

Original Research Article

A study of thyroid dysfunction in patients with type 2 diabetes mellitus at new civil hospital, Surat, Gujarat, India

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ABSTRACT

Background: Thyroid diseases and diabetes mellitus, as comorbid condition these together throw a great burden to medicine and humanity. Considering the ever increasing population of diabetics in our country and the significant causal relationship established by current literature, this study was undertaken.

Methods: A thorough clinical history regarding diabetes mellitus (onset, duration), any history of long-term illness, any previous thyroid dysfunction, previous history of any kind of drug therapy, whether the patient was on insulin or oral hypoglycaemic drugs was sought. All diabetic patients were evaluated for thyroid dysfunction by testing thyroid profile (T3, T4 and TSH).

Results: In the present study, out of the 100 diabetic patients, 18 (18%) patients had thyroid dysfunction and 82 (82%) patients were found to be euthyroid. The prevalence of thyroid dysfunction more in females as compared to males (68.75% vs 31.25%) and highest in the age group of >60 years. The prevalence of thyroid dysfunction found to be more in patients with HbA1C >7 as compared to patients with HbA1C <7. Out of 18 diabetic patients who had thyroid dysfunction, 05 (27.78%) had duration of diabetes >1 - 5 years and 08 (44.44%) had duration of diabetes 6 - 10 years. The prevalence of thyroid dysfunction found to be more in patients who had BMI >30 and patients who were on both oral hypoglycaemic agents and insulin.

Conclusions: There is a high prevalence of thyroid disorders in patients of type 2 diabetes mellitus which found to be more in Females, Elderly patients, Patients with uncontrolled diabetes and BMI > 30.

Keywords: Body mass index, Duration of diabetes, HbA1c, Thyroid dysfunction, Type 2 diabetes mellitus

INTRODUCTION

Diabetes is the single most important metabolic disease which can affect nearly every organ system in the body. Based on current trends, the International Diabetes Federation projects that 438 million individuals will have diabetes by the year 2030.¹

The association of thyroid dysfunction with type II DM is widely known and this study was first published in 1979.²

The thyroid hormones directly controls insulin secretion. In hypothyroidism there is a reduction in glucose-induced insulin secretion by beta cells and catecholamines are increased in hyperthyroidism, and insulin resistance will be increased.

The DM influences the thyroid dysfunction in two sites, first at the level of hypothalamus by controlling TSH release and second at the peripheral tissues by converting T4 to T3.³

The present study conducted to find out the relationship between type 2 DM and thyroid dysfunction in patients with type 2 diabetes, as the benefits of identifying at an early stage, and even in asymptomatic patients is considerable.

METHODS

A total number of 100 patients with type 2 diabetes mellitus.

Inclusion criteria

- All patients with type 2 diabetes mellitus aged more than 30 years.
- All diabetics irrespective of glucose control.
- All diabetics irrespective of treatment (OHA/insulin).

Exclusion criteria

- Type 1 diabetes mellitus.
- Patients with- gestational diabetes mellitus, fibrocalculo pancreatitis, pancreatitis, steroid induced diabetes.
- All those who had proven thyroid disorder and on treatment.

Patient admitted to NCH Surat who are included in this study fulfilling the inclusion exclusion criteria, informed consent taken.

A thorough clinical history regarding diabetes mellitus (onset, duration), any history of long-term illness, any previous thyroid dysfunction, previous history of any kind of drug therapy, whether the patient was on insulin or oral hypoglycaemic drugs was sought. A thorough clinical examination including vitals, general physical examination, systemic examination and investigations was carried out.

Patients were examined for presence of diabetes mellitus according to ADA criteria for diagnosis of diabetes mellitus.

All diabetic patients were then subjected to estimation of BMI, serum cholesterol, serum triglyceride, HDL, VLDL, and LDL levels. then all the patients were evaluated for thyroid dysfunction by testing thyroid profile (T3, T4 and TSH).

