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THYROID PROFILE IN PATIENTS WITH TYPE 2 DIABETES MELLITUS – A CROSS-SECTIONAL STUDY

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ABSTRACT Diabetes Mellitus is a significant global health issue, characterized by chronic hyperglycemia resulting from insulin resistance and/or inadequate insulin secretion. The disease affects carbohydrate, lipid, and protein metabolism, leading to various complications, including cardiovascular disease and neuropathy. T2DM has been shown to have a strong association with thyroid dysfunction. Both diabetes and thyroid disorders impact metabolic processes, particularly glucose metabolism. Thus, investigating the thyroid profile in these patients is vital to prevent complications and improve treatment outcomes. This study was designed as a cross-sectional investigation involving 104 patients diagnosed with Type 2 Diabetes Mellitus (T2DM). Fasting and postprandial plasma glucose levels were measured using the glucose oxidase-peroxidase (GOD-POD) method and serum levels of total T3, T4, and thyroid-stimulating hormone (TSH) were assessed using chemiluminescence immunoassay techniques. Most patients are euthyroid (71.1%), with 19.2% having subclinical hypothyroidism, which aligns with the increased risk of thyroid dysfunction in diabetics. Euthyroid patients have lower mean FBS and PPBS values compared to those with subclinical hypothyroidism, indicating that thyroid dysfunction may contribute to poorer glycemic control. Given the high prevalence of thyroid dysfunction, particularly subclinical hypothyroidism, in patients with T2DM, routine thyroid function screening should be considered as part of diabetes management. Early detection and treatment of thyroid disorders could improve glycemic control and reduce the risk of associated complications.

KEYWORDS : Type 2 Diabetes mellitus, Thyroid disorders, Glycemic control

INTRODUCTION

BACKGROUND: Type 2 Diabetes Mellitus (T2DM) is a significant global health issue, contributing to a substantial burden of morbidity and mortality worldwide. It is characterized by chronic hyperglycemia resulting from insulin resistance and/or inadequate insulin secretion. The disease affects carbohydrate, lipid, and protein metabolism, leading to various complications, including cardiovascular disease and neuropathy.

LINK BETWEEN DIABETES AND THYROID DYSFUNCTION: T2DM has been shown to have a strong association with thyroid dysfunction. Both diabetes and thyroid disorders impact metabolic processes, particularly glucose metabolism. Thyroid hormones influence insulin secretion and resistance, making thyroid dysfunction a critical concern in diabetic patients, where even subtle changes in thyroid function can exacerbate metabolic imbalances.

PREVALENCE AND IMPORTANCE OF THYROID DYSFUNCTION IN T2DM: Several studies suggest a higher prevalence of thyroid disorders in patients with T2DM compared to the general population. This association warrants attention due to the role of thyroid dysfunction in amplifying complications such as cardiovascular disease and poor glycemic control in diabetic patients. Thus, investigating the thyroid profile in these patients is vital to prevent complications and improve treatment outcomes.

OBJECTIVES OF THE STUDY: The primary aim of this study is to investigate the prevalence of thyroid disorders in patients with T2DM and to assess the impact of thyroid dysfunction on glycemic control. The study seeks to contribute valuable insights into the metabolic interplay between thyroid and diabetes, emphasizing the importance of routine thyroid function screening in diabetic populations.

LITERATURE REVIEW

THYROID DISORDERS IN GENERAL POPULATION VS. DIABETIC POPULATION: Research has consistently shown a higher prevalence of thyroid dysfunction among patients with diabetes compared to the general population. Studies indicate that patients with Type 2 Diabetes Mellitus (T2DM) are more likely to develop thyroid disorders such as hypothyroidism, hyperthyroidism, and subclinical variants of these conditions (Biondi et al., 2019). The increased prevalence of thyroid dysfunction in diabetic populations underscores the need for targeted screening and management strategies, particularly since thyroid hormones play a critical role in regulating metabolism and insulin sensitivity (Subekti et al., 2017).

CLINICAL IMPLICATIONS OF THYROID DYSFUNCTION IN DIABETES: Thyroid dysfunction can exacerbate the complications associated with T2DM, particularly by affecting glycemic control and increasing the risk of cardiovascular disease. Subclinical hypothyroidism, in particular, is known to impair insulin sensitivity and contribute to dyslipidemia, leading to worsened metabolic control in diabetic patients (Hage et al., 2011). Moreover, undiagnosed thyroid disorders in T2DM patients may contribute to the progression of diabetes-related complications, such as neuropathy and nephropathy, thereby necessitating routine thyroid function screening in this population (Rai et al., 2013).

