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Original Research Article

Prevalence of Hypothyroidism in Patients with Type 2 Diabetes Mellitus - A Prospective Study

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ABSTRACT

Background: Type 2 diabetes mellitus (T2DM) and thyroid dysfunction are both common endocrine disorders that frequently coexist and influence each other's pathophysiology. This study aimed to determine the prevalence of hypothyroidism in patients with T2DM and evaluate its association with glycaemic parameters.
Methods: A prospective observational study was conducted at a tertiary care hospital over 18 months. A total of 125 patients with confirmed T2DM were enrolled. Data collected included age, sex, BMI, duration of diabetes, fasting blood sugar (FBS), postprandial blood sugar (PPBS), random blood sugar (RBS), HbA1c, and thyroid function tests (TSH, T3, T4). Patients with known thyroid disease or secondary forms of diabetes were excluded.
Results: The majority of patients were aged 51–60 years (52.0%), with 50.4% males and 49.6% females. Thyroid dysfunction was observed in 37.6% of patients, with 26.4% having subclinical hypothyroidism and 11.2% overt hypothyroidism. Elevated HbA1c (>6.5%) was present in 65.6% of patients. Significant positive correlations were noted between TSH and HbA1c ($r = 0.312$, $p < 0.0001$), FBS ($r = 0.439$, $p < 0.0001$), PPBS ($r = 0.199$, $p = 0.026$), and RBS ($r = 0.200$, $p = 0.025$). The prevalence of thyroid dysfunction increased with duration of diabetes, affecting 82.4% of those with >16 years of disease. Thyroid disorders were more frequent among patients with poor glycaemic control, as evidenced by HbA1c >6.5% (48.8% vs. 16.3%; $p < 0.0001$), FBS >111 mg/dL (44.6% vs. 30.0%; $p = 0.042$), PPBS >141 mg/dL (50.6% vs. 16.7%; $p < 0.0001$), and RBS >201 mg/dL (55.6% vs. 13.2%; $p < 0.0001$).
Conclusion: Thyroid dysfunction, especially subclinical hypothyroidism, is common in T2DM and shows a significant association with poor glycaemic parameters and longer disease duration. Routine screening for thyroid abnormalities in diabetic patients is essential
Keywords: Type 2 diabetes mellitus, Hypothyroidism, Thyroid dysfunction, HbA1c, Body Mass Index Confidence Interval, Insulin Resistance & Hypertension

INTRODUCTION

The World Health Organization (WHO) defines diabetes mellitus (DM) as a group of metabolic conditions marked by persistently high blood sugar levels and imbalances in how the body processes carbohydrates, fats, and proteins. These issues are mainly due to the body's resistance to insulin or a lack of insulin production. [1] Diabetes has become a major global health issue, and its numbers continue to rise steadily. Over 500 million people worldwide currently have diabetes, with type 2 diabetes mellitus (T2DM) being the most common type, according to the International Diabetes Federation (IDF) [2, 3]. Prolonged hyperglycemia is the hallmark of the illness, which is linked to long-term complications and harm to multiple organ systems, with the eyes, kidneys, nerves, heart, and blood vessels being the most affected [4]. Despite being little known, the co-occurrence of diabetes and thyroid dysfunction—specifically, hypothyroidism—represents a clinically meaningful association that is crucial to patient care and illness management.

Through their effects on peripheral insulin sensitivity and insulin secretion, thyroid hormones (TH) are crucial for controlling glucose metabolism [5]. Diabetes patients may have varied thyroid function, and untreated thyroid conditions can contribute to poor glycaemic control and negatively impact diabetes treatment [6]. In addition, chronic metabolic stress and autoimmune changes associated with diabetes can impair thyroid gland function. Within the range of thyroid disorders, hypothyroidism marked by increased levels of thyroid-stimulating hormone (TSH) and decreased free thyroxine (FT4), is commonly observed in people with T2DM [7]. Recent studies suggest that people with conditions like T2DM and subclinical hypothyroidism have a higher risk of problems such as kidney disease and heart issues. So, regularly checking thyroid function in patients with DM is important to catch problems early and manage their health better [8].

