ORIGINAL RESEARCH

Study Of Thyroid Profile In Patients Of Type 2 Diabetes Mellitus

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Abstract

Background: Diabetes mellitus and thyroid diseases tend to coexist and have a mutual association. The prevalence of thyroid disorder in diabetics ranges from 10% to 24%. Thyroid disorders (TD) in Diabetes lead to increased risk of microvascular complications and can have a major impact on glycemic control.

Objectives: The aim of present study is to analyze the thyroid profile including the T3, T4 and TSH among Type 2 diabetes mellitus (T2DM) patients and to investigate the correlation of thyroid profile with the HbA1c and blood sugar levels.

Methodology: Present study comprised of 50 cases with T2DM without thyroid disorders and 50 healthy controls who were non diabetic. Thyroid profile including T3, T4 and TSH was analyzed in all patients. Correlation of T3, T4 and TSH with the HbA1c and blood sugar was done.

Results: The mean age of control group was 55.58 ± 6.40 years and of cases was 56.96 ± 6.33 years. The thyroid disorders were found to be more common in diabetics than non-diabetics. Overall prevalence of thyroid disorder in diabetic patients was 50% which was more common in females (56%) as compared to males (44%). Where subclinical hypothyroidism was present in 28% individuals in the age group whereas, hypothyroidism was seen in 18% individuals and remaining 2 % had Subclinical Hyperthyroidism and 2% had Hyperthyroidism. There was no significant difference between the control and cases was observed in T3 (1.24 ± 0.62 and 1.22 ± 1.00) and T4 (6.71 ± 2.87 and 6.04 ± 3.67) respectively. However, TSH was significantly higher in cases (7.77 ± 14.70) compared to control (3.39 ± 2.79). A negative correlation of HbA1c was observed with T3 (r=-0.112) and T4 (r=-0.110) whereas a positive correlation was observed with TSH (r=0.415). A negative correlation of FBS was observed with T3 (r=-0.135) and T4 (r=-0.108) whereas a positive correlation was observed with TSH (r=0.264).

Conclusion: Our study shows high prevalence of thyroid disorders in diabetic patients This can affect the glycemic control and complications. Therefore, routine screening of thyroid disorder in patients with diabetes mellitus is recommended, so that it can be diagnosed at the earliest to avoid any complications.

Keywords:thyroid profile, Diabetes mellitus,HbA1c

INTRODUCTION

Diabetes mellitus and thyroid diseases are the two of the most common endocrinopathies worldwide which tend to coexist and have a mutual association. Thyroid disorders(TD) in Diabetes have been linked with increased risk of microvascular complications and higher incidence of cardiovascular diseases through its interrelationships with dyslipidemia, insulin resistance and vascular endothelial dysfunction.Thyroid disorders can have a major impact on glycemic control, and the management of diabetes in patients can be affected by untreated thyroid disorders. Frequent hypoglycemic episodes were observed in diabetic patients with subclinical hypothyroidism. Metformin can helppeople with T2DM and TD, however other anti-diabetics such sulfonylureas,pioglitazone, and thiazolidinediones can harm TD patients. In T2DM patients, glycemic control can be deteriorated by antithyroid medications like methimazole.To enable tailored care and management, it is advised to screen the T2DM patients for thyroid disorder and vice versa.[1]In differentregions, theprevalence of TD in DM patients is variable, and can range from 4% to over 20%. Thesedifferences can beattributed to the large population diversity, the varieddegree ofiodine intake, differentcriteria of diagnosis of TD and differentlaboratoryassays sensitivity. An overallprevalence of thyroiddisorders in diabeticswasfound to be 13.4%, with the

highestprevalencein femaleswith type 1 diabetes (31.4%) and lowest in males with type 2 diabetes (6.9%). The prevalence of TD among the Greek patients withdiabeteswas 12.3% , 16% in Saudi patients and 12.5 % in Jordan.[2,3]The most common thyroid dysfunction encountered is hypothyroidism in patients with diabetes. According to a studyconducted by Al-Wazzan et al, hypothyroidism wasin 20.1% cases and subclinicalhypothyroidismin 45.1%. (Fig 1)[4]