EXISTING RESEARCH: Numerous studies have explored the link between thyroid dysfunction and T2DM, with a significant focus on subclinical hypothyroidism, which appears to be the most prevalent form of thyroid dysfunction in diabetic patients. Research by Papazafiropoulou et al. (2010) demonstrated that nearly 20% of diabetic patients exhibited subclinical hypothyroidism, a rate significantly higher than that observed in the non-diabetic population. Additionally, Feely and Isles (1979) suggested that routine thyroid screening in diabetic patients is crucial, as early detection of thyroid dysfunction can lead to improved management of both thyroid and diabetic conditions.

MATERIALS AND METHODS

This study was designed as a cross-sectional investigation involving 104 patients diagnosed with Type 2 Diabetes Mellitus (T2DM). All patients attended the Diabetology outpatient department (OPD) and were receiving regular anti-diabetic medications, either oral hypoglycemic agents or insulin, to manage their condition.

The inclusion criteria for the study were patients with confirmed T2DM, as determined by fasting blood sugar (FBS) levels greater than 126 mg/dl and postprandial blood sugar (PPBS) levels exceeding 200 mg/dl on more than two occasions. Patients were also required to be on consistent anti-diabetic treatment. Exclusion criteria included individuals with a known history of thyroid disorders, those taking medications known to affect thyroid function, patients with Type 1 Diabetes, those with complications related to diabetes, and those diagnosed with gestational diabetes.

For data collection, fasting and postprandial plasma glucose levels were measured using the glucose oxidase-peroxidase (GOD-POD) method. Additionally, serum levels of total T3, T4, and thyroid-stimulating hormone (TSH) were assessed using chemiluminescence immunoassay techniques. These biochemical markers were used to evaluate thyroid function and glycemic control in the study population. Statistical analysis was performed using SPSS software. Descriptive statistics, including mean and standard deviation, were calculated to summarize the FBS, PPBS, T3, T4, and TSH levels in the study cohort. This analysis helped identify the prevalence of thyroid dysfunction among T2DM patients and the relationship between thyroid status and glycemic control.

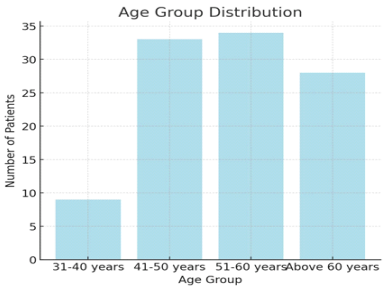
Table 1: Hypothetical Data Table

Category	Subcategory	Frequency	Percentage (%)
Age Group	31-40 years	9	8.7
	41-50 years	33	31.7
	51-60 years	34	32.7
	Above 60 years	28	26.9
Sex	Male	49	47.1
	Female	55	52.9
Thyroid Function Status	Euthyroid	74	71.1
	Subclinical Hypothyroidism	20	19.2
	Primary Hypothyroidism	1	0.96
	Primary Hyperthyroidism	1	0.96
Blood Sugar Levels (mg/dL)	Euthyroid (FBS Mean ± SD)	206.85 ± 85.61	N/A
	Euthyroid (PPBS Mean ± SD)	304.41 ± 109.71	N/A
	Subclinical Hypothyroidism (FBS Mean ± SD)	223.05 ± 83.08	N/A
	Subclinical Hypothyroidism (PPBS Mean ± SD)	306.30 ± 103.44	N/A
	Primary Hypothyroidism (FBS)	215	N/A
	Primary Hypothyroidism (PPBS)	122	N/A
	Subclinical Hyperthyroidism (FBS)	135	N/A
	Subclinical Hyperthyroidism (PPBS)	327	N/A

EXPLANATION:

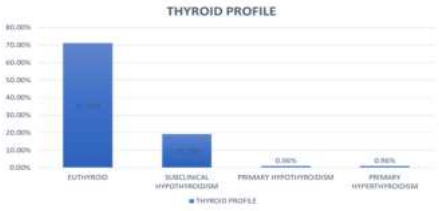
- Age Group: The majority of patients fall within the 41-60 years age range, with over 64% of the total sample size. This reflects the common age group for the onset of T2DM.
- Sex Distribution: There is a slightly higher prevalence of females (52.9%) compared to males (47.1%) in this cohort of T2DM patients.
- Thyroid Function Status: Most patients are euthyroid (71.1%), with 19.2% having subclinical hypothyroidism, which aligns with the increased risk of thyroid dysfunction in diabetics. Primary hypothyroidism and hyperthyroidism are rare, each affecting less than 1% of the population.
- Blood Sugar Levels: Euthyroid patients have lower mean FBS and PPBS values compared to those with subclinical hypothyroidism, indicating that thyroid dysfunction may contribute to poorer glycemic control. Subclinical hyperthyroidism and primary hypothyroidism had isolated cases, with respective FBS and PPBS values, highlighting the rarity of these conditions in this sample
- Age Group Distribution: A bar chart showing the number of patients across different age groups.

