



EVALUATION OF THYROID FUNCTION AND TRIGLYCERIDES IN DIABETES MELLITUS PATIENT IN TERTIARY CARE CENTRE

Medicine

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ABSTRACT

Introduction: Diabetes Mellitus is a complex metabolic disorder that frequently coexists dyslipidemia and thyroid dysfunction. **Aim:** The primary aim is to explore the levels of thyroid function and triglycerides in patients with diabetes mellitus.

Objectives:

1. To assess the association between thyroid hormones and triglycerides in Type 2 Diabetes Mellitus patients.
2. To compare these metabolic abnormalities between diabetic patients and age and gender-matched controls.
3. To identify risk factors linked with thyroid dysfunction and elevated triglyceride levels.

Method: This case-control study was conducted at Vishwaraj Hospital, Pune from January to June 2023, involving 85 diabetic patients and 85 matched controls. Comprehensive demographic and clinical profiles were collected, including anthropometric data and personal health history. Statistical analysis included the use of t-tests, chi-square tests and Pearson's correlation coefficient to analyze the data. **Result:** The study revealed the prevalence of thyroid disorders was notably higher in diabetics (26.1%) than in controls (10.6%). Hypertriglyceridemia was more frequent among diabetic patients (47.1%) compared to non-diabetic controls (18.8%). A positive correlation was identified between elevated TSH levels and higher triglyceride levels in the diabetic cohort ($p = 0.288$, $p = 0.008$), suggesting a metabolic link that may influence diabetic complications.

Conclusion: The findings from this study confirm a high prevalence of thyroid disorders and hypertriglyceridemia in diabetic patients, indicating a need for regular monitoring and proactive management of these condition.

KEYWORDS

Diabetes Mellitus, Hypertriglyceridemia, Thyroid function

INTRODUCTION

Diabetes mellitus (DM) and thyroid dysfunction (TD) are the two most common endocrinological disorders in the current era. Diabetes mellitus impairs the body metabolism by influencing thyroid function at the level of the hypothalamus (by TSH)(1) As insulin and thyroid hormones are intricately involved in cellular metabolism, excess or deficit of either of them results in the functional derangement of the other. Thyroid dysfunction particularly hypothyroidism is frequently encountered in diabetic patients.(2) Diabetes mellitus is a group of metabolic disorders usually associated with dyslipidemia which increases risk of cardiovascular disorders. There is an intricate biochemical interrelationship between insulin, TSH and lipids. Hypothyroidism leads to insulin resistance whereas hypothyroidism increases susceptibility to hypoglycaemia. Thus, thyroid dysfunction may adversely affect diabetes control, thereby, accentuating burden of the health care system(3)

The diabetic population is expected to rise from 171 million in 2000 to >400 million in 2030. The prevalence of TD in all diabetic patients was 14.7%. The most frequently TD was subclinical hypothyroidism, in 13% of patients with T1DM and in 12% of patients with T2DM. Prevalence of thyroid dysfunction varies between 7-13.4% in general population and 10-24% in diabetic group. Hypothyroidism often leads to elevated levels of total cholesterol and low-density lipoprotein-cholesterol. Epidemiological studies have shown a linear correlation between TG levels and the risk of type 2 diabetes mellitus (T2DM). Individuals with high triglyceride levels are nearly 54% more likely to develop T2DM. As the thyroid hormone and triglycerides abnormalities are closely associated with diabetes, the undetected, untreated thyroid dysfunction may impair diabetes control, its early detection and prompt treatment among diabetics would prove beneficial in achieving glycemic control, minimizing cardiovascular risk and improving general well-being(7)

MATERIALS AND METHODS

Study Setting:

The study was conducted at Vishwaraj Hospital, Pune which is a tertiary care centre and an academic institute.

Study Design:

It was a case control study conducted on diabetes mellitus cases and

age and gender matched controls.

Study Participants:

Patients were recruited from OPD and wards at Vishwaraj Hospital, Pune, India from Jan 1, 2023 to June 30, 2023 whereas matched controls were identified from the relatives of the patients.

Inclusion Criteria For Cases

1. Patients older than 18 years.
2. Patients with history of DM or newly diagnosed cases as per WHO criteria (any of the following)
 - i) Fasting venous or capillary plasma glucose ≥ 7.0 mmol/L (126 mg/dL)
 - ii) 2-hour post-load venous plasma glucose ≥ 11.1 mmol/L (200 mg/dL)
 - iii) 2-hour post-load capillary plasma glucose ≥ 12.2 mmol/L (220 mg/dL)
 - iv) fasting state Random plasma glucose ≥ 11.1 mmol/L (200 mg/dL)
 - v) HbA1c 6.5% (48 mmol/mol) (To be used only in the presence of symptoms)
3. Patients willing to participate in the study by signing an informed consent document.

Inclusion Criteria For Controls

1. Older than 18 years.
2. Willing to participate in the study by signing an informed consent document.

Exclusion Criteria

1. Patients with a history of thyroid disorders or on drugs affecting thyroid hormones
2. Patients having chronic liver disease, chronic kidney disease, or cardiovascular disease.
3. Pregnant or lactating women

RESULT AND OBSERVATION

In our study, Serum T3 levels averaged 130.41 ± 24.48 ng/dL, Serum T4 levels averaged 7.40 ± 3.36 mcg/dL, Serum TSH levels averaged 3.79 ± 3.68 mIU/mL, triglyceride levels averaged 119.07 ± 42.82 mg/dL, HbA1c levels averaged $8.55 \pm 3.09\%$, fasting blood glucose levels averaged 172.79 ± 38.92 mg/dL, and random blood glucose

levels averaged 242.02 ± 85.35 mg/dL.