BMI is derived from a simple math formula by Lambert Adolphe Jacques Quetelet and is universally expressed in units of kg/m^2 . TC and HDL cholesterol levels determined by CHOD/POD end point method. TG determined by GPO/POD method. LDL cholesterol assessed according to the formula by Friedewald et al, in which $\text{LDL} = \text{tc} - (\text{hdl} + \text{tg}/5)$.

The correlation of prevalence of thyroid disorder with gender distribution, age distribution, duration of diabetes, family history of thyroid disorder, BMI, usage of OHAS and insulin and dyslipidemia then done. The observations and interpretations recorded and results obtained statistically analysed by chi-square tests for association between two categorical variables.

RESULTS

Prevalence according to type of thyroid dysfunction

Subclinical hypothyroidism most prevalent disorder in diabetic patients in our study, occurring in 9%, followed by hypothyroidism in 5%, hyperthyroidism in 3%, and subclinical hyperthyroidism in 1% of total 100 diabetic patients (Table 1).

Table 1: Prevalence of types of thyroid dysfunction.

Thyroid dysfunction	Prevalence
Subclinical hypothyroidism	9
Hypothyroidism	5
Hyperthyroidism	3
Subclinical hyperthyroidism	1
Euthyroid	82

Age distribution

Out of 18 diabetic patients who had thyroid disorders, 02 (11.11%) patients belonged to age group of <50 years, 05 (27.77%) patients belonged to age group of 50 - 60 years and 11 (61.11%) patients belonged to age group >60 years. Thus the age specific trend in the prevalence of thyroid disorder was found to be highest in the age group of > 60 years (Table 2).

The chi-square statistic is 7.4368. The p-value is 0.024273. The result is significant at $p < 0.05$.

Table 2: Age and thyroid dysfunction.

Age	Thyroid disorder present	Thyroid disorder absent
<50	02	24
50-60	05	35
>60	11	23

Sex distribution

Among 100 patients studied, 50 were males and 50 were females. Thyroid disorder present in total 18 patients, 5 males and 13 females. Prevalence of thyroid disorders was found to be more in females (Table 3).

The chi-square statistic is 4.336. The p-value is 0.037314. The result is significant at $p < 0.05$.

Table 3: Sex distribution and thyroid dysfunction.

Patients	Cases	Thyroid disorder present	Thyroid disorder absent
Males	50	5	45
Females	50	13	37
Total	100	18	82

HbA1C and thyroid dysfunction

In this study, out of 18 diabetic patients who had thyroid disorders, 4 had HbA1C <7 and 14 had HbA1C >7. The prevalence of thyroid disorders was found to be more in patients with HbA1C <7 as compared to patients with HbA1C >7 (Figure 1).

The chi-square statistic is 7.2746. The p-value is 0.006994. The result is significant at p<0.05.

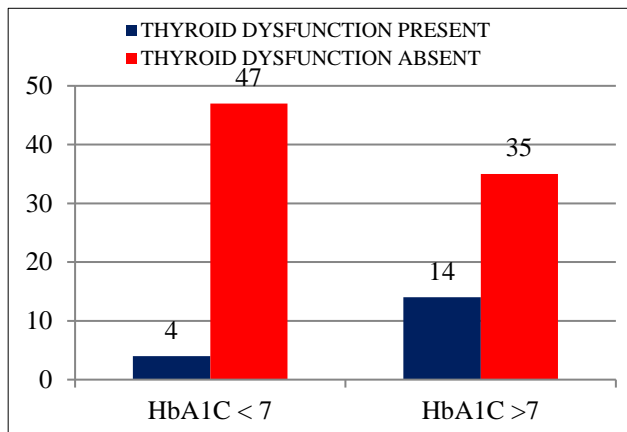


Figure 1: HbA1C and thyroid dysfunction.