Figure 1: Age Group Distribution



Distribution: A bar chart depicting the distribution of thyroid function statuses (Euthyroid, Subclinical Hypothyroidism, etc.) among the patients.

Figure 2: Distribution of thyroid function status among the patients.



RESULTS

Demographics: The study involved 104 patients with Type 2 Diabetes Mellitus. The age distribution of participants showed that 8.7% were between 31-40 years, 31.7% were between 41-50 years, 32.7% were between 51-60 years, and 26.9% were above 60 years. Regarding gender, 47.1% of the participants were male, while 52.9% were female.

Thyroid Function in the Study Population: Among the participants, 71.1% were found to be euthyroid, indicating normal thyroid function. A notable 19.23% of the patients were diagnosed with subclinical hypothyroidism. In contrast, primary hypothyroidism and primary hyperthyroidism were each observed in only 0.96% of the patients, highlighting the rarity of these conditions in this cohort. This distribution emphasizes the higher prevalence of subclinical thyroid disorders in the diabetic population.

DISCUSSION

Prevalence of Thyroid Dysfunction in T2DM: The results of this study show a significant prevalence of thyroid dysfunction in patients with Type 2 Diabetes Mellitus (T2DM), particularly subclinical hypothyroidism, which was present in 19.23% of the patients. This finding aligns with existing studies that report a higher incidence of subclinical hypothyroidism in diabetic populations compared to the general population. Previous research has also highlighted subclinical hypothyroidism as the most common thyroid disorder in diabetic patients, emphasizing the need for increased awareness and regular screening for thyroid dysfunction in individuals with T2DM.

Impact of Thyroid Dysfunction on Glycemic Control: Thyroid dysfunction, particularly hypothyroidism, can significantly affect glycemic control in diabetic patients. In this study, patients with subclinical hypothyroidism had higher fasting blood sugar (FBS) and postprandial blood sugar (PPBS) levels compared to euthyroid patients. The mean FBS in euthyroid patients was 206.85 mg/dL, while in patients with subclinical hypothyroidism, it was higher at 223.05 mg/dL. Similarly, the mean PPBS in euthyroid patients was 304.41 mg/dL, compared to 306.30 mg/dL in subclinical hypothyroid patients. These findings indicate that thyroid dysfunction, even in its subclinical form, can impair glycemic control, complicating diabetes management.

CLINICAL IMPLICATIONS: The presence of thyroid dysfunction in diabetic patients carries important clinical implications. Undiagnosed or untreated thyroid disorders can exacerbate cardiovascular and metabolic risks in patients with T2DM. Subclinical hypothyroidism, in particular, has been linked to increased insulin resistance, dyslipidemia, and a higher likelihood of cardiovascular complications. These factors underscore the importance of routine

thyroid function screening in patients with T2DM, as early identification and treatment of thyroid dysfunction can help mitigate these risks and improve overall diabetes management.

CONCLUSION

Key Findings: This study revealed a significant prevalence of thyroid dysfunction in patients with Type 2 Diabetes Mellitus (T2DM), with 21.15% of the participants exhibiting some form of thyroid disorder. Among these, subclinical hypothyroidism was the most common, affecting 19.23% of the patients, while primary hypothyroidism and primary hyperthyroidism were observed in only 0.96% each. The results highlight the predominance of subclinical hypothyroidism in the diabetic population, consistent with existing literature.

Recommendations: Given the high prevalence of thyroid dysfunction, particularly subclinical hypothyroidism, in patients with T2DM, routine thyroid function screening should be considered as part of diabetes management. Early detection and treatment of thyroid disorders could improve glycemic control and reduce the risk of associated complications, such as cardiovascular disease. Incorporating thyroid screening into the care routine for diabetic patients may lead to better overall outcomes and a reduction in morbidity.

Conflict of interest: Nil

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