E-ISSN 2250-0944
ISSN 2250-1150
doi: 10.31838/ijprt/16.01.610

**Research Article**

# Frequency and Pattern of Thyroid Dysfunction among Patients with Diabetes Mellitus: A Cross-Sectional Study

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Received: 14.04.26, Revised: 05.06.26, Accepted: 08.06.26

**ABSTRACT**

**Background:** Diabetes mellitus and thyroid dysfunction are two common endocrine disorders that frequently coexist. Altered thyroid hormone levels may affect glucose metabolism, insulin sensitivity, lipid profile, cardiovascular risk, and overall glycemic control. Early detection of thyroid dysfunction in diabetic patients may help improve clinical outcomes.

**Objective:** To determine the frequency and pattern of thyroid dysfunction among diabetic patients.

**Methods:** This cross-sectional study was conducted on 170 diagnosed diabetic patients attending the medical outpatient department and diabetic clinic. Patients aged 18 years and above with type 1 or type 2 diabetes mellitus were included. Patients with known thyroid disease on treatment, pregnancy, acute severe illness, chronic renal failure, liver failure, or drugs affecting thyroid function were excluded. Demographic data, duration and type of diabetes, body mass index, HbA1c, and thyroid function tests including serum thyroid-stimulating hormone, free triiodothyronine, and free thyroxine were recorded. Thyroid dysfunction was classified as overt hypothyroidism, subclinical hypothyroidism, overt hyperthyroidism, and subclinical hyperthyroidism. Data were analyzed using SPSS version 26.

**Results:** Among 170 diabetic patients, 83 were males and 87 were females. The mean age was 51.8 ± 10.6 years. Type 2 diabetes mellitus was present in 152 patients, while 18 patients had type 1 diabetes mellitus. Thyroid dysfunction was observed in 48 patients, giving an overall frequency of 28.2%. The most common abnormality was subclinical hypothyroidism, found in 23 patients, followed by overt hypothyroidism in 13 patients, subclinical hyperthyroidism in 7 patients, and overt hyperthyroidism in 5 patients. Thyroid dysfunction was more frequent in females than males, 36.8% versus 19.3%, respectively. Patients with diabetes duration greater than five years had a higher frequency of thyroid dysfunction than those with shorter duration, 37.1% versus 13.8%.

**Conclusion:** Thyroid dysfunction was found in more than one-fourth of diabetic patients, with subclinical hypothyroidism being the most frequent pattern. Female sex and longer duration of diabetes were associated with higher frequency of thyroid dysfunction. Routine thyroid screening, especially in high-risk diabetic patients, may be beneficial for early detection and management.

**Keywords:** Diabetes Mellitus, Thyroid Dysfunction, Hypothyroidism, Hyperthyroidism, Subclinical Hypothyroidism, Thyroid-Stimulating Hormone, Glycemic Control.

## INTRODUCTION

Diabetes mellitus is a chronic metabolic disorder characterized by persistent hyperglycemia due to impaired insulin secretion, insulin action, or both. It is one of the most common non-communicable diseases worldwide and is associated with multiple microvascular and macrovascular complications [1,2]. Thyroid disorders are also common endocrine abnormalities and may present as hypothyroidism, hyperthyroidism, or subclinical thyroid dysfunction [3]. The

coexistence of diabetes mellitus and thyroid dysfunction is clinically important because both disorders influence metabolism and cardiovascular risk.

Thyroid hormones play a major role in the regulation of carbohydrate, lipid, and protein metabolism. They affect hepatic glucose production, intestinal glucose absorption, insulin secretion, peripheral glucose utilization, and insulin resistance [3,4]. Hyperthyroidism may worsen glycemic control by increasing hepatic glucose output and insulin clearance, whereas hypothyroidism may reduce glucose absorption but increase dyslipidemia, obesity, and cardiovascular risk [4]. Subclinical thyroid dysfunction may remain asymptomatic but can still affect metabolic control and quality of life.