Hypothyroidism can lead to problems like weight gain, abnormal cholesterol levels, slow heart rate, and reduced kidney function, which together raise the risk of heart issues in people with DM, especially those with type 2 diabetes. It can also change how much insulin is needed and hide the signs of poor blood sugar control, making diabetes harder to manage [9]. In hypothyroidism, the body absorbs less glucose from the gut, stores more glucose in the tissues, makes less glucose in the liver, and doesn't use glucose properly. In subclinical hypothyroidism, TSH levels are high but FT4 stays normal. The chance of it turning into full hypothyroidism is high, especially in people with T2DM [10].

Despite the growing body of evidence highlighting the coexistence of these conditions, thyroid function is not routinely evaluated in patients with T2DM, particularly in resource-limited settings. Early detection and appropriate management of hypothyroidism in individuals with diabetes can have important therapeutic and prognostic consequences. It works by helping to regulate metabolism more effectively, reducing the chances of complications, and improving the overall Quality of life (QOL) of the patient. Therefore, understanding the prevalence of hypothyroidism in T2DM is essential for guiding clinical practice and adapting treatment strategies [11].

A trustworthy biological indicator for evaluating long-term blood sugar control in individuals with diabetes mellitus is glycated haemoglobin (HbA1c), which shows the average blood sugar levels over the previous two to three months. Research has demonstrated that HbA1c levels can vary under different conditions, such as haemoglobinopathies, chronic kidney disease, and pregnancy, even in the absence of DM [12]. Some studies have proposed that elevated TSH, particularly in hypothyroidism, may be associated with higher HbA1c levels, suggesting a clear link between poor thyroid function and suboptimal glycaemic regulation. However, the evidence remains inconclusive, with some studies reporting no significant interactions. This variation highlights the importance of additional research, particularly among diverse patient groups.

Proper ruling out the extent of hypothyroidism is essential, considering the high prevalence of T2DM in India increasing number of coexisting endocrine disorders within this population. Variations in iodine consumption, genetic predisposition, and disparities in healthcare accessibility across different regions may contribute to the differences in the prevalence and clinical presentation of thyroid dysfunction among individuals with diabetes. However, studies focusing on the relationship between HbA1c and TSH levels in the Indian population are limited [13].

In diabetic patients, early detection of hypothyroidism may guarantee prompt action and enhance treatment regimens. For instance, starting levothyroxine therapy in people with hypothyroidism may help with the overall metabolic management of diabetes by improving lipid profiles, insulin sensitivity, and thyroid function. In the long term, this can contribute to the prevention of diabetes-related complications, including macrovascular and microvascular complications.

MATERIALS & METHODS

This prospective observational study was conducted in the Department of General Medicine, Kanyakumari Government Medical College. The study was carried out over a duration of 18 months, from March 2023 to August 2024. The study population comprised patients diagnosed with type 2 diabetes mellitus who attended the outpatient and inpatient services of the Department of General Medicine during the study period.

Sample Size and Sampling Technique

A total of 125 patients with type 2 diabetes mellitus were included in the study. Convenience sampling was used. The sampling frame consisted of all patients with type 2 diabetes mellitus presenting to the department during the study period. The sample size was calculated based on the expected prevalence reported in previous studies using a standard formula for cross-sectional studies, with a 95% confidence interval and 5% precision.

Sample Size Calculation

The sample size was calculated using the formula for comparison of proportions:

$$N = \frac{p_0 q_0 \left(Z_{1-\alpha/2} + Z_{1-\beta} \sqrt{\frac{p_1 q_1}{p_0 q_0}} \right)^2}{(p_1 - p_0)^2}$$

$$N = \frac{0.255 \times 0.745 \left(1.96 + 0.84 \sqrt{\frac{0.15 \times 0.85}{0.255 \times 0.745}} \right)^2}{(0.15 - 0.255)^2}$$

$$N = 121$$

Where:

p_0: Proportion (incidence) in the population
p_1: Proportion (incidence) in the study group
q_0: $1 - p_0$
q_1: $1 - p_1$
N: Required sample size for the study group
α: Probability of Type I error (commonly set at 0.05)
β: Probability of Type II error (commonly set at 0.20)
Z: Standard normal deviate corresponding to the selected values of $\alpha$and β

Inclusion Criteria

All patients diagnosed with type 2 diabetes mellitus were included in the study, irrespective of their glycemic control status or the type of antidiabetic treatment being received.

Exclusion Criteria

Patients with type 1 diabetes mellitus, gestational diabetes mellitus, steroid-induced diabetes, known thyroid disorders, history of thyroid surgery, hyperglycemic emergencies, and adults unwilling to participate in the study were excluded.

