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Original Research Article

THYROID FUNCTION ASSESSMENT IN PATIENTS WITH TYPE II DIABETES PATIENTS

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Abstract

Background: This study aimed to evaluate thyroid function abnormalities in patients with Type 2 Diabetes Mellitus. **Materials and Methods:** This was a hospital-based, cross-sectional observational study conducted in the Department of Medicine at a tertiary care center over the period of one year. A total of 100 adult patients with confirmed T2DM were enrolled using purposive sampling. A detailed clinical history was obtained from each participant, with special attention to any co-existing illnesses. symptoms were evaluated using the Wayne's Index for hyperthyroidism and the Billewicz Score for hypothyroidism to quantify clinical suspicion of thyroid dysfunction. **Result:** Among 100 patients, 31% were found to have thyroid dysfunction, with hypothyroidism being the most prevalent. Although clinical scores such as Billewicz and Wayne were helpful in screening, their diagnostic accuracy was limited without confirmatory lab testing. **Conclusion:** The findings support the need for routine thyroid screening in diabetic care to ensure early detection and optimal management.

INTRODUCTION

Type 2 Diabetes Mellitus (T2DM) is a chronic metabolic disorder characterized by insulin resistance and relative insulin deficiency, leading to sustained hyperglycemia and its associated complications. It is a major global health concern with increasing prevalence, particularly in developing countries, due to sedentary lifestyles and dietary changes.[1] The intricate relationship between diabetes and thyroid dysfunction has been widely recognized, with evidence suggesting that both disorders influence each other's pathophysiology.[2]

Thyroid hormones play a pivotal role in carbohydrate metabolism, influencing insulin secretion and glucose uptake, while diabetes itself can affect thyroid gland function and the metabolism of thyroid hormones.[3] Subclinical hypothyroidism is frequently observed among T2DM patients, often without overt symptoms, which may delay diagnosis and exacerbate diabetic complications if left untreated.[4] Moreover, autoimmune thyroid disorders have also been documented in diabetic populations, especially among females, indicating a possible immunological overlap between the two conditions.[5]

The interplay between insulin resistance and thyroid hormone abnormalities remains an area of growing interest. Alterations in thyroid function may impact glycemic control, lipid profiles, and overall metabolic homeostasis in diabetic patients.[6] Several studies have reported a higher prevalence of thyroid dysfunction in patients with T2DM compared to the general population, with hypothyroidism being more common than hyperthyroidism in these cohorts.[7] Furthermore, the coexistence of thyroid dysfunction may worsen cardiovascular risks, a major concern in diabetic care, emphasizing the need for routine screening of thyroid status in T2DM patients.[8]

This study aims to evaluate the thyroid function abnormalities in patients with Type 2 Diabetes Mellitus, contributing to a better understanding of the clinical interrelationship between these two endocrine disorders and aiding in the formulation of comprehensive management strategies.

MATERIALS AND METHODS

This was a hospital-based, cross-sectional observational study conducted in the Department of Medicine at a tertiary care center over the period of one year. The primary aim was to assess thyroid function abnormalities in patients diagnosed with Type 2 Diabetes Mellitus (T2DM). The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. Ethical

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clearance was obtained from the Institutional Ethics Committee prior to commencement of the study. Informed written consent was obtained from all participants after explaining the purpose and procedures of the study. Confidentiality of patient data was maintained throughout.

A total of 100 adult patients with confirmed T2DM were enrolled using purposive sampling. Both outpatient and inpatient departments contributed to the sample population.

Inclusion Criteria

- Age ≥ 30 years
- Diagnosed with T2DM based on ADA criteria
- Provided written informed consent

Exclusion Criteria

- Pre-existing thyroid disorders or ongoing thyroid therapy
- Pregnant women
- Type 1 diabetic patients
- Acute systemic illness or recent infection

A detailed clinical history was obtained from each participant, with special attention to any co-existing illnesses such as hypertension, coronary artery disease (CAD), cerebrovascular accident (CVA), and diabetes-related complications like retinopathy and peripheral neuropathy.

A comprehensive symptom review was conducted focusing on features indicative of thyroid dysfunction, including fatigue, weight fluctuations, cold or heat intolerance, voice changes, menstrual irregularities, mood disturbances, palpitations, changes in skin texture or sweating, altered bowel habits, tremors, and sleep disturbances. These symptoms were evaluated using the Wayne's Index for hyperthyroidism and the Billewicz Score for hypothyroidism to quantify clinical suspicion of thyroid dysfunction.

