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Thyroid Dysfunction in Patients with Type 2 Diabetes Mellitus Attending an OPD at a Tertiary Care Facility

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Abstract
Background and Aim:*The most frequent cause ofthyroid dysfunctionin T2DM may be owing to aberrant gene expression together with physiological anomalies that result in worse muscle glucose uptake and disposal, excessive hepatic glucose output, and improved splanchnic glucose absorption.The aim of the current investigation was to determine the prevalence of thyroid dysfunction in people with type 2 diabetes.*
Material and Methods:*The current study was a cross-sectional analysis of individuals with type 2 diabetes who were enrolled in anoutpatient department at a tertiary care facility.A totalof 600 patients were included in the present research.A thorough history was obtained regarding the patient's duration of diabetes, the existence of diabetes in other family members, and the review of treatment records.The blood sugar level and thyroid function tests were performed and compared.*
Results: *Females were more likely than males to have thyroid dysfunction (75.6%), and this difference was determined to be statistically significant (p 0.05).Patients with a positive family history of thyroid dysfunction experience the condition statistically more frequently.The presence of albuminuria in the research participants was used to diagnose diabetic nephropathy. Both types of thyroid dysfunction (hypothyroidism & hyperthyroidism) were more common in females as compared to males.*

Conclusion:*The results of the current investigation indicated that type 2 DM patients had a high prevalence of thyroid dysfunctions. Therefore, routine thyroid dysfunction testing in diabetic patients is necessary in order to identify these dysfunctions early and assist them to live better lives with lower rates of morbidity.*

Key Words: Blood Sugar level, Cross-sectional, Thyroid Dysfunction, Type 2 Diabetes Mellitus

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I. Introduction

Diabetes mellitus refers to a group of common metabolic disorders that shares thephenotypeofhyperglycemia. The main causes of diabetes mellitus include a sedentary lifestyle, poor eating habits, ethnicity, hypertension, and obesity. 1-3 By 2030, the World Health Organization predicts that 300 million people (7.8%) will have diabetes worldwide.[1,2]

In T2DM, inadequate insulin secretion causes a variety of metabolic abnormalities, including dyslipidemia, which is characterized by a disturbance in the homeostasis of fatty acids, triglycerides, and lipoproteins. Hyperglycemia results from inadequate insulin-stimulated glucose uptake and increased hepatic glucose production.[3,4]

The second most prevalent endocrine ailment impacting the general population is thyroid disease. As a result, having thyroid illness and diabetes together is quite frequent. Previous research has indicated that diabetic patients had a higher prevalence of thyroid dysfunction. Thyroid disease is more common in diabetic patients, particularly those who have poor glycemic control.[5-7]

The thyroid hormones are crucial components of several critical metabolic pathways because they regulate the balance of energy production and storage. TH primarily affects the brain, brown fat, white fat, liver, skeletal muscle, and pancreas to control metabolism. Although the link between Type I diabetes and thyroid dysfunction is well established by the autoimmune mechanism, Type II diabetes mellitus and thyroid dysfunction are still not totally understood.[8,9]The most frequent cause of thyroid dysfunction in T2DM may be owing to aberrant genetic expression together with physiological anomalies that result in worse muscle glucose uptake and disposal, excessive hepatic glucose output, and improved splanchnic glucose absorption. Insulinresistance is influenced by these elements. Thyroid dysfunction is also linked to insulin resistance.[10,11]

Insulin and thyroid hormones compete with one another for roles in the cellular metabolism of lipids, proteins, and carbohydrates. If their levels alter, thyroid hormone and insulin both experience functional impairment. Thyroid function appears to be impacted by DM at two different levels: first, at the level of the hypothalamic control of TSH release, and second, at the peripheral tissue's conversion of T4 to T3.[12,13] Diabetic patients who undergo thyroid screening will be able to treat overt and subclinical thyroid problems sooner. Thus, the goal of the current investigation was to determine the prevalence of thyroid dysfunction in people with type 2 diabetes.

II. Materials and Methods

The current study was a cross-sectional analysis of individuals with type 2 diabetes who were enrolled in anoutpatient department at a tertiary care facility. The investigation was conducted over the course between April 2020 to June 2021. The study population included all type-2 diabetic patientswho attended a tertiary care center's outpatient department. The institutional human ethics committee granted the study approval. All study participants provided written informed consent, and only those who were prepared to sign it were allowed to take part in the investigation.

The study's inclusion and exclusion criteria were as follows:

All T2DM patients who attended the outpatient department at SMIMER medical college and hospital, which has all advanced facilities like 24-hour laboratory facilities and full-time research centre, were included in the study.

Cases with known thyroid conditions, a history of other illnesses such as physiological Stress and CRF, DKA, and patients taking medications like lithium and amiodarone were disqualified.

A known T2DM patient's fasting blood sample was taken early in the morning and sent for a thyroid profile. Utilizing the competitive binding ELISA technique, TSH, T3, and T4 were calculated. The values were categorized using the following standards:

Normal when total T4 and TSH were in the normal range (i.e., TSH=0.69-2.02ng/ml, T4=4.4-10mcg/d1 for males and females 4.8-11.6mcg/dl.

Hypothyroidism:when total T4<6.2m1U/1.

Subclinical hypothyroidism when T4 was within normal limit and TSH>6.2mIU/L.