Data Collection and Study Procedures

Written informed consent was obtained from all participants prior to enrollment. Demographic details, medical history, and findings from clinical examination were recorded using a structured case-record form. Anthropometric measurements were obtained, and venous blood samples were collected for biochemical analysis. The variables assessed included age, sex, body mass index (BMI), duration of diabetes, fasting plasma glucose (FPG), postprandial plasma glucose (PPG), glycated hemoglobin (HbA1c), and thyroid function parameters - triiodothyronine (T3), thyroxine (T4), and thyroid-stimulating hormone (TSH). Diabetes mellitus was diagnosed according to the American Diabetes Association criteria. Thyroid status was assessed through clinical evaluation and laboratory estimation of thyroid hormone levels.

Ethical Considerations

The study was conducted after obtaining approval from the Institutional Ethics Committee (IEC Approval No. PG-41/IEC/2023). All participants were informed about the objectives, methodology, potential benefits, and risks of the study. Written informed consent was obtained prior to participation, and confidentiality and voluntary participation were ensured throughout the study.

Statistical Analysis

Data were analyzed using IBM SPSS version 21.0. Continuous variables were expressed as mean and standard deviation, while categorical variables were summarized as frequencies and percentages. Comparisons between continuous variables were performed using the independent sample Student's *t*-test. Categorical variables were compared using Pearson's chi-square test and Fisher's exact test, as appropriate. Pearson's correlation coefficient was used to assess the relationship between continuous variables. All statistical tests were two-tailed, and a p value of less than 0.05 was considered statistically significant.

RESULT

A total of 125 participants were included in the study. The majority of patients belonged to the 51–60-year age group (52.0%), followed by those aged 61–70 years (24.0%). The sex distribution was nearly equal, with males comprising 50.4% and females 49.6% of the study population. Nearly half of the participants had a normal body mass index (48.0%), while 44.0% were overweight and 8.0% were obese. With respect to diabetes duration, 44.8% of patients had diabetes for less than 5 years, whereas 24.0%, 17.6%, and 13.6% had disease duration of 6–10 years, 11–15 years, and more than 16 years, respectively. Poor glycemic control, indicated by HbA1c levels >6.5%, was observed in 65.6% of participants. Elevated fasting, postprandial, and random blood sugar levels were noted in 52.0%, 61.6%, and 57.6% of patients, respectively, indicating suboptimal glycemic control in a substantial proportion of the study population.

Table 1: Distribution of demographic and clinical characteristics of study participants (n = 125)

Variable	Category	Number of Patients	Percentage
Age group (years)	41–50	20	16.0%
	51–60	65	52.0%
	61–70	30	24.0%
	>71	10	8.0%
Sex	Female	62	49.6%
	Male	63	50.4%
Body Mass Index (BMI)	Normal	60	48.0%
	Overweight	55	44.0%
	Obese	10	8.0%
Duration of Diabetes Mellitus (years)	<5	56	44.8%
	6–10	30	24.0%
	11–15	22	17.6%

	>16	17	13.6%
HbA1c level	>6.5%	82	65.6%
	5.7–6.4%	43	34.4%
Fasting Blood Sugar (mg/dL)	<110	60	48.0%
	>111	65	52.0%
Postprandial Blood Sugar (mg/dL)	<140	48	38.4%
	>141	77	61.6%
Random Blood Sugar (mg/dL)	<200	53	42.4%
	>201	72	57.6%

Thyroid disorders were detected in 37.6% of patients, whereas 62.4% had no thyroid dysfunction. Among those with thyroid dysfunction, 26.4% had subclinical hypothyroidism, 11.2% had overt hypothyroidism, and 62.4% had a normal thyroid status.

The correlation analysis demonstrated a statistically significant positive association between serum TSH levels and all assessed glycemic parameters (table 2). TSH showed a moderate positive correlation with fasting blood sugar (FBS) (r = 0.439, p < 0.0001) and HbA1c (r = 0.312, p < 0.0001), indicating that higher TSH levels were associated with poorer long-term and fasting glycemic control. In contrast, the correlations between TSH and postprandial blood sugar (PPBS) (r = 0.199, p = 0.026) as well as random blood sugar (RBS) (r = 0.200, p = 0.025) were weaker but remained statistically significant. Overall, these findings suggest a consistent, albeit variable, relationship between thyroid dysfunction and glycemic status, with stronger associations observed for fasting and chronic glycemic indices.