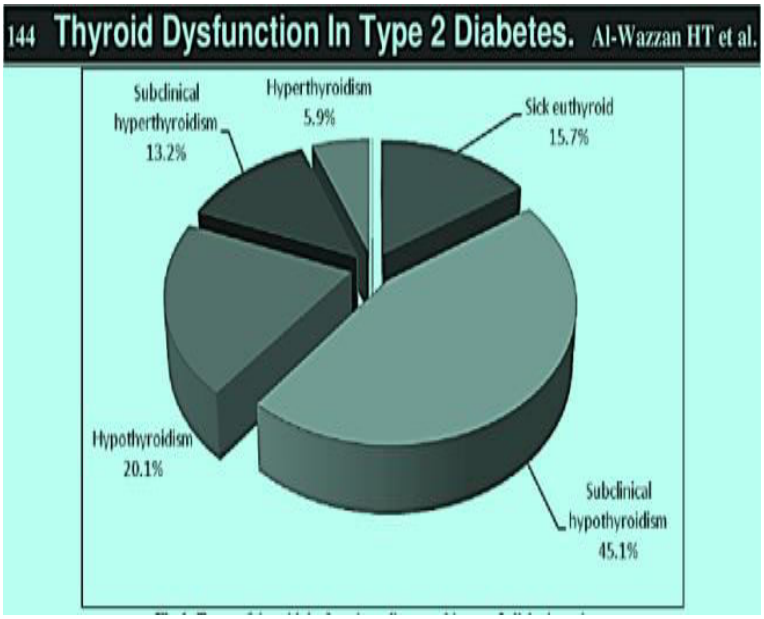

Fig 1-Showing prevalence of different types of thyroiddisorders in Type 2 DM

Thyroid hormones affect glucose metabolism. Hyperthyroidism reduces thehalf-life of insulin by an increased rate of degradation.Thus, excess of thyroid hormones promote hyperglycaemia by enhancing insulin clearance and causing glycogenolysis and gluconeogenesis and increasing absorption of glucose. This leads to a worsening of glycemic control.[5]In patients with diabetes and hypothyroidism, the effect on glucose metabolism is opposite to those seen in hyperthyroidism. In hypothyroidism, there is a reduced rate of liver glucose production. There is reduced gluconeogenesis and peripheral glucose utilization. The net effect of these processes is a predisposition to hypoglycaemia. In diabetic patients with thyroid disorders, there is reduced insulin requirement. In patients with type 1 diabetes, the presenting signs for the development of hypothyroidism are the recurring hypoglycaemic episodes and it was observed that there was a reduction in fluctuation of blood glucose levels when thyroid hormones replacement was done.[6\]Diabetes hinders the peripheral tissue ability to convert thyroxine (T4) to triiodothyronine (T3). Therefore, “low T3 state” is seen in case of poorly managed diabetes where serum total and free T3 levels are low.[7]

AIMS AND OBJECTIVES

1. To study thyroid profile in Type 2 diabetes mellitus subjects.
2. To correlate thyroid function with HBA1C and blood sugar.

MATERIALS AND METHODS

It was a cross sectional case-control study conducted for 1 year from January 2021 to December 2021in a tertiary hospital.The study group comprised of 50 patients with known/newly detected type 2 diabetesmellitus without history of known thyroid disorders from either IPD/OPD, whomet the inclusion criteria and 50 patients with age and sex matched controls who werenon diabetic

▪ Group 1: 50 individuals with (HbA1c 5.5 to 6.5% ▪ Group II: 50 type 2 diabetes mellitus subjects with HbA1c >7.5%All the participants were evaluated for thyroid function. The prevalence of thyroiddisorders was estimated.

INCLUSION CRITERIA

1. Patients with known type 2 diabetes mellitus.
3. Patients between the age of 35 to 65 years of either sex

EXCLUSION CRITERIA

1. Patients with known thyroid disease.
2. Patients who have a history of chronic renal failure and diabetic nephropathy.
3. Patients with acute conditions like sepsis, acute MI, severe heart failure or any other condition which resulted in recent admission in intensive care unit.

4. Patients on treatment with drugs affecting thyroid function (beta blocker,
steroids and oral contraceptives).
5. Pregnancy.Detailed history and clinical examination was done in all the patients

RESULTS

A total of 100 patients wereincluded, out of which 50 patients (control group 1) had HbA1c between 5.5 to 6.5 %.as compared to case group where it ranged from 7.5 to 15% which included knowndiabetics or newly diagnosed patients.Both groups were age and sex matched.The mean age of control group was 55.58 ± 6.40 years and of cases was 56.96 ± 6.33 years. There were 28 (56%) male and 22 (44%) female in both groups (Table 1). The prevalence of Hypothyroidism in control and case group was 6% and 18% respectively Though the number was more in the case group there was no significant difference between the two groups. The prevalence of Subclinical hypothyroidism was significantly higher in cases i.e., 14 (28%), compared with the control i.e., 4 (8%). The prevalence of Hyperthyroidism was 2% in cases whereas no case of hyperthyroidism was found in controls (Table 2).