The relationship between diabetes and thyroid dysfunction is more clearly established in type 1 diabetes mellitus because both conditions may share autoimmune mechanisms [5]. However, thyroid dysfunction is also increasingly reported in patients with type 2 diabetes mellitus, where insulin resistance, obesity, dyslipidemia, chronic inflammation, and aging may contribute to the association [6]. Previous studies have reported variable frequencies of thyroid dysfunction among diabetic patients, ranging from approximately 10% to more than 30%, depending on population, age, sex, iodine status, diabetes duration, and diagnostic criteria [7,8].

Subclinical hypothyroidism has been reported as the most common thyroid abnormality in diabetic populations [8,9]. The condition is important because it may contribute to dyslipidemia, weight gain, fatigue, poor glycemic control, and increased cardiovascular risk. Female sex, older age, longer duration of diabetes, poor glycemic control, obesity, and diabetic nephropathy have been identified as possible risk factors for thyroid dysfunction among diabetic patients [10]. Early identification of thyroid abnormalities may therefore help in the comprehensive management of diabetes mellitus.

Despite the clinical significance of thyroid dysfunction in diabetic patients, routine thyroid screening is not uniformly practiced in many clinical settings. Local data are also needed to define the burden of thyroid dysfunction among diabetic patients. Therefore, the present study was conducted to determine the frequency and pattern of thyroid dysfunction in diabetic patients.

## METHODOLOGY

### Study Design

This was a descriptive cross-sectional study.

### Study Setting

The study was conducted in the Department of Medicine and diabetic outpatient clinic of a Frontier Medical College Abbottabad.

### Study Duration

The study was conducted over a period of six months from October 2025 to March 2026 after approval from the institutional ethical review committee.

### Sample Size

A total of 170 diagnosed diabetic patients were included by non-probability consecutive sampling.

### Inclusion Criteria

1. Age 18 years or above.
2. Diagnosed case of type 1 or type 2 diabetes mellitus.
3. Patients willing to provide informed consent.
4. Patients attending outpatient or inpatient medical services during the study period.

### Exclusion Criteria

1. Known thyroid disease already on treatment.
2. Pregnancy.
3. Acute severe systemic illness.
4. Chronic kidney disease or chronic liver disease.
5. History of thyroid surgery or radioiodine therapy.
6. Use of drugs affecting thyroid function, such as amiodarone, lithium, interferon, or steroids.
7. Incomplete laboratory record.

### Data Collection Procedure

After informed consent, demographic and clinical data were collected using a structured proforma. Age, sex, type of diabetes, duration of diabetes, body mass index, history of hypertension, and treatment history were recorded. Blood samples were collected for HbA1c and thyroid function tests, including serum thyroid-stimulating hormone, free triiodothyronine, and free thyroxine.

### Operational Definitions

**Euthyroid:** Normal TSH with normal FT3 and FT4.

**Overt Hypothyroidism:** Raised TSH with low FT4.

**Subclinical Hypothyroidism:** Raised TSH with normal FT3 and FT4.

**Overt Hyperthyroidism:** Suppressed TSH with raised FT3 and/or FT4.

**Subclinical Hyperthyroidism:** Suppressed TSH with normal FT3 and FT4.
**Poor Glycemic Control:** HbA1c >=7%.

### Statistical Analysis

Data were analyzed using SPSS version 26. Mean and standard deviation were calculated for quantitative variables such as age, diabetes duration, BMI, and HbA1c. Frequencies and percentages were calculated for qualitative variables such as gender, type of diabetes, and thyroid dysfunction. Chi-square test was used to determine association between thyroid dysfunction and categorical variables. A p-value <=0.05 was considered statistically significant.

## RESULTS

A total of 170 diabetic patients were included in the study. The mean age of the patients was 51.8 ± 10.6 years. Out of 170 patients, 83 were males and 87 were females. Type 2 diabetes mellitus was present in 152 patients, while 18 patients had type 1 diabetes mellitus. The mean duration of diabetes was 7.2 ± 4.1 years. Poor glycemic control, defined as HbA1c >=7%, was observed in 120 patients.

