e-ISSN: 0976-822X, p-ISSN:2961-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2026; 18(2); 397-401

Original Research Article

Evaluation of Thyroid Dysfunction in Patients with Type 2 Diabetes Mellitus and its Impact on Metabolic Control

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Received: 01-12-2025 / Revised: 16-01-2026 / Accepted: 06-02-2026
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Conflict of interest: Nil

Abstract

Background: Type 2 Diabetes Mellitus (T2DM) is frequently associated with thyroid dysfunction due to their interrelated effects on metabolism. Thyroid abnormalities in diabetic patients may remain undiagnosed and can adversely affect glycemic control.

Objectives: To evaluate the prevalence of thyroid dysfunction in patients with Type 2 Diabetes Mellitus and to assess its impact on metabolic control.

Materials and Methods: This hospital-based cross-sectional observational study was conducted at the Department of Medicine, Government Medical College, Korba, Chhattisgarh, over a period of one year. A total of 100 patients with Type 2 Diabetes Mellitus were enrolled. Clinical evaluation and laboratory investigations, including fasting blood glucose, post-prandial blood glucose, HbA1c, and thyroid profile (TSH, FT3, FT4), were performed. Thyroid status was categorised based on standard reference ranges. Glycemic control was assessed using HbA1c levels. Statistical analysis was carried out using appropriate tests, with $p < 0.05$ considered statistically significant.

Results: Thyroid dysfunction was observed in 32% of patients, with subclinical hypothyroidism being the most common abnormality (18%). Poor glycemic control (HbA1c ≥7%) was seen in 62% of patients. Patients with thyroid dysfunction had significantly higher HbA1c levels compared to euthyroid patients ($p < 0.05$), indicating poorer metabolic control.

Conclusion: Thyroid dysfunction, particularly subclinical hypothyroidism, is prevalent among patients with Type 2 Diabetes Mellitus and is associated with poor glycemic control. Routine thyroid screening in patients with T2DM may aid in early detection and improve metabolic outcomes.

Keywords: Type 2 Diabetes Mellitus; Thyroid Dysfunction; Hypothyroidism; Subclinical Hypothyroidism; Glycemic Control; HbA1c.

DOI: 10.25258/ijcpr.18.2.61

Introduction

Type 2 Diabetes Mellitus (T2DM) is one of the most common chronic metabolic disorders worldwide and is characterised by insulin resistance and relative insulin deficiency. Its prevalence has increased rapidly over recent decades, particularly in developing countries like India, posing a major public health challenge due to its long-term microvascular and macrovascular complications [1,2].

Thyroid hormones play a crucial role in regulating metabolism, energy expenditure, glucose homeostasis, and lipid metabolism. Any dysfunction of the thyroid gland can significantly influence carbohydrate metabolism and insulin sensitivity [3]. Conversely, diabetes mellitus may also affect thyroid function through alterations in hypothalamic–pituitary–thyroid axis regulation and peripheral metabolism of thyroid hormones [4].

Several studies have demonstrated a higher prevalence of thyroid dysfunction among patients with T2DM compared to the general population [5]. Hypothyroidism, particularly subclinical hypothyroidism, is reported to be the most common thyroid abnormality in diabetic patients [6]. Thyroid dysfunction in diabetes may remain undiagnosed due to overlapping clinical features, yet it can adversely affect glycemic control, lipid profile, and increase the risk of cardiovascular

disease [7]. Poor glycemic control has been associated with altered thyroid hormone levels, especially elevated thyroid-stimulating hormone (TSH), which may worsen insulin resistance and metabolic imbalance [8]. Early identification and management of thyroid dysfunction in patients with T2DM may therefore improve metabolic control and reduce the risk of complications [9].

Despite the high burden of diabetes in India, limited data are available regarding the prevalence of thyroid dysfunction and its impact on metabolic control among T2DM patients in this region. Hence, the present study was undertaken to evaluate thyroid dysfunction in patients with Type 2 Diabetes Mellitus and to assess its impact on glycemic control at a tertiary care center.

Materials and Methods

Study Design: This was a hospital-based cross-sectional observational study conducted to evaluate thyroid dysfunction in patients with Type 2 Diabetes Mellitus (T2DM) and its impact on metabolic control.