Variable	Subdomain	Control	Cases	P Value
Mean Age		55.58 ± 6.40 years	56.96 ± 6.33 years	0.281
Gender	Male	28 (56%)	28 (56%)	NA
	Female	22 (44%)	22 (44%)	

Table 1: Age distribution and gender ratio among control and cases.

Variable	Control	Cases	P Value
Hypothyroidism	3 (6%)	9 (18%)	0.065
Subclinical hypothyroidism	4 (8%)	14 (28%)	0.017
Hyperthyroidism	0	1 (2%)	NA

Table 2: Hypothyroidism, Subclinical hypothyroidism and Hyperthyroidism in control and cases.

No significant difference between the control and cases was observed in T3 (1.24 ± 0.62 and 1.22 ± 1.00) and T4 (6.71 ± 2.87 and 6.04 ± 3.67) respectively. However, TSH was significantly higher in cases (7.77 ± 14.70) compared to control (3.39 ± 2.79) (Table 3).

Variable	Control	Cases	P Value
T3	1.24 ± 0.62	1.22 ± 1.00	0.926
T4	6.71 ± 2.87	6.04 ± 3.67	0.316
TSH	3.39 ± 2.79	7.77 ± 14.70	0.041

Table 3: Thyroid profile in control and cases.

A negative correlation of HbA1c was observed with T3 (r=-0.112) and T4 (r=-0.110) whereas a positive correlation was observed with TSH (r=0.415). A negative correlation of FBS was observed with T3 (r=-0.135) and T4 (r=-0.108) whereas a positive correlation was observed with TSH (r=0.264). The correlation between TSH and FBS was statistically significant.

Variable	HbA1c		FBS	
	Correlation (r)	P value	Correlation (r)	P value
T3	-0.112	0.268	-0.135	0.180
T4	-0.110	0.277	-0.108	0.283
TSH	0.415	0.151	0.264	0.008

Table 4: Correlation of T3, T4 and TSH with HbA1c and FBS in cases.

DISCUSSION

Hypothyroidism was seen in 18% of the cases in our study as compared to controls where it was only 6% which was comparable with study by Gurunath et al[8], where, the incidence of hypothyroidism in diabetic patients was 20.2%. Singh et al.[9], demonstrated that hypothyroidism was seen in 14% of the diabetics. In a study by Perros et al.[3], the prevalence of hypothyroidism was only 0.9%.In our study, Subclinical hypothyroidism was present in 28% cases as compared to the control group where it was present only in 8% individuals. The prevalence of subclinical hypothyroidism in the different studies is quite variable varying from 4.5% to 45%. In a study by Nsr-Allah et al.[10], the prevalence of subclinical hypothyroidism was 29.8% among type 2 diabetes patients which compare well with our study. In a study conducted by Al – Wazzan et al.[4], prevalence of subclinical hypothyroidism was 45.1%. In a study conducted by Furukawa et al.[11], it was 8.7%. The prevalence of subclinical hypothyroidism in T2DM patients was 10.2% in a study by Han et al. [12]and 18% in a study by Ashok et al. [13]Hyperthyroidism was seen 2% cases in the case group and there was no incidence

of them in the control group. Which was comparable with study by Gurunath et al.[8], where, the incidence of hyperthyroidism in diabetic patients was 1.71%. In severe hyperglycemia patients, a low T3 is found and this is normalised with control of diabetes. HbA1C is an important marker of long-term glycemic control that can get altered in altered thyroid status possibly due to RBC turnover change. In our study, negative correlation of HbA1c was seen with T3 (r=-0.11), which was also seen in a study by Uppal et al [14] and Kaur et al.[15].Positive correlation of HbA1c was seen with TSH (r=0.151). This was also seen in studies by Nayak B et al[16], Komarika et al [17] However, non-significant correlation was found in studies by Sharma et al.[18].Negative correlation of FBS with T3 (r=-0.13). Whereas positive correlation was seen in a study by Datchinamoorti[19] and Elmeshwari et al.[20]. Positive correlation of FBS with TSH (r=0.264) which was significant, which was also seen in a study by Datchinamoorti et al.[19].

CONCLUSION

The assessment of thyroid function in diabetic patients is crucial for improving the management of diabetes and its consequences. Our results demonstrate increased prevalence of thyroid dysfunction, especially subclinical hypothyroidism in the case group and therefore emphasise the need to screen patients diagnosed with DM for thyroid disease routinely. The American thyroid association guidelines recommend thyroid test in Type2 DM patients at the time of diagnosis and to be repeated at least every five years. Therefore, it is suggested for routine screening for thyroid function in all type 2 DM patients. The screening test of choice is Serum TSH.

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