



THYROID DYSFUNCTION IN TYPE 2 DIABETES MELLITUS PATIENTS IN A TERTIARY CARE HOSPITAL: A PILOT STUDY

Shyam M Garg	Associate Professor, Department Medicine M M Institute of Medical Sciences and Research, Maharishi Markandeshwar University, Mullana, Haryana, India 133207
Shivam Sharma	Ex-Senior Resident, Department of Medicine M M Institute of Medical Sciences and Research, Maharishi Markandeshwar University, Mullana, Haryana, India 133207
Richa Goel	Senior Resident, Department of Biochemistry M M Institute of Medical Sciences and Research, Maharishi Markandeshwar University, Mullana, Haryana, India 133207
Himanshu Devender Kumar	Resident, Department of Medicine M M Institute of Medical Sciences and Research, Maharishi Markandeshwar University, Mullana, Haryana, India 133207
Ouber Qayoom	Senior Resident, Department of Medicine M M Institute of Medical Sciences and Research, Maharishi Markandeshwar University, Mullana, Haryana, India 133207
Bimal K Agrawal	Corresponding Author, Professor of Medicine M M Institute of Medical Sciences and Research, Maharishi Markandeshwar University, Mullana, Haryana, India 133207

ABSTRACT **Objective:** Diabetes is frequently encountered health problem worldwide. Various studies have shown the existence of thyroid dysfunction in diabetic patients. So we conducted a study to find out thyroid dysfunction in Type 2 diabetes mellitus patients in North Indian population.

Research design and methods: Fifty patients with Type 2 diabetes mellitus aged between 30 - 70 years were enrolled for the study. All the patients were assessed for thyroid dysfunction by investigating T3, T4 and Thyroid stimulating hormone (TSH). Prevalence of thyroid dysfunction with age distribution, gender distribution, duration of diabetes and HbA1C was correlated. The observations were recorded and results obtained were analyzed by appropriate statistical tests.

Results: Prevalence of thyroid dysfunction found to be 24% in patients with Type 2 diabetes mellitus. Thyroid dysfunction was more common in females when compared with males and subclinical hypothyroidism was most common finding. No correlation between age, gender, duration of diabetes or HbA1C levels between euthyroid patients and patients with thyroid dysfunction was found.

Conclusions: Patients with Type 2 diabetes mellitus should be screened for thyroid dysfunction.

KEYWORDS : Diabetes mellitus, Thyroid function tests, Hypothyroidism, Subclinical Hypothyroidism, Hyperthyroidism

INTRODUCTION

Type 2 Diabetes Mellitus (DM) is the most frequent endocrine disorder encountered in clinical practice. Variable interaction of environmental and hereditary factors along with defective insulin secretion from pancreatic β - cells or insulin resistance results in hyperglycemia in Type 2 DM patients.^[1] Thyroid dysfunction is second only to diabetes mellitus as the most frequent condition affecting the endocrine system. Various studies have shown the prevalence of 2.2 % to 17 % of thyroid dysfunction among the diabetic patients.^[2,3]

Thyroid dysfunction is also widely known in Type 1 DM patients, where predominant pathology is an autoimmune process.^[4] Recent studies have shown that thyroid dysfunction can be seen in patients with Type 2 DM patients when compared with the normal population, and the most common amongst them is subclinical hypothyroidism.^[5,6]

Thyroid hormones regulate cellular metabolism and functionally act as insulin antagonists, therefore a change in the levels of anyone can result in the functional imbalance of the other.^[7] Insulin resistance has been the most important facet connecting thyroid dysfunction with Type 2 DM. Hyperthyroidism is typically associated with worsening of glycemic control and increased insulin requirements, attributed to underlying enhanced glucose absorption in the gut, stimulation of hepatic gluconeogenesis and increased insulin clearance.^[8,9] Sometimes, thyrotoxicosis may uncover latent diabetes.^[6,10] Subclinical hyperthyroidism has also been associated with insulin resistance.^[11,12] Hypothyroidism is associated with a diminished uptake of glucose in the adipose tissue and skeletal muscle leading to impaired glycemic control.^[13]

The present study was conducted to evaluate the thyroid dysfunction in patients with Type 2 diabetes mellitus.

METHODOLOGY

This hospital based study was conducted in the Department of

Medicine at M M Institute of Medical Sciences and Research, Mullana, Haryana after getting ethical clearance from the institutional ethical committee.

