% to 46% [6–10]. Radaideh et al. (2004) reported 12.5% prevalence of subclinical hypothyroidism in T2DM patients [7], while Wang et al. (2017) identified thyroid disease as significantly more common in diabetes compared to the general population [8]. Indian data also demonstrate high prevalence, with Gupta et al. reporting 14.6% and Singh et al. reporting 22% thyroid dysfunction in T2DM cohorts [9,10].

Mechanisms linking thyroid dysfunction and T2DM include insulin resistance, autoimmune predisposition, alterations in deiodinase activity, and dysregulation of the hypothalamic–pituitary–thyroid (HPT) axis [11]. Anti-TPO antibody-mediated autoimmunity further contributes to subclinical hypothyroidism in diabetics [12].
Given regional variations and limited data from northeastern India, this study was undertaken to determine the prevalence and pattern of subclinical thyroid dysfunction in T2DM patients attending a tertiary care hospital.

Objectives:

1. To determine the prevalence of subclinical thyroid dysfunction among patients with T2DM.
2. To assess the pattern and distribution of thyroid abnormalities in T2DM.
3. To evaluate the association between thyroid dysfunction and demographic, clinical, and biochemical parameters.

Materials and Methods:

(With continuous reference numbers)

Study Design and Setting

This was a hospital-based cross-sectional observational study conducted at the Department of Medicine, MJN Medical College & Hospital, Coochbehar (West Bengal), a tertiary care center with a large diabetic population [13].
Study Period: April 2024 to January 2025.

Sample Size Calculation

The minimum sample size was calculated using the formula for prevalence studies:
$\mathbf{N = Z^2pq / d^2}$ [14]
Assuming p = 12.4% (previous Indian prevalence) [9], d = 5%, the sample size obtained was 167. A total of **172 patients** were included.

Inclusion Criteria

- Adults aged ≥18 years
- Established T2DM as per ADA criteria
- Willing to participate

Exclusion Criteria

- Known thyroid disease or ongoing thyroid therapy
- Pregnancy or gestational diabetes
- Use of drugs influencing thyroid profile (amiodarone, lithium)
- Critically ill patients

Data Collection

A structured proforma recorded:

- Demographics (age, sex)
- Duration of diabetes
- Symptoms
- BMI, waist–hip ratio
- Complications (neuropathy, nephropathy, retinopathy)

Laboratory Investigations

- **Thyroid profile:** TSH, FT3, FT4 (chemiluminescence)
- **Anti-TPO antibodies**
- **Glycemic profile:** FBS, PPBS, HbA1c
- **Lipid profile**
- **Renal parameters:** urea, creatinine, ACR

Thyroid dysfunction was classified per **ATA Guidelines (2012)**

- Subclinical hypothyroidism: ↑TSH, normal FT4
- Subclinical hyperthyroidism: ↓TSH, normal FT3/FT4
- Overt hypo-/hyperthyroidism: abnormal TSH + abnormal FT3/FT4

Statistical Analysis

Data analysis was performed using **SPSS version 26**. Continuous variables were expressed as **mean ± standard deviation (SD)**, while categorical variables were presented as frequencies and percentages. Associations between categorical variables were assessed using the **Chi-square test**, and a **p-value < 0.05** was considered statistically significant.

Results & Analysis:

Table 1. Baseline Demographic Characteristics of Study Participants (n = 172)

Variable	Category	n (%)
Age Group (years)	40–55	43 (25.0)
	56–70	110 (64.0)
	>70	19 (11.0)
Gender	Male	61 (35.5)
	Female	111 (64.5)
Education	Illiterate	55 (32.0)
	Primary	59 (34.3)
	Secondary	45 (26.2)
	Graduate	13 (7.6)

Most participants belonged to the 56–70-year age group (64%), followed by 40–55 years (25%), and only 11% were above 70 years. Females constituted nearly two-thirds of the study population (64.5%), and a substantial proportion of participants were either primary educated (34.3%) or illiterate (32%).