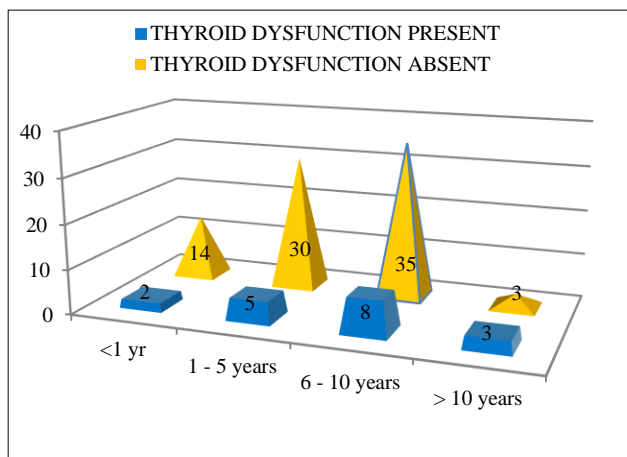


Figure 2: Duration of diabetes and thyroid dysfunction.

Duration of diabetes and thyroid dysfunction

Out of 18 diabetic patients who had thyroid disorders, 2 had duration of diabetes <1 yr, 5 had duration of diabetes

1 - 5 years, 8 had duration of diabetes 6 - 10 years and 3 had duration of diabetes >10 years (Figure 2).

The chi-square statistic is 4.8283. The p-value is 0.18481. The result is not significant at p<0.05.

Treatment for dm and thyroid dysfunction

In our study, out of 18 diabetic patients who had thyroid disorders, 06 were on oral hypoglycaemic agents and 12 were on both oral hypoglycaemic agents and insulin (Figure 3).

The chi-square statistic is 6.5041. The p-value is 0.010763. The result is significant at p<0.05.

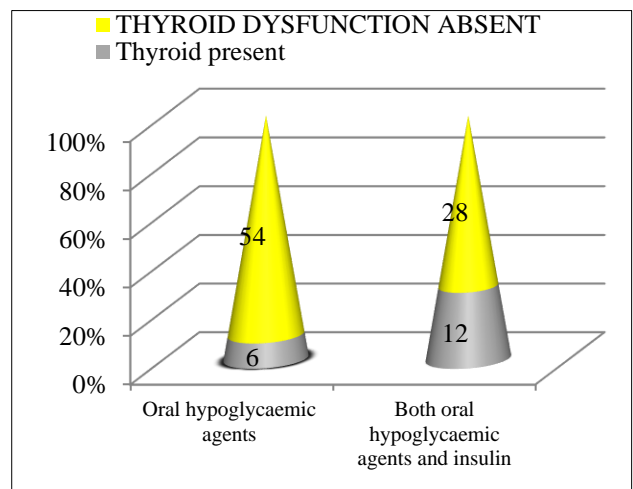


Figure 3: Treatment for DM and thyroid dysfunction.

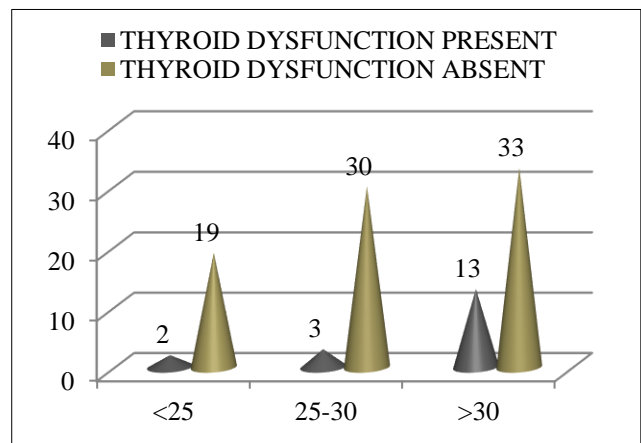


Figure 4: BMI and thyroid dysfunction.

BMI and thyroid dysfunction

In our study, out of 18 diabetic patients who had thyroid disorders, 02 had BMI <25, 03 had BMI between 25 - 30 and 13 had BMI >30. Thus, the prevalence of thyroid disorders was found to be more in patients who had BMI >30 (Figure 4).

The chi-square statistic is 6.078. The p-value is 0.047882. The result is significant at $p < 0.05$.