A total of 50 patients between 30 - 70 years satisfying American Diabetic Association criteria^[14] for the diagnosis of Type 2 DM were included in the study. Data was collected using a piloted proforma meeting the objectives of the study, after an informed written consent from the patients. In all the patients, systemic evaluation comprising a complete medical history, general physical examination with height and weight measurement, measurement of routine biochemistry, serum TSH, T3 & T4 levels were done. Patients with previous history of thyroid dysfunction and those on drugs influencing the thyroid profile were excluded from the study. Based on the American Thyroid Association guidelines,^[15] patients were divided into euthyroid, subclinical hypothyroidism, overt hypothyroidism, hyperthyroidism and subclinical hyperthyroidism groups. Serum TSH, T3 and T4 levels were estimated using chemiluminescence immunoassay (CLIA) method. The relationship of thyroid dysfunction with age distribution, gender distribution, duration of diabetes and HbA1C was evaluated using the appropriate statistical method. All the data was compiled and statistical analysis was done using SPSS software.

RESULTS

Out of the fifty Type 2 DM patients, 23 (46%) were males and 27 (54%) were females, maximum number of patients were in age group 46-55 years (Table 1), 38 (76%) were euthyroid (20 males and 18 females) and 12 (24%) had thyroid dysfunction out of which 16.0% were subclinical hypothyroidism (2 males and 6 females), 6 % were overt hypothyroidism (1 males and 2 females), none had subclinical hyperthyroidism and 2 % were hyperthyroidism cases (only 1 females). Thyroid dysfunction was found to be more common among females (N=9, 75%) however gender based analysis was not significant at $p > 0.05$ ($p = .094$).

Table 1: Correlation of thyroid dysfunction with age and gender in Type 2 diabetic patients

Thyroid dysfunction	Female N=27	Male N=23	P Value	Age < 55 (N=25)	Age 55-65 (N=17)	Age > 65 (N=8)	p Value
Present (N=12)	9 (33.34%)	3 (13.04%)	0.094 (NS)	3 (12%)	6 (35.30%)	3 (37.5%)	0.263 (NS)
Absent (N=38)	18 (66.66%)	20 (86.96%)		22 (88%)	11 (64.70%)	5 (62.5%)	

(NS: Non-significant, Age in years)

Table 2: Distribution of thyroid dysfunction in diabetic patients (gender based)

Thyroid dysfunction	Diabetics	
	Males	Females
Overt Hypothyroid (6%)	1	2
Subclinical Hypothyroid (16%)	2	6
Hyperthyroid (2%)	0	1
Subclinical Hyperthyroid (0%)	0	0
Total Cases (N=12)	3	9

The mean age of diabetics with thyroid dysfunction (60.5 ± 8.6 yrs) was higher than euthyroid's (55.7 ± 8.9 yrs), but was not significant ($p = 0.109$) (Table 3). Mean HbA1C was highest in patients with overt hypothyroidism ($9.1\% \pm 1.3$). In the case of patients with euthyroidism, it was $8.9\% (\pm 1.3)$ whereas cases with subclinical hypothyroidism had mean HbA1C levels of $8.0\% (\pm 1.0)$. In patients with overt hyperthyroidism, it was 8.9% . No statistical significance was seen although ($p=0.341$) (Table 4). Patients with BMI > 25 showed increased association with hypothyroidism ($p < 0.012$).

Table 3: Comparison of thyroid profile, plasma fasting glucose, HbA1C levels and duration of diabetes in subjects with normal (euthyroid) and abnormal thyroid profile in diabetic patients

	Euthyroid	Thyroid dysfunction	p value
Age (years)	55.4 ± 8.34	60.92 ± 7.93	0.05 (S)
Duration (years)	3.84 ± 2.10	5.08 ± 2.19	0.08
TSH (mIU/mL)	1.75 ± 0.91	7.66 ± 3.64	0.00(S)
T3 (ng/mL)	2.49 ± 0.81	2.44 ± 1.36	0.84
T4 (nmol/mL)	7.62 ± 1.32	7.63 ± 2.76	0.98
HbA1C (%)	8.92 ± 1.34	8.34 ± 1.24	0.18
FBS (mg/dL)	177.92 ± 27.2	167.58 ± 26.56	0.24

S: Statistically significant)

Table 4: Comparison of mean HbA1C in each subgroup			
	N	HbA1C (%) (mean \pm SD)	P value
Euthyroid	38	8.9 ± 1.3	0.341 (NS)
Subclinical Hypothyroidism	8	8.0 ± 1.0	
Overt Hypothyroidism	3	9.1 ± 1.9	
Overt Hyperthyroidism	1	8.9 ± 0	

(NS: Non-significant)

Only 22.73% (10/44) patients with poor glycemic control (HbA1C $\geq 7\%$) had thyroid dysfunction, while 77.27% were euthyroid. Thyroid dysfunction was found more common in patients with longer duration of diabetes (≥ 5 years) but the difference was statistically not significant when compared with duration less than 5 years (Table 5).