Table 2. Clinical Profile Related to Diabetes (n = 172)

Variable	Category	n (%)
Duration of T2DM (years)	<5	50 (29.0)
	5–10	56 (32.6)
	>10	66 (38.4)
Type of Diabetes Medication	OHA only	96 (55.8)
	Insulin only	27 (15.7)
	OHA + Insulin	42 (24.4)
	None	7 (4.1)
Glycaemic Control	Controlled (HbA1c <7%)	56 (32.6)
	Uncontrolled (HbA1c ≥7%)	116 (67.4)

Around 38.4% of the participants had diabetes for more than 10 years, and more than half (55.8%) were on oral hypoglycaemic agents alone, while 24.4% required both insulin and OHA. Overall, glycaemic control was poor in the cohort, with 67.4% having uncontrolled HbA1c ≥7%.

Table 3. Thyroid Status of Study Participants (n = 172)

Thyroid Status	n (%)
Euthyroid	76 (44.2)
Subclinical Hypothyroidism	**56 (32.6)**
Subclinical Hyperthyroidism	10 (5.8)
Overt Hypothyroidism	25 (14.5)
Overt Hyperthyroidism	5 (2.9)

Subclinical hypothyroidism was the most common thyroid abnormality, affecting 32.6% of participants, followed by overt hypothyroidism (14.5%). Only 44.2% of the population were euthyroid, indicating a high burden of thyroid dysfunction among T2DM patients.

Table 4. Association Between Age and Thyroid Dysfunction (n = 172)

Age Group	Subclinical Hypothyroid n (%)	Subclinical Hyperthyroid n (%)	Others (%)
<60 years (n=57)	19 (33.3)	2 (3.5)	36 (63.1)
≥60 years (n=115)	37 (32.2)	8 (7.0)	70 (60.8)

$\chi^2 = 3.7$, p = 0.43 (NS)

Although thyroid dysfunction appeared slightly more frequent in ≥60-year individuals, with 32.2% having subclinical hypothyroidism, the association between age group and thyroid status was statistically insignificant (p = 0.43).

Table 5. Gender-wise Distribution of Thyroid Dysfunction (n = 172)

Gender	Subclinical Hypothyroid n (%)	Subclinical Hyperthyroid n (%)	Total n (%)
Female (n=111)	37 (33.3)	2 (1.8)	39 (35.1)
Male (n=61)	19 (31.1)	8 (13.1)	27 (44.3)

$\chi^2 = 5.67$, p = 0.0173 (Significant)

Thyroid dysfunction differed significantly between genders (p = 0.0173). Females predominantly exhibited subclinical hypothyroidism (33.3%), whereas males showed higher rates of subclinical hyperthyroidism (13.1%).

Table 6. Association Between Duration of Diabetes and Thyroid Dysfunction (n = 172)

Duration of T2DM	Subclinical Hypothyroid n (%)	Subclinical Hyperthyroid n (%)	Others (%)
<5 years (n=43)	3 (7.0)	4 (9.3)	36 (83.7)
5–10 years (n=56)	19 (30.2)	2 (3.2)	35 (62.6)
≥10 years (n=66)	**34 (51.5)**	4 (6.1)	28 (42.4)

$\chi^2 = 10.75$, p = 0.0046 (Significant)

A strong association was observed between increasing duration of diabetes and thyroid dysfunction (p = 0.0046). Participants with diabetes ≥10 years had the highest proportion of subclinical hypothyroidism (51.5%), whereas those with <5 years duration showed minimal thyroid abnormalities.

Table 7. Glycaemic Control vs Thyroid Status (n = 172)

Thyroid Status	Controlled n (%)	Uncontrolled n (%)
Euthyroid	39 (51.3)	37 (48.7)
Overt Hypothyroid	0 (0)	25 (100)
Subclinical Hypothyroid	6 (10.7)	50 (89.3)
Subclinical Hyperthyroid	5 (50)	5 (50)

$\chi^2 = 41.81$, p < 0.000001 (Highly Significant)

Poor glycaemic control (HbA1c ≥7%) was markedly more common among participants with hypothyroid states, particularly overt (100%) and subclinical hypothyroidism (89.3%), demonstrating a highly significant association between glycaemic status and thyroid dysfunction (p < 0.000001).

Table 8. Microvascular Complications vs Thyroid Status (n = 172)

Thyroid Status	Microvascular Present n (%)	Absent n (%)
Euthyroid	41 (53.9)	35 (46.1)
Overt Hypothyroid	23 (92.0)	2 (8.0)
Subclinical Hypothyroid	50 (89.3)	6 (10.7)
Subclinical Hyperthyroid	6 (60.0)	4 (40.0)

$\chi^2 = 28.59$, p < 0.00001 (Significant)

Microvascular complications were more prevalent among hypothyroid patients, affecting 92% of overt and 89.3% of subclinical hypothyroid individuals, compared with 53.9% of euthyroid participants. This association was statistically significant (p < 0.00001).

