

Research Article

Prevalence of thyroid dysfunction in patients with diabetes mellitus

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ABSTRACT

Background: Diabetes mellitus (DM) and thyroid dysfunction (TD) are the two most common endocrine disorders in clinical practice. Various studies have found that diabetes and thyroid disorders mutually influence each other and both disorders tend to coexist. The objective of this study was to investigate the prevalence of thyroid dysfunction in patients with type 1 and type 2 diabetes mellitus.

Methods: This is a prospective descriptive study which was conducted on 186 patients of diabetes mellitus who attended the outpatient diabetic clinic of Sri Ramakrishna Hospital, Coimbatore, Tamil Nadu from January 2015 to June 2015. All patients underwent a clinical and laboratory evaluation. The correlation of prevalence of thyroid disorder with gender distribution, age distribution, HbA1C, duration of diabetes, hypertension, family history of thyroid disorder, and dyslipidemia was then done. The observations and interpretations were recorded and results obtained were statistically analyzed.

Results: The prevalence of thyroid dysfunction in diabetic patients was found to be 21.5%, in which the most common thyroid disorder being the subclinical hypothyroidism (12.4%) followed by subclinical hyperthyroidism (6.5%) which was followed by primary hyperthyroidism (2.7%) and primary hypothyroidism (0%). Prevalence of thyroid disorders was found to be more in males (n=95) than in females (n=91), highest in the age group of <50 years, more in patients with HbA1c values ≥ 7 , i.e. in uncontrolled diabetes.

Conclusions: The prevalence of thyroid dysfunction among type 2 Diabetes Mellitus patients is very high (21.5%) with subclinical hypothyroidism is being most common. Screening of thyroid dysfunction should be done in all diabetic patients especially in patients with poor diabetic control.

Keywords: Diabetes mellitus, Prevalence, Thyroid dysfunction

INTRODUCTION

Diabetes mellitus is an endocrine disorder so it is prone to affect other endocrine functions, one of which is thyroid function.^{1,2} The association between Diabetes and Thyroid Dysfunction is widely known, with the first studies published in 1979. Since then, several studies in different countries were conducted to estimate the prevalence of thyroid dysfunction in diabetic patients. There is great variability in the prevalence of thyroid

dysfunction in general population, ranging from 6.6% to 13.4%. In diabetic patients, the prevalence is still greater and varies from 10 to 24%.

In the NHANES III study, a survey of 17,353 subjects representing the US population, hypothyroidism was found in 4.6% and hyperthyroidism in 1.3% of subjects.³ It was observed that there was an increased frequency of thyroid dysfunction with advancing age and a higher prevalence of thyroid disease in women compared to men and in diabetic subjects compared to non-diabetic.⁴ The

WHO estimated diabetes prevalence was 2.8% in 2000 and 4.4% in 2030. The total no. of people with diabetes is projected to rise from 171 million in 2000 to 366 million in 2030.

DM appears to influence thyroid function in two sites; Firstly at the level of hypothalamic control of TSH release and secondly at peripheral tissue by converting T4 to T3. Hyperglycaemia causes reduction in hepatic concentration of T4-5 deiodinase, low serum concentration of T3, raised levels of reverse T3 and low, normal, or high level of T4. Thyroid hormone regulate metabolism and diabetes can alter metabolism.

The present study was therefore undertaken to see prevalence of thyroid dysfunction in diabetics and to see the correlation between thyroid profile and diabetes mellitus.