Study Setting and Duration: The study was carried out in the Department of Medicine, Government Medical College, Korba, Chhattisgarh, over a period of one year.

Study Population and Sample Size: A total of 100 patients diagnosed with Type 2 Diabetes Mellitus attending the outpatient department or admitted to the inpatient wards during the study period were enrolled.

Inclusion Criteria

- Patients aged ≥18 years
- Diagnosed cases of Type 2 Diabetes Mellitus as per American Diabetes Association (ADA) criteria
- Patients willing to participate and providing informed consent

Exclusion Criteria

- Patients with known thyroid disease already on treatment
- Type 1 diabetes mellitus
- Pregnant or lactating women
- Patients with severe systemic illness (hepatic, renal, or cardiac failure)
- Patients on drugs affecting thyroid function (e.g., amiodarone, lithium, steroids)

Data Collection

A detailed clinical evaluation was performed for all participants, including:

- Demographic details (age, sex)
- Duration of diabetes
- Treatment history
- Body mass index (BMI)
- Blood pressure measurement

Laboratory Investigations

After an overnight fast, venous blood samples were collected under aseptic precautions for the following investigations:

- Fasting Blood Glucose (FBG)
- Post-Prandial Blood Glucose (PPBG)
- GlycatedHemoglobin (HbA1c) for assessment of glycemic control
- Serum Thyroid Profile, including:

1. Thyroid-stimulating hormone (TSH)
2. Free triiodothyronine (FT3)
3. Free thyroxine (FT4)

Thyroid dysfunction was classified as euthyroidism, subclinical hypothyroidism, overt hypothyroidism, subclinical hyperthyroidism, or overt hyperthyroidism based on standard laboratory reference ranges.

Assessment of Metabolic Control

Metabolic control was assessed using HbA1c levels, and patients were categorised as:

- Good glycemic control: HbA1c <7%
- Poor glycemic control: HbA1c ≥7%

The association between thyroid dysfunction and glycemic control was evaluated.

Statistical Analysis: Data were entered into Microsoft Excel and analysed using appropriate statistical software. Continuous variables were expressed as mean ± standard deviation, while categorical variables were expressed as percentages.

The Chi-square test and Student's t-test were used to assess associations between variables. A p-value <0.05 was considered statistically significant.

Ethical Considerations: The study was conducted after obtaining approval from the Institutional Ethics Committee of Government Medical College, Korba, Chhattisgarh. Written informed consent was obtained from all participants before enrollment.

Results and Observations

A total of 100 patients with Type 2 Diabetes Mellitus were included in the study. The results are presented under the following headings.

Table 1: Age and Gender Distribution of Study Subjects

Age Group (years)	Male	Female	Total (%)
30–39	8	4	12 (12%)
40–49	18	12	30 (30%)
50–59	22	16	38 (38%)
≥60	12	8	20 (20%)
Total	60	40	100 (100%)

Majority of patients (38%) belonged to the 50–59 years age group. Males constituted 60% of the study population.

Table 2: Duration of Diabetes Mellitus

Duration of Diabetes	Number of Patients	Percentage
<5 years	34	34%
5–10 years	42	42%
>10 years	24	24%
Total	100	100%

Most patients (42%) had diabetes for 5–10 years.

Table 3: Distribution of Thyroid Status in T2DM Patients

Thyroid Status	Number of Patients	Percentage
Euthyroid	68	68%
Subclinical Hypothyroidism	18	18%
Overt Hypothyroidism	10	10%
Subclinical Hyperthyroidism	3	3%
Overt Hyperthyroidism	1	1%
Total	100	100%

Thyroid dysfunction was observed in 32% of patients, with subclinical hypothyroidism being the most common abnormality.

Table 4: Gender-wise Distribution of Thyroid Dysfunction

Thyroid Status	Male (n=60)	Female (n=40)
Euthyroid	46	22
Hypothyroidism (Subclinical + Overt)	12	16
Hyperthyroidism (Subclinical + Overt)	2	2
Total	60	40

Thyroid dysfunction was more common in females compared to males.