Table 5: Correlation of thyroid dysfunction with HbA1C(%) and Duration of diabetes in Type 2 diabetic patients

Thyroid dysfunction	HbA ₁ C <7 (N=6)	HbA ₁ C ≥ 7 (N=44)	P Value	Duration of DM			p Value
				< 1 year	1-5 years	≥ 5 years	
Present (N=12)	2 (33.34%)	10 (22.73%)	0.109 (NS)	1 (8.33%)	4 (33.37%)	7 (58.33%)	0.122 (NS)
Absent (N=38)	4 (66.66%)	34 (77.27%)		6 (15.79%)	20 (52.63%)	12 (31.58%)	

DISCUSSION

Thyroid dysfunction and Type 2 DM may coexist in a patient and can present a management challenge for the primary care physician. Altered thyroid hormone levels have been seen in diabetic patients mainly in those with impaired glycemic control. Our study observed a direct correlation of thyroid dysfunction with advancing age and prevalence of thyroid dysfunction was 24% among the diabetic patients, females being more affected than males. The observations of our study are consistent with studies of Singh P et al^[16] and Babu K et al^[17] who demonstrated an overall prevalence of 29 % and 28 %, respectively, of thyroid dysfunction in Type 2 DM patients. Studies by Celani MF et al^[18] and Udiong C.E.J et al^[5] found even higher prevalence rate of 31.4 % and 46.5 %, respectively.

Subclinical hypothyroidism was the most prevalent thyroid dysfunction occurring in 16% diabetic subjects of our study, followed by overt hypothyroidism in 6.0% and hyperthyroidism in 2.0% of total 50 diabetic patients. Our results are in accordance with the studies by Babu et al,^[17] Perros et al^[2] and Celani et al.^[18] In a meta-analysis, Han et al reported that Type 2 DM patients are more likely to have subclinical hypothyroidism when compared with the general population (prevalence of 10.2%).^[19] Previous studies suggested that higher levels of leptin and insulin in Type 2 DM may stimulate synthesis of TSH by affecting hypothalamic-pituitary-thyroid (HPT) via JAK/STAT pathways. Thus, diabetics might have altered thyroid profile.^[20] Chaker et al suggested that low and low-normal thyroid functions are related to increased risk of diabetes mellitus. They hypothesized that risk of progression to diabetes is more prominent in pre-diabetics with subnormal thyroid functions.^[21]

In the present study, the prevalence of thyroid dysfunction was higher in females when compared to males (33.34% vs 13.04%) but the results were not statistically significant (Table I, p value < 0.094). Although, Our results are consistent with the studies of Celani et al^[18], Babu et al^[17] and Khurana et al^[22] which reported a higher prevalence of thyroid dysfunction in diabetic females in comparison with diabetic males.

In our study, out of 24 diabetic patients who had thyroid dysfunction, 4 (33.34%) had HbA1C <7% and 20 (22.73%) had HbA1C $\geq 7\%$. The higher prevalence of thyroid dysfunction was recorded in patients with uncontrolled DM (HbA1C $\geq 7\%$) as compared to patients with controlled glycaemia (HbA1C <7%) but result was not statistically significant (Table I, p value < 0.109). In contrast, there are studies where positive correlation has been found between raised HbA1C levels and thyroid dysfunction. Bazrafshan et al,^[23] Afkhami-ardekani et al^[24] and Khurana et al^[22] observed a significant positive correlation between HbA1C and TSH levels.

The prevalence of thyroid dysfunction was not significantly affected by the duration of diabetes. Out of 24 diabetic patients with thyroid dysfunction, 2 (8.33%) had the duration of diabetes < 1 year, 8 (33.37%) had 1-5 years, 14 (58.33%) had ≥ 5 years and the difference was not statistically significant (Table 2, p value > 0.122). Our results are in concordance with Diez et al^[25] and Khurana et al^[22] who also found no significant association between prevalence of thyroid dysfunction with the duration of diabetes.

CONCLUSION

In this small study, a trend of common occurrence of thyroid dysfunction mainly subclinical hypothyroidism is seen in Type 2 DM patients. Hypothyroidism may worsen diabetic dyslipidemia and if it is ignored cardiovascular complication risk will increase. Therefore, we conclude that patients with Type 2 diabetes mellitus should be screened for thyroid dysfunction and if present should be adequately managed. However further studies are required with a larger sample size to have a well-defined approach.

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