DISCUSSION

Prevalence of thyroid dysfunction

In the present study, out of the 100 diabetic patients, 18 (18%) patients had thyroid dysfunction and 82 (82%) patients were found to be euthyroid. The findings of our study are consistent with studies of Papazafropoulou et al, Nobreet al, and Radaiedeh et al.⁴⁻⁶ Subclinical hypothyroidism was the most prevalent disorder in diabetic patients in our study, occurring in 9%, followed by hypothyroidism in 5%, hyperthyroidism in 3%, and subclinical hyperthyroidism in 1% of total 100 diabetic patients.

Thyroid dysfunction in diabetics in relation to gender

The prevalence of thyroid disorders was more in females as compared to males (68.75% vs 31.25%). Authors results are consistent with studies of Papazafropoulou et al, Babu et al, Vondra et al, Celani et al, and Michalek et al, in which they also reported prevalence of thyroid disorders higher in diabetic females as compared to diabetic males.^{4,7-10}

Thyroid dysfunction in diabetics in relation to age

Out of 18 diabetic patients who had thyroid disorders, 2 (11.11%) patients belonged to age group of <50 years, 5 (27.77%) patients belonged to age group of 50 - 60 years and 11 (61.12%) patients belonged to age group >60 years. The results of our study are in accordance with the previous studies of Michalek et al, Whitehead et al, and Vondra et al, who also found high prevalence of thyroid disorders in diabetic patients with advancing age.^{10,11,8}

Thyroid dysfunction in diabetics in relation to HBA1C

The prevalence of thyroid disorders was found to be more in patients with HbA1C >7 as compared to patients with HbA1C <7. Authors results are comparable with the previously conducted studies where Schlienger et al, observed that patients with poorly controlled diabetes, i.e., HbA1C >12 were having low T3 levels, Bazrafshan et al, found significant positive correlation between HbA1C and TSH levels, Ardekani et al, found HbA1C significantly higher in diabetic patients having thyroid disorders as compared to euthyroid patients (8.9 ± 1.99 vs 7.1 ± 1.02 , p value = 0.001).¹²⁻¹⁴

Thyroid dysfunction in diabetics in relation to duration of diabetes

Out of 18 diabetic patients who had thyroid disorders, 02 (11.11%) had duration of diabetes <1 yr, 05 (27.78%) had duration of diabetes >1 - 5 years, 08 (44.44%) had duration of diabetes 6 - 10 years and 03 (16.66%) had

duration of diabetes >10 years. However, this difference when evaluated statistically was not significant (p value >0.05). Thus, it was found that the prevalence of thyroid disorders was not significantly affected with duration of diabetes. Our results are in concordance with Diez et al, who also found no significant relationship between presence of thyroid dysfunction and duration of diabetes.¹⁵

Thyroid dysfunction in diabetics in relation to treatment taken for diabetes

In this study, out of 18 diabetic patients who had thyroid disorders, 6 (37.50%) were on oral hypoglycaemic agents and 12 (62.50%) were on both oral hypoglycaemic agents and insulin. The prevalence of thyroid disorders was found to be more in patients who were on both oral hypoglycaemic agents and insulin. This difference was found to be highly significant statistically (p value <0.001). Authors results are in concordance with Celani et al, who also found prevalence of thyroid disorders significantly more in patients who were on insulin therapy (p value <0.02).⁹

Thyroid dysfunction in diabetics in relation to BMI

The prevalence of thyroid disorders was found to be more in patients who had BMI >30. This data when evaluated statistically was significant (p value <0.05). The findings of our study are similar to the studies by Papazafropoulou et al, who also found prevalence of thyroid disorders to be significantly more in patients who had higher BMI (p values = 0.03).⁴

CONCLUSION

There is a high prevalence of thyroid disorders in patients of type 2 diabetes mellitus which found to be more in females, elderly patients, patients with uncontrolled diabetes (High HbA1C), patients on both OHA and insulin, patients with BMI >30. So regular screening of thyroid function in all type 2 diabetic patients should be done, which will allow early treatment of subclinical hypothyroidism and decrease morbidity and mortality associated with coexistence of TD in diabetic patients.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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