Table 1. Baseline Characteristics of Diabetic Patients (N=170)

| Variable | Frequency | Percentage |
|---|---|---|
| **Gender** | | |
| Male | 83 | 48.8% |
| Female | 87 | 51.2% |
| **Age group** | | |
| 18-40 years | 37 | 21.8% |
| 41-60 years | 93 | 54.7% |
| >60 years | 40 | 23.5% |
| **Type of diabetes** | | |
| Type 1 diabetes mellitus | 18 | 10.6% |
| Type 2 diabetes mellitus | 152 | 89.4% |
| **Duration of diabetes** | | |
| <=5 years | 65 | 38.2% |
| >5 years | 105 | 61.8% |
| **HbA1c status** | | |
| HbA1c <7% | 50 | 29.4% |
| HbA1c >=7% | 120 | 70.6% |

Thyroid dysfunction was detected in 48 patients, giving an overall frequency of 28.2%. Among the thyroid abnormalities, subclinical hypothyroidism was the most common pattern, seen in 23 patients, followed by overt hypothyroidism in 13 patients. Subclinical hyperthyroidism was observed in 7 patients, while overt hyperthyroidism was present in 5 patients.

Table 2. Frequency and Pattern of Thyroid Dysfunction among Diabetic Patients

| Thyroid status | Frequency | Percentage |
|---|---|---|
| Euthyroid | 122 | 71.8% |
| Subclinical hypothyroidism | 23 | 13.5% |
| Overt hypothyroidism | 13 | 7.6% |
| Subclinical hyperthyroidism | 7 | 4.1% |
| Overt hyperthyroidism | 5 | 2.9% |
| Total thyroid dysfunction | 48 | 28.2% |

Thyroid dysfunction was more common in females than males. Among females, 32 out of 87 patients had thyroid dysfunction, while among males, 16 out of 83 patients had thyroid dysfunction. The association between female sex and thyroid dysfunction was statistically significant. Patients with duration of diabetes greater than five years showed a higher frequency of thyroid dysfunction than those having diabetes for five years or less. Thyroid dysfunction was also more frequent among patients with poor glycemic control, although the association was borderline statistically significant.

Table 3. Association of Thyroid Dysfunction with Clinical Variables

| Variable | Present | Absent | Frequency | p-value |
|---|---|---|---|---|
| Male | 16 | 67 | 19.3% | 0.018 |
| Female | 32 | 55 | 36.8% | |
| Type 1 diabetes | 7 | 11 | 38.9% | 0.432 |
| Type 2 diabetes | 41 | 111 | 27.0% | |
| Diabetes duration <=5 years | 9 | 56 | 13.8% | 0.002 |
| Diabetes duration >5 years | 39 | 66 | 37.1% | |
| HbA1c <7% | 9 | 41 | 18.0% | 0.084 |
| HbA1c >=7% | 39 | 81 | 32.5% | |