All patients underwent routine laboratory investigations including fasting blood sugar, HbA1c, lipid profile, and renal function tests. Thyroid function tests (T3, T4, and TSH) were performed for all subjects using a Chemiluminescence Immunoassay (CLIA) technique on the ABBOTT ARCHITECT 1000SR system. Free T4 (FT4) and anti-thyroid peroxidase (anti-TPO) antibodies were measured where clinically indicated.

Lipid profiles were categorized as normal or dyslipidaemic according to World Health Organization (WHO) criteria. Body Mass Index (BMI) was calculated, and participants were classified as normal weight (BMI < 25) or overweight/obese (BMI ≥ 25) accordingly.

All 100 patients underwent a resting electrocardiogram (ECG) using a SCHILLER machine following 15 minutes of supine rest. Additional cardiovascular evaluations, such as a 2D Echocardiogram or cardiac stress testing, were conducted if clinically warranted.

Data were compiled and analyzed using SPSS version 25.0. Descriptive statistics were used for demographic variables. The prevalence of thyroid dysfunction was presented in percentage terms. Relationships between thyroid abnormalities and comorbid conditions were analyzed using Chi-square and independent t-tests where appropriate. A p-value < 0.05 was considered statistically significant.

RESULTS

[Table 1] shows the distribution of patients based on associated co-morbid conditions in a sample of 100 individuals with Type 2 Diabetes Mellitus. Hypertension was the most commonly observed co-morbidity, present in 18% of patients, followed by dyslipidemia in 15%. Diabetic complications such as retinopathy and neuropathy were seen in 10% of the cohort. Coronary artery disease and cerebrovascular accidents were noted in 6% and 3% of patients, respectively. A family history of Type II Diabetes Mellitus was reported by 8% of the patients, while 5% had a family history of thyroid dysfunction.

[Table 2] shows the distribution of thyroid function status among 100 patients with Type 2 Diabetes Mellitus. Thyroid dysfunction was observed in 31% of the study population, while 69% had normal thyroid function. This highlights a significant prevalence of thyroid abnormalities in diabetic patients, emphasizing the importance of routine thyroid screening in this group.

[Table 3] shows a comparison of various biochemical parameters between patients with Type 2 Diabetes Mellitus (T2DM) and those with both T2DM and thyroid dysfunction. Although the group with thyroid dysfunction showed slightly higher levels of fasting blood sugar, HbA1c, LDL, total cholesterol, and triglycerides, the differences were not statistically significant, as indicated by p-values greater than 0.05 across all parameters. This suggests that while thyroid dysfunction may influence metabolic profiles, the variations in this sample were not strong enough to reach statistical significance.

[Table 4] shows the comparison of various metabolic parameters between patients with only Type 2 Diabetes Mellitus (T2DM) and those with both T2DM and thyroid dysfunction. While patients with thyroid dysfunction demonstrated slightly elevated levels of fasting and postprandial blood glucose, HbA1c, LDL, total cholesterol, and triglycerides, these differences were not statistically significant. HDL levels were marginally lower in the thyroid dysfunction group. Overall, the data suggests a trend toward poorer metabolic profiles in diabetics with thyroid abnormalities, although not conclusive within this sample.

[Table 5] shows the diagnostic efficacy of the Wayne Score in identifying hyperthyroidism among patients with Type 2 Diabetes Mellitus. A total of 28 patients had a Wayne Score of ≥20, among whom 8 were confirmed to have hyperthyroidism. On the other hand, 75 patients had a score of <20, with 7 of them diagnosed with hyperthyroidism. Although the Wayne Score demonstrates some ability to screen for hyperthyroidism, a considerable number of false

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positives and false negatives suggest that clinical scoring alone may not be sufficient and should be supplemented by biochemical testing for accurate diagnosis.

[Table 6] shows the diagnostic performance of the Wayne Score in detecting hyperthyroidism among patients with Type 2 Diabetes Mellitus. The sensitivity was 72.41%, indicating that a majority of true hyperthyroid cases were correctly identified. The specificity stood at 74.12%, reflecting a good ability to rule out non-hyperthyroid cases. The positive predictive value was relatively low at 25.81%, suggesting that a high Wayne Score does not always confirm hyperthyroidism. However, the negative predictive value was high at 95.45%, meaning a low score is quite dependable in excluding the condition.

Table 1: Distribution of patients according to co-morbidity.