Table 2: Correlation between TSH and Glycemic Parameters

Glycemic Parameter	TSH (µIU/mL)	Pearson Correlation (r)	*P* value
HbA1c (%)	TSH (µIU/mL)	0.312	<0.0001
FBS (mg/dL)	TSH (µIU/mL)	0.439	<0.0001
PPBS (mg/dL)	TSH (µIU/mL)	0.199	0.026
RBS (mg/dL)	TSH (µIU/mL)	0.200	0.025

Table 3: Association between Thyroid Disorder and Diabetes-related Clinical Parameters

Variable	Category	Thyroid Disorder – No	Thyroid Disorder – Yes	P value
Duration of Diabetes (years)	<5	42 (53.8%)	14 (29.8%)	0.004
	6–10	20 (25.6%)	10 (21.3%)	
	11–15	11 (14.1%)	11 (23.4%)	
	>16	5 (6.4%)	12 (25.5%)	
HbA1c	>6.5%	42 (51.2%)	40 (48.8%)	<0.0001
	5.7–6.4%	36 (83.7%)	7 (16.3%)	
FBS (mg/dL)	<110	42 (70.0%)	18 (30.0%)	0.042
	>111	36 (55.4%)	29 (44.6%)	
PPBS (mg/dL)	<140	40 (83.3%)	8 (16.7%)	<0.0001
	>141	38 (49.4%)	39 (50.6%)	
RBS (mg/dL)	<200	46 (86.8%)	7 (13.2%)	<0.0001
	>201	32 (44.4%)	40 (55.6%)	

A statistically significant association was observed between thyroid disorder and duration of diabetes (p = 0.004), with a progressively higher prevalence of thyroid dysfunction among patients with longer disease duration, particularly those with diabetes duration exceeding 16 years. Thyroid disorder was also significantly associated with poorer glycemic control, as evidenced by higher HbA1c levels (p < 0.0001). Additionally, significant associations were noted between thyroid disorder and elevated fasting blood sugar (p = 0.042), postprandial blood sugar (p

<0.0001), and random blood sugar levels (p <0.0001), indicating that patients with thyroid dysfunction were more likely to have suboptimal glycemic indices compared to those without thyroid disorder (table 3).

A statistically significant association was observed between thyroid status and multiple diabetes-related clinical parameters (table 4). The prevalence of subclinical hypothyroidism increased progressively with longer duration of diabetes, being highest among patients with diabetes duration >16 years (52.9%; $p = 0.032$). Poor glycemic control, reflected by elevated fasting, postprandial, and random blood glucose levels, was significantly associated with abnormal thyroid status, particularly subclinical hypothyroidism ($p = 0.025$, $p = 0.038$, and $p = 0.0001$, respectively). Similarly, patients with HbA1c levels >6.5% showed a markedly higher proportion of subclinical hypothyroidism (50.9%), whereas euthyroid status predominated among those with HbA1c between 5.7–6.4% ($p < 0.0001$). Overall, these findings suggest that worsening and longer-standing glycemic dysregulation is significantly associated with an increased burden of thyroid dysfunction, especially subclinical hypothyroidism, among patients with diabetes mellitus.

Table 4: Association between Thyroid Status and Diabetes-related Clinical Parameters

Variable	Category	Normal Count (%)	Overt Hypothyroidism Count (%)	Subclinical Hypothyroidism Count (%)	P value
Duration of DM (years)	<5	42 (75.0%)	5 (8.9%)	9 (16.1%)	0.032
	6–10	20 (66.7%)	3 (10.0%)	7 (23.3%)	
	11–15	11 (50.0%)	3 (13.6%)	8 (36.4%)	
	>16	5 (29.4%)	3 (17.6%)	9 (52.9%)	
Fasting Blood Sugar (mg/dL)	<110	42 (70.0%)	8 (13.3%)	10 (16.7%)	0.025
	>111	36 (55.4%)	6 (9.2%)	23 (35.4%)	
Postprandial Blood Sugar (mg/dL)	<140	40 (83.3%)	4 (8.3%)	4 (8.3%)	0.038
	>141	38 (49.4%)	10 (13.0%)	29 (37.7%)	
Random Blood Sugar (mg/dL)	<200	45 (84.9%)	5 (9.4%)	3 (5.7%)	0.0001
	>201	33 (45.8%)	9 (12.5%)	30 (41.7%)	
HbA1c (%)	>6.5	15 (27.3%)	12 (21.8%)	28 (50.9%)	<0.0001
	5.7–6.4	63 (90.0%)	2 (2.9%)	5 (7.1%)	

DISCUSSION

In our study, most of the patients were between 51 and 60 years of age, followed by those in the 61–70 age group. This shows that the diabetic population in our study was predominantly in older age groups. Male and female patient numbers were nearly equal, suggesting that there is little sex-specific variation in thyroid disorders associated with diabetes. Of the patients, a small percentage were obese, and nearly half were overweight. This implies that a common factor among people with diabetes and thyroid dysfunction may be increased body weight.

