ORIGINAL ARTICLE

THYROID DYSFUNCTION IN DIABETIC PATIENTS: A CLINICAL STUDY OF 140 CASES AND ITS IMPACT ON GLYCEMIC CONTROL AND METABOLIC HEALTH

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ABSTRACT

Background: Thyroid dysfunction is a commonly observed complication in diabetic patients. Hypothyroidism and hyperthyroidism can adversely affect glycemic control, insulin resistance, and metabolic health. This study aims to evaluate the association of thyroid dysfunction with diabetes and its impact on various metabolic parameters in 140 diabetic patients.

Objective: To assess the prevalence of thyroid dysfunction in diabetic patients and its impact on glycemic control, insulin resistance, and lipid profile.

Methods: A cross-sectional study was conducted involving 140 diabetic patients (70 Type 1 and 70 Type 2). Thyroid function was evaluated using TSH, Free T4, and Free T3 levels. Glycemic control was assessed by HbA1c, insulin resistance by HOMA-IR, and lipid profile and BMI were also evaluated.

Results: Thyroid dysfunction was observed in 40% of the diabetic patients, with hypothyroidism being more prevalent in Type 1 diabetes and hyperthyroidism in Type 2 diabetes. Insulin resistance was significantly higher in those with thyroid dysfunction.

Conclusion: Thyroid dysfunction has a significant impact on diabetes management and metabolic health. Regular thyroid screening in diabetic patients is recommended for better control and management.

Keywords: thyroid dysfunction, diabetes, hypothyroidism, hyperthyroidism, insulin resistance, glycemic control, Type 1 diabetes, Type 2 diabetes.

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INTRODUCTION

Hypothyroidism and hyperthyroidism, or thyroid dysfunction are common among diabetic patients. The pathophysiology of this association is generally linked to common autoimmune processes particularly in Type 1 diabetes[1]. It has been indicated that thyroid diseases can alter the metabolism of glucose and insulin resistance to some extent, and, consequently, complicate the treatment of diabetes[2]. Hypothyroidism is linked to higher levels of insulin resistance and inability to control the glucose level in the blood, whereas hyperthyroidism can necessitate higher levels of insulin to achieve normal glucose levels in the blood[3].

Of particular interest is the association between thyroid dysfunction and diabetes because this may predispose patients to cardiovascular risk which is a significant complication in diabetic patients[4]. Furthermore, thyroid hormones control several metabolic processes, and changes in thyroid activity may increase the symptoms of diabetes[5]. Since thyroid hormones are central to the regulation of metabolism, there is a need to explore the effects of thyroid dysfunction on the metabolic status of diabetic individuals.

Thyroid disorders are more common in diabetes in various studies and it has been reported that approximately 10-20% of diabetic patients have thyroid dysfunction[6]. The clinical outcomes of thyroid dysfunction are different, but Type 1 and Type 2 diabetes are associated with an increased risk of this condition[7]. Hence, it is important to diagnose and treat thyroid dysfunction early in a diabetic patient to avoid complications and achieve better clinical outcome.

The goal of the study is to identify the incidence of thyroid dysfunction among a cohort of 140 patients with diabetes and the effects of thyroid dysfunction on glycemic and insulin resistance as well as metabolic health.

METHODOLOGY

The research was carried out at Medical Unit of Services hospital Lahore throughout the course of a length of time ranging from 1st April 2024 to 31st December 2024. It was a cross-sectional observational study. There were a total of 140 patients who had been diagnosed with diabetes, and they were split into two groups: those with type 1 diabetes (n=70) and those with type 2 diabetes (n=70).

Inclusion Criteria:

- Age between 18–65 years.
- Have had a diabetes diagnosis of Type 1 or Type 2 for a minimum of one year.
- No prior thyroid surgery or radioactive iodine therapy.

Exclusion Criteria:

- Pregnancy.
- Known thyroid cancer or treatment with antithyroid medications.
- Other serious comorbidities affecting metabolism.

Data Collection: Demographic data (age, gender, duration of diabetes) were obtained from patient records. All participants provided blood samples after a 12-hour overnight fast for the following tests:

- **Thyroid Function Tests**:
  - **TSH (Thyroid Stimulating Hormone)**: Measured using chemiluminescent microparticle immunoassay (CMIA).
  - **Free T4 and Free T3**: The electrochemiluminescence immunoassay was used for this measurement.
- **Glycemic Control**: High-performance liquid chromatography (HPLC) was used to measure the levels of hemoglobin A1c. A glycemic control score below 7% was considered inadequate.
- **Insulin Resistance**: HOMA-IR, which stands for Homeostasis Model Assessment of Insulin Resistance, was utilized in order to determine the level of insulin resistance. The formula used is:

HOMA-IR=Fasting Insulin×Fasting Glucose
450

- **Lipid Profile and BMI**: Lipid profile (total cholesterol, LDL, HDL, triglycerides) was assessed by enzyme-linked immunosorbent assay (ELISA).

BMI= Weight (kg)
Height (m)2

Statistical Analysis: The analysis was done on SPSS version 26.0. Continuous variables were analyzed by descriptive statistics (mean +- SD). T-tests were used to examine the relationship between thyroid dysfunction and glycemic control and chi-square tests were used to compare groups. To evaluate the probability of poor glycemic control (HbA1c >7%) depending on thyroid condition, logistic regression was conducted, controlling the effect of confounding factors, such as age, sex, and diabetes type.