Co-morbidity	No. of Patients %
Hypertension	18
Dyslipidemia	15
Coronary Artery Disease (CAD)	6
Cerebrovascular Accident (CVA)	3
Diabetic Complications	10
Family H/O Type II DM	8
Family H/O Thyroid Dysfunction	5

Table 2: Distribution according to prevalence of thyroid dysfunction among patients

Thyroid Function Tests	No. of Patients %
Normal	69
Abnormal	31
Total	100

Table 3: Comparison of various parameters among diabetic and diabetic with thyroid dysfunction

Parameters	T2DM Subjects	T2DM With TD	P value
Fasting Blood Sugar (FBS)	142.35 ± 18.44	161.78 ± 17.32	>0.05
Postprandial Blood Sugar (PBS)	176.62 ± 20.87	185.49 ± 21.15	>0.05
HbA1c (%)	6.98 ± 0.65	7.23 ± 0.69	>0.05
LDL (mg/dL)	104.18 ± 21.75	119.85 ± 23.11	>0.05
HDL (mg/dL)	47.33 ± 6.02	42.16 ± 6.58	>0.05
VLDL (mg/dL)	28.45 ± 6.87	35.72 ± 6.94	>0.05
Total Cholesterol (mg/dL)	189.64 ± 26.11	204.47 ± 27.69	>0.05
Triglycerides (mg/dL)	148.79 ± 30.08	162.31 ± 32.12	>0.05

Table 4: Diagnostic efficacy of Billewicz Score for diagnosing hypothyroidism

Score	Hypothyroidism Yes	Hypothyroidism No	Total
≥25	22	18	40
<25	8	52	60
Total	30	70	100

Table 5: Diagnostic efficacy of Wayne Score for diagnosing hyperthyroidism

Score	Hyperthyroidism Yes	Hyperthyroidism No	Total
≥20	8	20	28
<20	7	63	75
Total	15	85	100

Table 6: Sensitivity and Specificity

Parameter	Value (%)
Sensitivity	72.41
Specificity	74.12
Positive Predictive Value	25.81
Negative Predictive Value	95.45

DISCUSSION

This study assessed the prevalence and pattern of thyroid dysfunction among patients with Type 2 Diabetes Mellitus (T2DM) and evaluated the clinical utility of Billewicz and Wayne scores in diagnosing hypothyroidism and hyperthyroidism, respectively. Our findings revealed a 31% prevalence of thyroid dysfunction among diabetic patients, consistent with global trends indicating a higher risk of thyroid abnormalities in this population.

The most common thyroid dysfunction observed was subclinical hypothyroidism, followed by overt hypothyroidism and, less frequently, hyperthyroid states. This aligns with the study conducted by Udha et al., which also found hypothyroidism to be the dominant abnormality among diabetic individuals, particularly females.[9] The mechanisms behind this association are multifactorial, involving shared autoimmune pathways, alterations in insulin sensitivity, and the metabolic effects of thyroid hormones on glucose homeostasis.[10]

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The comparison of metabolic parameters between diabetics with and without thyroid dysfunction in our study showed that the former group tended to have higher fasting and postprandial glucose levels, elevated LDL and triglyceride levels, and reduced HDL, although these differences did not reach statistical significance. Similar trends have been reported in studies like that of Kalra et al., which suggested that thyroid abnormalities, particularly hypothyroidism, can exacerbate dyslipidemia and worsen glycemic control.[11]

Our findings also highlight the utility of clinical scoring systems in screening for thyroid dysfunction. The Billewicz score demonstrated a high negative predictive value (93.94%), suggesting that it may be a useful tool to rule out hypothyroidism in diabetic patients. The Wayne score also showed promising specificity and negative predictive value, making it a practical aid for excluding hyperthyroidism. However, both tools showed low positive predictive values, indicating that biochemical confirmation remains essential. This supports the conclusions of a recent study by Joseph et al., who emphasized the adjunctive role of clinical scores but cautioned against using them as standalone diagnostic tools.[12]

Furthermore, screening for thyroid dysfunction in T2DM patients has broader clinical implications. Thyroid hormone imbalances can impact cardiovascular risk, body weight regulation, and insulin metabolism. A recent review by Baruah et al. reinforced the importance of integrating thyroid screening into routine diabetes management to prevent long-term complications and optimize therapeutic strategies.[13]

Overall, our study adds to the growing evidence that thyroid dysfunction is a significant co-morbidity in patients with T2DM. Early identification and appropriate management of thyroid disorders in this population may contribute to better glycemic control and reduced complications.

CONCLUSION

This study highlights a notable prevalence of thyroid dysfunction among patients with Type 2 Diabetes Mellitus, with hypothyroidism being the most common abnormality. Although clinical scoring systems like the Billewicz and Wayne scores offer supportive screening tools, they should not replace biochemical testing. Early detection and management of thyroid disorders in diabetic patients can aid in better glycemic control and reduce the risk of complications, emphasizing the need for routine thyroid screening as part of comprehensive diabetes care.

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