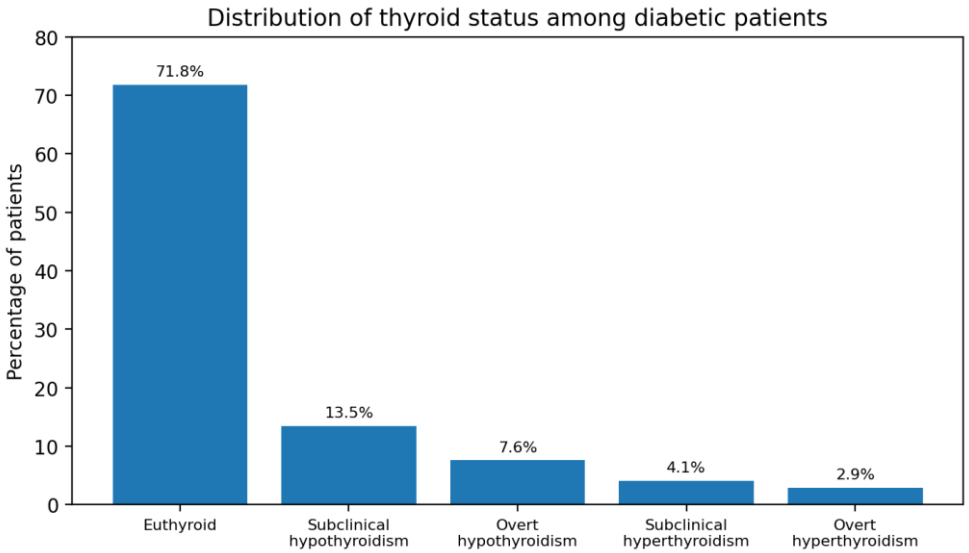


Figure 1. Distribution of Thyroid Status among Diabetic Patients

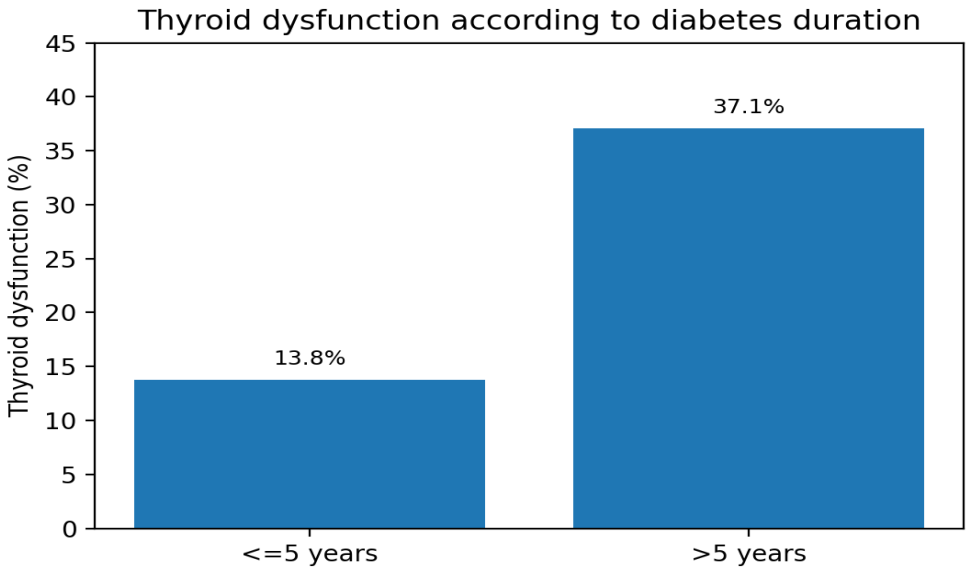


Figure 2. Frequency of Thyroid Dysfunction According to Diabetes Duration

## DISCUSSION

The present study evaluated the frequency of thyroid dysfunction among 170 diabetic patients and found that 28.2% had abnormal thyroid function. This finding indicates that thyroid dysfunction is common among diabetic patients and supports the need for careful endocrine evaluation in this population. The observed frequency is comparable with previous studies that have reported increased prevalence of thyroid disorders in diabetic

patients compared with the general population [11,12].

In our study, subclinical hypothyroidism was the most frequent thyroid abnormality, accounting for 13.5% of all patients. This finding is consistent with several previous studies in which subclinical hypothyroidism was reported as the dominant thyroid disorder among diabetic patients [13,14]. Subclinical hypothyroidism is clinically important because it may remain undiagnosed for long periods. It may contribute to fatigue, dyslipidemia, weight gain, cardiovascular disease, and poor metabolic control, particularly in patients already at high risk due to diabetes mellitus.

The overall frequency of hypothyroid disorders, including overt and subclinical hypothyroidism, was 21.2% in the present study. This predominance of hypothyroidism over hyperthyroidism has also been reported in regional and international studies [15,16]. A possible explanation is that autoimmune thyroiditis, chronic inflammation, obesity, and metabolic syndrome may increase the tendency toward hypothyroid states in diabetic patients. In type 1 diabetes mellitus, autoimmune mechanisms are more prominent, while in type 2 diabetes mellitus, insulin resistance and chronic metabolic stress may play a greater role [17,18].