Hyperthyroidism when serum TSH< 0.4mIU/L.

The demographic information of each patient, including their age, sex, height, weight, residence address, and BMI (Body Mass Index), was recorded. A thorough history was obtained regarding the patient's duration of diabetes, the existence of diabetes in other family members, and the review of treatment records. Co-morbidities like hypertension and chronic obstructive lung disease were also investigated. A review of the patient's medical history included noting whether they were taking oral hypoglycemic medications or insulin.

Results from the statistical analysis presented as mean SD. Each parameter was calculated using the SPSS statistical tool, and the comparison was done using a student t-test (Chicago, USA). P values under 0.05 were deemed significant.

III. Results

In the analysis of the current research, a total of 600 patients were included. The included patients' full medical histories and initial characteristics were noted. The average number of years that each patient with diabetes had the disease was 8.24. The average HbA1C value was 8.13 (8.94%). The age range of 51 to 60 years had the highest proportion of diabetes individuals included in this study.

The tables below display the thyroid function test results for the study participants by gender. It was discovered that 20.21% of people with type 2 diabetes had thyroid abnormalities.Females were more likely than males to have thyroid dysfunction (75.6%), and this difference was determined to be statistically significant (p 0.05). A majority of study subjects (85%) had normal TSH, free T3, and free T4 values. Hypothyroidism was seen in 16.4% while hyperthyroidism was seen inonly 5.2% of subjects.

Patients with a positive family history of thyroid dysfunction experience the condition statistically more frequently (p 0.05). This demonstrates the link between thyroid problems and family history. The majority of thyroid dysfunction patients belonged to the older age group. With advancing age, sub-clinical hypothyroidism incidence rises. The presence of albuminuria in the research participants was used to diagnose diabetic nephropathy. This was subsequently categorized as microalbuminuria. (300 mg albumin/gram of creatinine). Both types of thyroid dysfunction (hypothyroidism & hyperthyroidism) were more common in females as compared to males.

IV. Discussion

The largest cause of morbidity and mortality in the globe is diabetes. Endocrine abnormalities of the thyroid are also quite prevalent in the general population. Thyroid issues and diabetes have long been linked, and research has shown that these two conditions can affect one another. The development of thyroid dysfunction in people with type 2 diabetes mellitus is significantly influenced by the insulin resistance that is frequently observed in these individuals. Hypothyroidism and hyperthyroidism are two different types of thyroid dysfunction that can happen. Patients with diabetes may also experience subclinical hypothyroidism, which can worsen cardiovascular disease, retinopathy, and other diabetic consequences.[14,15]

Patients with type 2 diabetes who also have thyroid dysfunction will have greater macrovascular and microvascular consequences, morbidity, mortality, and quality of life. Since these significant consequences receive so much attention, thyroid dysfunction and its impact on the numerous end organs in diabetes have not been thoroughly researched.[16,17]

In the study population, 42% of patients in the 51–60 age range, 33% of patients in the >60 age range, and 25% of patients in the 50 age range had thyroid disorders. Age and thyroid disease have a strong relationship. With increasing age, it was shown that thyroid issues were more common in diabetes individuals. This is comparable to studies by Vondra K et al18 and Michalek AM et al, which indicated that older diabetic patients also had a significant prevalence of thyroid problems.[19]

There were 280 men and 320 women in the 600 patients who were included in the current investigation. There were 76 men and 44 women in 120 instances in other research on the same subject, such as the one by Radhakrishna G et al., which is essentially identical to our study.

The majority of our patients (87.91%) who had a family history of thyroid disease had abnormal thyroid function tests. While a family history of diabetes did not increase the risk for thyroid dysfunction, which is the same result reported earlier, diabetic patients with a positive family history of thyroid disease had a higher likelihood of acquiring thyroid dysfunction.

In our study, most common thyroid dysfunction among type 2 diabetic patients is sub-clinicalhypothyroidism (84 patients) followed by hypothyroidism (15 patients) andhyperthyroidism (6 patients).

Thyroid dysfunction is more prevalent in female patients who are older than 50 and have higher BMIs. According to a prior study, hypothyroidism was the most prevalent thyroid malfunction, followed by subclinical hypothyroidism. Another study found that individuals with type 2 diabetes had a subclinical hypothyroidism rate

of 14%, that thyroid abnormalities were more prevalent in people between the ages of 40 and 58, and that people with a BMI greater than 25 had an increased risk of developing thyroid disorders.

V. Conclusion

The results of the current investigation indicated that type 2 DM patients had a high prevalence of thyroid dysfunctions. Therefore, routine thyroid dysfunction testing in diabetic patients is necessary in order to identify these dysfunctions early and assist them live better lives with lower rates of morbidity.

Table 1:Age distribution of patients having thyroid and differential thyroid dysfunction

Age (years)	No.	Hypothyroidism	Hyperthyroidism	Sub-clinical hypothyroidism	Sub-clinical hyperthyroidism
30-40	9	3	0	6	0
41-50	12	0	0	12	0
51-60	45	6	3	36	0
61-70	30	3	3	24	0
> 70	9	3	0	6	0

Table 2: Thyroid function test in study subjects according to glycemic status.

HbA1c(%)	Hypothyroidism	Hyperthyroidism
6.5 – 7	6	3
7.1 – 8	15	6
8.1 – 9	21	6
> 9	36	12

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