Rezagholi. (2022) reported that the overall prevalence of thyroid dysfunction in patients with diabetes was 46.5%. This condition was more frequently observed in women, particularly those aged > 60 years. A numerical breakdown of the affected individuals' age groups, gender distribution in percentage, or BMI classifications was not provided by this study, though [14]. According to Talwalkar et al. (2019), the majority of thyroid dysfunction patients (57.2%) were between the ages of 41 and 60 and 61 and 80. (32.2%). A higher proportion of thyroid dysfunction was observed in females (81.8%) than in males (18.2%). Regarding BMI, 36.3% of thyroid-affected patients were overweight, and 31.8% were obese [13].

Reddy. (2018) studied 100 type 2 diabetic patients, equally divided between males and females. Thyroid dysfunction was more prevalent in females (36%) than in males

(22%). Among elderly patients (≥60 years), the prevalence of subclinical hypothyroidism was 31.25%, whereas in adults and middle-aged individuals (<60 years), it was 7.36%. This study did not report specific BMI classification data [15]. Narukurthi et al. (2020) reported that among the 104 types 2 diabetic patients, thyroid dysfunction was more common in females (68.1%) than males (31.9%). The age group analysis revealed that the 51–60 age group had the highest percentage of thyroid dysfunction (38.6%), followed by the 41–50 group (22.7%). In terms of BMI, 38.6% of patients with thyroid dysfunction were overweight, and 40.9% were obese [16].

Basera included 112 patients with type 2 diabetes mellitus and hypothyroidism in their study. The mean age of the patients was 48.31 ± 4.22 years. The average BMI was 28.01 ± 3.39 kg/m², placing most patients in the overweight category. Although sex distribution was not reported, the provided BMI and age figures indicate that middle-aged overweight individuals were commonly affected [17].

In our study, a large number of patients had poor blood sugar control. More than half of the participants had an HbA1c value above 6.5%. Similarly, fasting, postprandial, and random blood sugar levels were high in most patients. These findings suggest that many individuals either did not achieve proper glucose control or were unaware of their diabetic status until later. This poor glycaemic control may also be linked to the presence of thyroid abnormalities, which can interfere with metabolism and insulin activity.

Talwalkar. (2019) found that patients with thyroid dysfunction had a mean fasting blood sugar of 172.3 ± 47.1 mg/dL, significantly higher than the 155.4 ± 47.0 mg/dL in euthyroid individuals. Similarly, the mean HbA1c level was elevated in those with thyroid dysfunction at 8.5 ± 1.4%, compared to 7.8 ± 1.6% in euthyroid patients [13]. Reddy et al. (2018) did not provide specific values for HbA1c, FBS, PPBS, or RBS levels. However, they reported that hyperthyroid individuals had poor glycaemic control and that this association was more frequent in patients with hyperthyroidism (14%) than in those with subclinical hypothyroidism [15].

In our study, thyroid dysfunction was present in over one-third of patients with DM. Subclinical hypothyroidism was the most common condition, followed by overt hypothyroidism. Most patients with thyroid disorders do not show visible symptoms, which means that the condition may remain undiagnosed unless specifically tested. These results support the need to screen for thyroid function in all patients with DM, regardless of symptoms, especially because subclinical conditions can still affect the overall metabolic balance. According to Rezagholi. (2022), the prevalence of thyroid dysfunction in patients with type 2 diabetes was 46.5%. Within this group, subclinical hypothyroidism accounted for 4%–20% of cases, while overt hypothyroidism was present in 2%–4% of cases. The study emphasised that these conditions were more commonly observed in women and older adults [14].

According to Talwalkar. (2019), the overall prevalence of thyroid dysfunction among patients with type 2 diabetes was 26.7%. Subclinical hypothyroidism was the most frequent form (17.1%), followed by overt hypothyroidism (7.6%) and subclinical hyperthyroidism (1.3%) [13].