RESULTS

With 60 males (43%) and 80 females (57%), the average age of the participants was 54.3 years with a standard deviation of 7.2 years. 50 percent of the patients were diagnosed with type 1 diabetes, and the same number of patients were diagnosed with type 2 diabetes. The following is a summary of the baseline characteristics of the individuals who participated in the study: (Table 1)

Table 1: Baseline characteristics of all the patients

Characteristic	Value (%)
Gender (Male/Female)	60/80 (43%/57%)
Type of Diabetes	
Type 1	70 (50%)
Type 2	70 (50%)
Mean Age (years)	54.3 ± 7.2
Mean Duration of Diabetes	10.3 ± 3.1

Diabetes patients were found to have thyroid impairment in forty percent of cases. The prevalence of hypothyroidism was higher in people with type 1 diabetes (24%) compared to those with type 2 diabetes (16%), whereas the prevalence of hyperthyroidism was higher in cases of type 2 diabetes (16%) compared to those with type 1 diabetes (8%). (Table 2)

Table 2: Thyroid Dysfunction among patients

Thyroid Status	Type 1 (n=70)	Type 2 (n=70)	Total (n=140)
Hypothyroidism	17 (24%)	11 (16%)	28 (20%)
Hyperthyroidism	6 (8%)	14 (16%)	20 (14%)
Euthyroid	47 (68%)	45 (64%)	92 (66%)

Hypothyroid patients had significantly higher HbA1c levels (mean HbA1c: 8.3%) compared to euthyroid (mean HbA1c: 7.2%) and hyperthyroid patients (mean HbA1c: 7.5%). Table 3

Table 3: Thyroid Dysfunction and Glycemic control

Group	HbA1c (%)
Hypothyroid	8.3 ± 0.9
Hyperthyroid	7.5 ± 1.2
Euthyroid	7.2 ± 0.8

Insulin resistance was higher in patients with thyroid dysfunction. The mean HOMA-IR for hypothyroid patients was 3.7, for hyperthyroid patients 3.1, and for euthyroid patients 2.2.

Hypothyroid patients had elevated cholesterol levels, with a mean LDL of 145 mg/dL, while hyperthyroid patients had lower BMI (22.5 ± 2.2 kg/m²).

Table 4: Insulin Resistance

Group	HOMA-IR
Hypothyroid	3.7 ± 1.1
Hyperthyroid	3.1 ± 0.9
Euthyroid	2.2 ± 0.7

Table 5: Lipid Profile and BMI

Group	LDL (mg/dL)	BMI (kg/m²)
Hypothyroid	145 ± 20	28.3 ± 3.5
Hyperthyroid	112 ± 18	22.5 ± 2.2
Euthyroid	120 ± 17	25.8 ± 3.1

Logistic regression analysis revealed that hypothyroidism significantly increased the likelihood of having poor glycemic control (HbA1c ≥ 7%) with an odds ratio of 3.4 (95% CI: 1.8-6.4), while hyperthyroidism had a modest association with an odds ratio of 1.8 (95% CI: 1.0-3.3).

Table 6: Logistic Regression Analysis

Variable	Odds Ratio (OR)	95% Confidence Interval (CI)
Hypothyroidism	3.4	1.8-6.4
Hyperthyroidism	1.8	1.0-3.3

DISCUSSION

The findings of this study provide substantial support that thyroid dysfunction is a strong predictor of whether diabetes patients can continue to control their glycemic control and stay metabolically healthy. The results of the study are consistent with the results of other studies[6,7], which reported that hypothyroidism was significantly correlated with increased levels of HbA1c and increased insulin resistance. Moreover, hypothyroid patients also had elevated LDL cholesterol which predisposed them to cardiovascular disease. Such results are in agreement with the findings of recent researches[8,9].

Conversely, hyperthyroidism was demonstrated to be more common among individuals with type 2 diabetes and was also associated with greater insulin demand as reported in previous medical researches[10]. The body mass index (BMI) of hyperthyroid patients was smaller and insulin requirements were also higher but this is probably connected with the fact that the metabolic rates of such patients were greater[11].

The results of the logistic regression model indicate that hypothyroidism predicts poor glycemic control significantly with odds ratio of 3.4. It shows that regularly checking the thyroid glands of diabetic patients is crucial to improve glycemic control and avoid complications[12,13].

We have further conclusions supported by other recent studies. In Type 1 diabetes, e.g., one study by N et al. (2021) established the same relation between a bad glycemic control and hypothyroidism[14]. In addition, hyperthyroidism has been proved to increase the likelihood of insulin resistance among individuals with type 2 diabetes[15].

CONCLUSION

Thyroid dysfunction is a common side effect of people having diabetes and significantly affects their capacity to keep their blood glucose levels, insulin resistance, and lipid profiles normal. Thyroid dysfunction screening is crucial in patients with diabetes to allow diagnosis and treatment at the earliest possible stage, which in turn may help prevent complications arising in diabetes management in the long run. The mechanism that links the thyroid dysfunction with diabetes has to be addressed in future research to develop more specific treatment options.

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