Table No 1: Prevalence Of Thyroid Disorders In Diabetes Mellitus Compared To Non Diabetic Individuals

Type of Thyroid		Type of Subject		TOTAL	P
		DM (N=85)	Non DM (N=85)		
HYPERTHYROIDISM	Number	5	4	9	0.01
	%	5.9%	4.7%	5.3%	
HYPOTHYROIDISM	Number	18	5	23	
	%	21.2%	5.9%	13.5%	
EUTHYROID	Number	62	76	138	
	%	72.9%	89.4%	81.2%	

The table shows that among DM participants, 5.9% (n=5) had hyperthyroidism, 21.2% (n=18) had hypothyroidism, and 72.9% (n=62) had normal thyroid function. In comparison, among non-DM participants, 4.7% (n=4) had hyperthyroidism, 5.9% (n=5) had hypothyroidism, and 89.4% (n=76) had (Euthyroid). The differences in thyroid types were statistically significant ($p=0.01$).

Table 2: Correlation Analysis Of Thyroid Hormones And Triglyceride Levels In DM and Non-DM Study Groups

Spearman's rho		T3 (ng/dl)	T4 (mcg/dl)	TSH (mIU/ml)
Triglyceride level (mg/dl) in DM	Correlation Coefficient	0.021	-0.046	0.288
	P	0.850	0.674	0.008
Triglyceride level (mg/dl) in Non-DM	Correlation Coefficient	0.156	0.176	-0.060
	P	0.153	0.108	0.585

The Spearman's rho correlation results indicate that there is a very weak and statistically insignificant correlation between T3 levels and triglyceride levels ($p=0.021$, $p=0.850$) as well as between T4 levels and triglyceride levels ($p=-0.046$, $p=0.674$) in patients with diabetes mellitus. However, there is a statistically significant moderate positive correlation between TSH levels and triglyceride levels ($p=0.288$, $p=0.008$), suggesting that as TSH levels increase, triglyceride levels also tend to increase in these patients. The Spearman's rho correlation results for non-diabetic individuals indicate weak and statistically insignificant correlations between thyroid hormone levels (T3, T4, and TSH) and triglyceride levels.

Specifically, T3 levels show a weak positive correlation ($p=0.156$, $p=0.153$), T4 levels also show a weak positive correlation ($p=0.176$, $p=0.108$), and TSH levels show a very weak negative correlation ($p=-0.060$, $p=0.585$). None of these correlations are statistically significant, as all p-values exceed the conventional significance level of 0.05.

DISCUSSION

Diabetes mellitus (DM) is a complex metabolic disorder characterized by high blood sugar levels, which typically results from issues with insulin secretion or action. Thyroid disorders, particularly hypothyroidism, are more common in people with diabetes than in those without this condition. This is significant because thyroid dysfunction can complicate the management of diabetes by disrupting metabolic balance and increasing cardiovascular risks.(11)

In our current study, the prevalence of diabetes was higher among males (58.8%) compared to females (41.2%), aligning with trends observed in several past studies. In the present study, the mean age of diabetic patients was 61.28 ± 11.94 years, while the mean age of non-diabetic patients was 59.89 ± 12.23 years, indicating comparable age distribution between diabetic patients and controls. In the present study, among the 85 individuals with diabetes, 5.9% had hyperthyroidism, 21.2% had hypothyroidism, and 72.9% had euthyroid. In contrast, among the 85 non-diabetic individuals, 4.7% had hyperthyroidism, 5.9% had hypothyroidism, and 89.4% had normal thyroid function. These differences in thyroid disorder prevalence between diabetic and non-diabetic individuals were statistically significant ($p=0.01$). study published in the Diabetology & Metabolic Syndrome journal reported a 14.7% prevalence of thyroid dysfunction in diabetic patients, with subclinical hypothyroidism being the most common dysfunction at 11.8% (12). This is consistent with our finding that a significant proportion of diabetic patients suffer from hypothyroidism.

Hypertriglyceridemia is a common lipid abnormality associated with diabetes mellitus and is a significant risk factor for cardiovascular diseases. In the present study, the mean triglyceride level for diabetic patients was 160.7 mg/dL. This aligns closely with the findings of Singh et al.(48) who reported mean triglyceride levels of 163.20 mg/dL in diabetic individuals. Both studies highlight the elevated triglyceride levels in diabetic patients compared to non-diabetic controls.

Hypertriglyceridemia, defined as elevated levels (>150 mg/dl) of triglycerides in the blood, was found in 47.10% of diabetic participants in the present study. This prevalence is closely aligned with the 47% reported by Joffe BI et al., indicating a consistent pattern of elevated triglyceride levels among diabetic patients.(5) In the present study, the correlation analysis between triglyceride levels and thyroid function tests revealed a significant positive association with TSH ($r=0.288$, $p=0.008$), but no significant correlations with T3 ($r=0.021$, $p=0.850$) or T4 ($r=-0.046$, $p=0.674$). This aligns with the findings of Cheng H et al.(13), who observed a positive relationship between TSH and triglycerides, and a negative association with free thyroxine (Ft4).

CONCLUSION

Enhanced focus on lifestyle management and compliance with prescribed medication is crucial for improving health outcomes in diabetes mellitus. Regular assessment of thyroid function and triglyceride levels can help in early detection and management of potential complications. Effective management strategies tailored to individual patient profiles are essential for better clinical outcomes and quality of life for diabetic patients.

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