Female patients in the present study had a significantly higher frequency of thyroid dysfunction than males. This is in agreement with previous studies showing that thyroid disorders are more common in females, both in the general population and among diabetic patients [18,19]. Female predominance may be explained by greater susceptibility to autoimmune thyroid disease, hormonal factors, and genetic influences. Therefore, diabetic women may represent an important target group for thyroid screening.

The present study also found that thyroid dysfunction was significantly more common in patients with diabetes duration greater than five years. This association has been reported by other researchers and may reflect the cumulative effect of chronic metabolic disturbance, increased autoimmune tendency, vascular complications, and aging [18,20]. Patients with longer duration of diabetes are also more likely to develop complications and may undergo more frequent investigations, increasing the chance of detecting thyroid dysfunction.

Poor glycemic control was associated with a higher frequency of thyroid dysfunction in this study, although the association was borderline statistically significant. Previous studies have reported that higher HbA1c may be associated with thyroid dysfunction, especially hypothyroidism [21]. The relationship may be bidirectional. Thyroid dysfunction can worsen glycemic control by affecting insulin sensitivity, glucose absorption, hepatic glucose output, and insulin clearance. Similarly, chronic hyperglycemia and insulin resistance may influence thyroid hormone metabolism.

The clinical significance of thyroid dysfunction in diabetes is considerable. Hypothyroidism may worsen dyslipidemia and increase cardiovascular risk, while hyperthyroidism may precipitate weight loss, tachycardia, arrhythmias, and deterioration of glycemic control [22,23]. Subclinical thyroid disease is particularly important because patients may not have obvious symptoms, and the condition may be detected only by laboratory screening. Early identification of thyroid dysfunction allows timely treatment and may improve symptoms, lipid profile, cardiovascular risk, and metabolic control.

Guidelines regarding routine thyroid screening differ according to diabetes type and clinical context. Screening is strongly emphasized in type 1 diabetes mellitus due to the autoimmune association between type 1 diabetes and autoimmune thyroid disease [24]. In type 2 diabetes mellitus, there is no universal consensus on screening frequency, but many authors recommend thyroid function testing in high-risk groups such as females, older patients, those with long-standing diabetes, poor glycemic control, dyslipidemia, goiter, infertility, unexplained weight changes, or symptoms suggestive of thyroid disease [10,25].

The findings of this study support targeted thyroid screening among diabetic patients, especially females and those with diabetes duration greater than five years. A simple serum TSH test, followed by FT3 and FT4 where indicated, may be a practical approach in resource-limited settings. Since subclinical hypothyroidism was the most common abnormality, screening based only on symptoms may miss a substantial number of patients.

The present study has some limitations. It was a single-center cross-sectional study with a relatively small sample size. Causal relationships could not be established. Thyroid autoantibodies were not assessed, so autoimmune thyroid disease could not be

confirmed. Follow-up data after treatment of thyroid dysfunction were also not available. Despite these limitations, the study provides useful information regarding the burden and pattern of thyroid dysfunction among diabetic patients.

Future multicenter studies with larger sample sizes, thyroid antibody testing, lipid profile correlation, and follow-up after thyroid treatment are recommended. Such studies may help define cost-effective screening strategies and clarify whether treatment of thyroid dysfunction improves glycemic control and long-term diabetic outcomes.

## CONCLUSION

Thyroid dysfunction was present in 28.2% of diabetic patients in this study. Subclinical hypothyroidism was the most common pattern, followed by overt hypothyroidism. Thyroid dysfunction was significantly more frequent among females and patients with diabetes duration greater than five years. Routine or targeted thyroid function screening should be considered in diabetic patients, especially in high-risk groups, to allow early diagnosis and appropriate management.

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