In a study by Reddy. (2018), 29% of patients with diabetes had thyroid dysfunction. Subclinical hypothyroidism was the most common, occurring in 15% of patients, followed by hyperthyroidism in 13% and overt hypothyroidism in only 1% [15]. Narukurthi et al. (2020) found that 29.8% of the diabetic patients had thyroid dysfunction. The most prevalent of these was subclinical hypothyroidism (17.3%), which was followed by subclinical hyperthyroidism (2.9%) and overt hypothyroidism (9.6%) [16].

According to Hussain. (2019), 24% of patients with type 2 diabetes had thyroid dysfunction. Subclinical hypothyroidism was the most common type (14.6%), followed by subclinical hyperthyroidism (3.1%) and overt hypothyroidism (6.3%) [18]. Bhattacharyya et al., thyroid dysfunction in 34 out of 120 patients (27.3%). Among them, 23 (19.1%) had subclinical hypothyroidism, 9 (7.5%) had clinical hypothyroidism, and 2 (1.7%) had subclinical hyperthyroidism. The remaining 86 patients (71.7%) were euthyroid [19].

Behera and Sen (2023) reported a total thyroid dysfunction prevalence of 14.69% among diabetic patients. Subclinical hypothyroidism was the most prevalent (9.38%), followed by hypothyroidism (2.5%), subclinical hyperthyroidism (2.5%), and hyperthyroidism (0.30%). These values indicate that subclinical hypothyroidism is dominant, which supports the pattern observed in our study [20].

In our study, TSH levels showed a clear positive link with all blood sugar readings. Higher TSH was seen along with higher HbA1c, fasting blood sugar, postprandial blood sugar, and random blood sugar. The strongest link was with fasting blood sugar. This shows that even small changes in thyroid hormones can affect how the body handles glucose, especially during fasting. These results stress the need to check thyroid function in patients who have trouble keeping their blood sugar under control.

Rezagholi. (2022) reported that elevated TSH levels, indicative of hypothyroidism, contribute to poor glycaemic control by interfering with insulin action and glucose uptake mechanisms. Although no statistical correlation values were reported, the biological relationship between high TSH levels and impaired glucose metabolism was clearly stated. These findings support our study, in which higher TSH levels were associated with elevated HbA1c, FBS, PPBS, and RBS levels [14]. Talwalkar et al. (2019) demonstrated a positive correlation between TSH and HbA1c ($r = 0.244$; $p = 0.001$), as well as between TSH and fasting blood sugar ($r = 0.234$; $p = 0.002$), indicating that higher TSH levels were associated with poorer glycaemic outcomes [13].

Afrin. (2018) study demonstrated a significant positive correlation between TSH and HbA1c ($r = 0.28$, $p < 0.01$), indicating that rising TSH levels were associated with poorer glycaemic control. Correlations with FBS, PPBS, or RBS were not reported separately [21]. Behera and Sen (2023) reported a mean TSH of 10.44 ± 12.76 µIU/mL among patients with DM and thyroid dysfunction, which was significantly higher than that of controls (2.54 ± 2.39 µIU/mL, $p = 0.0001$). This suggests a strong positive correlation between TSH levels and poor glycaemic control, especially in those with elevated HbA1c levels. These findings support the results of our study regarding the TSH-HbA1c correlation [20].

In our study, the number of patients with thyroid disorders increased with diabetes duration. Patients with diabetes for > 16 years had the highest rates of thyroid dysfunction, especially subclinical hypothyroidism. This indicates that the longer a person lives with diabetes, the higher their chance of developing thyroid issues. Regular monitoring of thyroid function is important in patients with long-term diabetic patients to detect these changes early and manage them appropriately.

Talwalkar. (2019) observed that thyroid dysfunction prevalence was higher in patients with a diabetes duration of more than 10 years (33.3%) and lower in those with less than 5 years of diabetes (18.2%) [13]. Reddy et al. (2018) study divided participants into three groups based on diabetes duration: 0–5 years (54 patients), 6–10 years (36 patients), and >11 years (10 patients). Thyroid dysfunction was most prevalent in the 0–5year group (33.33%), followed by the 6–10year group (27.77%), and least in the > 11-year group (10%). The p-value was 0.0012, suggesting no significant association between diabetes duration and thyroid dysfunction [15].