Table 9. Macrovascular Complications vs Thyroid Status (n = 172)

Thyroid Status	Macrovascular Present n (%)	Absent n (%)
Euthyroid	30 (39.5)	46 (60.5)
Overt Hypothyroid	21 (84.0)	4 (16.0)
Subclinical Hypothyroid	31 (55.4)	25 (44.6)
Subclinical Hyperthyroid	10 (100)	0 (0)

$\chi^2 = 28.22$, $p = 0.00001$ (Significant)

Macrovascular complications were also significantly higher in hypothyroid states, particularly overt hypothyroidism (84%) and subclinical hypothyroidism (55.4%). All participants with subclinical hyperthyroidism exhibited macrovascular involvement, indicating a strong association ($p = 0.00001$).

Table 10. Lipid Abnormalities (Dyslipidemia) in Relation to Thyroid Status (n = 172)

Thyroid Status	Dyslipidemia Present n (%)	Dyslipidemia Absent n (%)
Euthyroid	45 (59.2)	31 (40.8)
Subclinical Hypothyroid	**50 (89.3)**	6 (10.7)
Overt Hypothyroid	25 (100)	0
Subclinical Hyperthyroid	10 (100)	0

$\chi^2 = 22.71$, $p < 0.0001$ (Highly Significant)

Dyslipidemia prevalence was strikingly higher among those with thyroid dysfunction, affecting 89.3% of subclinical hypothyroid and 100% of overt hypothyroid participants, while only 40.8% of euthyroid individuals had lipid abnormalities, showing a highly significant association ($p < 0.0001$).

Discussion:

In the present study, thyroid dysfunction was observed in **55.8%** of patients with type 2 diabetes mellitus, with **subclinical hypothyroidism** being the most common subtype (32.6%). This prevalence is higher than that reported by **Han et al. (2015)** [13], who found a pooled prevalence of 10.2% among T2DM patients, and also higher than the findings of **Kahaly & Frommer (2018)** [14], who reported thyroid dysfunction in 28–35% of diabetics. However, our prevalence closely resembles that of **Yaseri et al. (2025)** [15], who reported thyroid dysfunction in 61.9% of diabetic individuals.

A significant association was observed between **female gender** and thyroid dysfunction in our study, consistent with **Jali et al. (2017)** [16], who found a significantly higher prevalence of hypothyroidism and subclinical hypothyroidism in diabetic women. We also found that thyroid dysfunction increased with longer **duration of diabetes**, which aligns with **Khandelwal & Tandon (2012)** [17], who suggested that chronic metabolic stress and insulin resistance may predispose diabetic patients to thyroid abnormalities.

Poor glycaemic control (HbA1c ≥7%) was more prominent among those with hypothyroid states, mirroring the findings of **Mohamed et al. (2017)** [18], who reported worse metabolic control in diabetic patients with thyroid dysfunction. Similarly, the strong association between dyslipidemia and hypothyroid states in our study agrees with **Elhussein et al. (2025)** [19], who demonstrated that subclinical hypothyroidism significantly worsens lipid profile and increases cardiovascular risk in diabetics.

Regarding complications, microvascular and macrovascular complications were more common among patients with hypothyroidism, which is consistent with the meta-analysis by **Han et al. (2015)** [13], who reported increased risks of nephropathy, retinopathy, and neuropathy in SCH patients. Conversely, some authors such as **Chaker et al. (2014)** [20] did not find significant differences in complication rates between euthyroid and SCH diabetics, indicating heterogeneity across populations.

Conclusion

In this study, more than half of the patients with type 2 diabetes mellitus exhibited thyroid dysfunction, with **subclinical hypothyroidism** being the most prevalent abnormality. Thyroid dysfunction was significantly associated with **female gender**, **longer duration of diabetes**, **poor glycaemic control**, **dyslipidemia**, and a higher burden of both **microvascular** and **macrovascular complications**. These findings highlight the clinical importance of routinely assessing thyroid function in patients with T2DM, particularly those with uncontrolled diabetes or long-standing disease. Early detection and management of thyroid dysfunction may contribute to improved metabolic control and a reduction in diabetes-related complications.

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