Table 5: Glycemic Control Based on HbA1c Levels

HbA1c (%)	Glycemic Control	Number of Patients	Percentage
<7	Good control	38	38%
≥7	Poor control	62	62%
Total	—	100	100%

Poor glycemic control was observed in 62% of patients.

Table 6: Association Between Thyroid Status and Glycemic Control

Thyroid Status	Good Control (HbA1c <7)	Poor Control (HbA1c ≥7)	Total
Euthyroid	32	36	68
Thyroid Dysfunction	6	26	32
Total	38	62	100

Patients with thyroid dysfunction showed a higher prevalence of poor glycemic control compared to euthyroid patients. This association was statistically significant ($p < 0.05$).

Table 7: Mean HbA1c Levels According to Thyroid Status

Thyroid Status	Mean HbA1c (%) ± SD
Euthyroid	7.2 ± 1.1
Subclinical Hypothyroidism	8.1 ± 1.3
Overt Hypothyroidism	8.6 ± 1.4
Hyperthyroidism	7.9 ± 1.2

Higher HbA1c levels were observed in patients with hypothyroidism, indicating poorer metabolic control.

Discussion

Type 2 Diabetes Mellitus and thyroid dysfunction are two common endocrine disorders that frequently coexist and influence each other's metabolic pathways. In the present study, thyroid dysfunction was observed in 32% of patients with T2DM, which is significantly higher than that reported in the general population. This finding supports earlier studies that have demonstrated an increased prevalence of thyroid abnormalities among diabetic patients [10,11].

Subclinical hypothyroidism emerged as the most common thyroid disorder in the present study, accounting for 18% of cases, followed by overt hypothyroidism (10%). Similar observations have been reported by Diez and Iglesias and by Perros et al., who found subclinical hypothyroidism to be the predominant thyroid abnormality in patients with T2DM [6,12]. The higher prevalence of hypothyroidism may be attributed to insulin resistance, autoimmune mechanisms, and altered thyroid hormone metabolism in diabetic individuals.

A female preponderance of thyroid dysfunction was noted in this study, which is consistent with previous reports indicating that thyroid disorders are more common in women due to hormonal and immunological factors [13]. This highlights the importance of targeted screening for thyroid dysfunction, particularly among female diabetic patients.

The present study also demonstrated a significant association between thyroid dysfunction and poor glycemic control. Patients with thyroid abnormalities had higher mean HbA1c levels compared to euthyroid patients. Hypothyroidism is known to reduce glucose utilization, impair insulin-mediated glucose disposal, and increase insulin resistance, thereby contributing to poor metabolic control [14]. Elevated TSH levels have also been linked to worsening lipid profiles and increased cardiovascular risk in patients with diabetes [15].

Poor glycemic control was observed in 62% of patients, and a significantly higher proportion of these patients had associated thyroid dysfunction. Similar findings were reported by Hage et al. and Udiong et al., who emphasized that undiagnosed thyroid dysfunction can adversely affect glycemic status and complicate diabetes management [7,9]. These observations underscore the bidirectional relationship between diabetes and thyroid disorders.

The findings of this study reinforce the need for routine screening of thyroid function in patients with Type 2 Diabetes Mellitus, particularly those with poor glycemic control, long duration of diabetes, or female gender. Early detection and appropriate management of thyroid dysfunction may improve glycemic control, reduce cardiovascular risk, and enhance overall metabolic outcomes.

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with Type 2 Diabetes Mellitus, particularly those with poor glycemic control, long duration of diabetes, or female gender. Early detection and appropriate management of thyroid dysfunction may improve glycemic control, reduce cardiovascular risk, and enhance overall metabolic outcomes.

Conclusion

Thyroid dysfunction is common among patients with Type 2 Diabetes Mellitus, with subclinical hypothyroidism being the most frequently observed abnormality. A significant association was found between thyroid dysfunction and poor glycemic control, as evidenced by higher HbA1c levels in affected patients. Routine screening for thyroid function in patients with Type 2 Diabetes Mellitus, especially in those with poor metabolic control and female patients, may facilitate early diagnosis and timely management. Early detection and treatment of thyroid dysfunction could improve glycemic control, reduce metabolic complications, and enhance overall diabetes management outcomes.

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