Narukurthi. (2020) showed that the prevalence of thyroid dysfunction increased with duration of diabetes: it was 19.2% in those with <5 years, 34.6% in 6–10 years, and 46.2% in >10 years duration of diabetes.

The difference was significant (p = 0.019) [16]. Hussain et al. (2019) found that the highest prevalence of thyroid dysfunction was found in patients with diabetes for 6–10 years (41.6%) and ≥10 years (35.4%). Thyroid dysfunction was found in only 22.9% of patients with less than five years of diabetes, indicating a significant relationship between the two conditions [18].

According to Shanmugam. (2015), out of 40 thyroid dysfunction patients, 12.5% had diabetes for ≤1 year, 45% for 1–5 years, and 42.5% for 6–10 years (p=0.656). This association was not statistically significant, in contrast, our study found a statistically significant increase in thyroid dysfunction with longer duration of diabetes [22]. Afrin et al. (2018) categorized diabetes duration as newly diagnosed (10.2%), <5 years (51.1%), 5–10 years (23.0%), and >10 years (15.7%). Among patients with hypothyroidism, 52.1% had diabetes for less than 5 years, and only 18.8% had it for > 10 years. However, the association between thyroid dysfunction and diabetes duration was not statistically significant (p =0.985) [21].

In our study, poor blood sugar control was associated with thyroid dysfunction. Patients with high HbA1c levels, as well as elevated fasting, postprandial, and random blood sugar levels, had higher rates of subclinical and overt hypothyroidism. Thyroid dysfunction was less common in patients with better glycaemic control. This shows that both conditions can affect each other. Without monitoring and treating thyroid function, it may be impossible to maintain adequate blood sugar control. According to these results, routine diabetes care should include both thyroid and blood sugar checks. Shanmugam et al. (2015) reported a high prevalence of thyroid dysfunction in patients with HbA1c ≥7 (51.4% of cases) but did not analyse thyroid status-specific distribution (normal, subclinical, overt) in relation to individual glycaemic values such as FBS, PPBS, or RBS. Therefore, their results partially support our findings, specifically regarding the association between elevated HbA1c levels and thyroid dysfunction, but do not provide sufficient detail for comparison with thyroid status stratifications [22]. Talwalkar et al. (2019) reported that patients with both subclinical and overt hypothyroidism had significantly higher HbA1c and fasting glucose levels compared to euthyroid patients, confirming a strong link between thyroid abnormalities and poor glycaemic control [13].

Although no specific numerical values were reported for glycaemic parameters across thyroid statuses, Reddy (2018) observed that hyperthyroid patients demonstrated poor glycaemic control and patients with subclinical hypothyroidism experienced more complications, such as retinopathy and nephropathy. This supports the clinical relationship between thyroid dysfunction and glycaemic derangements [15].

Limitations

It was conducted in a single tertiary care centre, which may limit the generalizability of the findings to other geographic regions or healthcare settings. The use of a cross-sectional design prevents the establishment of causality between thyroid dysfunction and glycaemic control, restricting the interpretation to associations alone. Although the sample size was statistically justified, it may not be sufficient to capture rarer forms of thyroid dysfunction or subtle metabolic changes. The exclusion of patients with known thyroid illnesses or prior thyroid surgery may have led to an underestimation of the true burden of thyroid disorders among patients with diabetes. Confounding factors such as dietary iodine intake, presence of autoimmune conditions, concurrent medications, and lifestyle variables were not assessed, which may have influenced the observed associations. The absence of longitudinal follow-up limited the ability to assess the progression or reversibility of thyroid dysfunction over time in relation to the glycaemic status.

CONCLUSION

This prospective study showed that subclinical hypothyroidism is the most commonly observed abnormality, and thyroid dysfunction is a common comorbidity in patients with type 2 diabetes mellitus. Thyroid dysfunction was clearly linked to poor glycaemic control, as evidenced by elevated glycaemic marker levels. Those with suboptimal metabolic control are more likely to have abnormal thyroid function, and the longer a person has diabetes, the more likely they are to have thyroid dysfunction. A strong association between thyroid function and glucose metabolism is suggested by the significant correlations found between thyroid-stimulating hormone and fasting, postprandial, random blood glucose, and HbA1c levels. These findings point to the need for checking thyroid function regularly in people with diabetes, even if they don't have symptoms. Finding thyroid problems early can help manage the disease better and keep blood sugar and metabolism more stable in diabetic patients.

Declaration by Authors

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