METHODS

This is a prospective descriptive study. One hundred eighty six (186) patients which included 95 males and 91 females with a mean age of 54.65 ± 12.709 years with diabetes mellitus that regularly attended the outpatient clinic of the unit of diabetes at Sri Ramakrishna Hospital, Coimbatore, Tamil Nadu. Written informed consent for the study was obtained from all of the patients aged 18 years or older or from the parents or guardians of the patients younger than 18 years. The inclusion criteria was patients diagnosed with diabetes mellitus and thyroid disorder, having duration of diabetes mellitus for longer than 6 months and absence of renal, hepatic and bone disease. Patients or guardians who were unable to understand and sign the informed consent, pregnant women, patients with recent interventions: pulse corticosteroids and/or radioiodine and use of amiodarone, lithium were excluded.⁵ 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 like FBS, RBS, PPBS, HbA1C, T3, T4, FT3, FT4 and TSH was carried out. Data on comorbidities such as hypertension, dyslipidaemia were also taken. Biochemical investigations were carried out using proper aseptic precautions for collecting blood. Patients were examined for presence of diabetes mellitus according to ADA criteria for diagnosis of diabetes mellitus. Prevalence rate of thyroid dysfunction was studied and their statistical significance with various parameters was obtained using chi-square tests.

Guidelines for detection of thyroid dysfunction:⁶

1. Normal – when T3, T4 and TSH were in normal range

2. Primary Hypothyroidism – when TSH more than 5.5mIU/ml and T3, T4 less than normal.
3. Primary Hyperthyroidism – when TSH is less than 0.3mIU/ml and T3, T4 more than normal.
4. Subclinical Hypothyroidism – when TSH is more than 5.5 mIU/ml and T3, T4 is within normal range.
5. Subclinical Hyperthyroidism – when TSH is less than 0.3 mIU/ml and T3, T4 is within normal range.

Normal values:⁷

- FBS: 60-90mg%
- PPBS: 80-150mg%
- RBS: 90-110mg%
- HbA1c: <7%
- TSH: 0.35-4.94IU/ml
- T3: 58-159ng/ml
- T4: 4.7-11.7µg/dl
- FT3: 1.71-3.71pg/dl
- FT4: 0.7-1.48ng/dl

The correlation of prevalence of thyroid disorder with gender distribution, age distribution, HbA1C, duration of diabetes, hypertension, family history of thyroid disorder and dyslipidaemia was then done. The observations and interpretations were recorded and results obtained were statistically analysed by SPSS using chi square test. Results are significant if p value <0.05 and non-significant if p value >0.05.

RESULTS

Table 1: Sex and age distribution of diabetic patients.

Group	Sex	Number	Mean age in years
186 diabetic patients	Male	95	59.89±11.883
	Female	91	49.16± 11.185

The prevalence of thyroid dysfunction in all diabetic patients was 21.5%, i.e. 40 out of 186 diabetic patients had thyroid dysfunction. The study included 95 males and 91 females with a mean age of 54.65 ± 12.709 years (males having a mean age of 59.89 ± 11.883 and females having a mean age of 49.16 ± 11.185 years) (Table 1). The most common thyroid disorder being the subclinical hypothyroidism (12.4%) followed by subclinical hyperthyroidism (6.5%) which was followed by primary hyperthyroidism (2.7%) and primary hypothyroidism (0%) (Figure 1). Out of 95 male patients, 7 (7.4%) had subclinical hypothyroidism, 5 (5.3%) had subclinical hyperthyroidism and none had primary hypothyroidism and primary hyperthyroidism. Out of 91 female patients, 16 (17.6%) had subclinical hypothyroidism, 7 (7.7%) had subclinical hyperthyroidism, 5 (5.5%) had primary hyperthyroidism and none had primary hypothyroidism (Table 4). Prevalence of thyroid disorders was found to be more in males than in females, highest in the age group of <50 years, more in patients with HbA1c values

≥7, i.e. in uncontrolled diabetes. More in patients with HbA1c values ≥7, i.e. in uncontrolled diabetes. The association of prevalence of thyroid disorders with hypertension, duration of diabetes, hypotension and family history of diabetes was not significant.

DISCUSSION

In this study, 21.5% i.e., 40 out of 186 patients suffering from diabetes mellitus had abnormal thyroid profile and 146 patients (78.5%) were found to be euthyroid. The findings of our study are consistent with studies of Papazafiropoulou A et al, Nobre EL et al, Vikram B

Vikhe et al, M. Anita Devi et al, Priti Singh et al and KiranNagaraju et al.⁸⁻¹¹ 23 (12.4%) and 17 (9.1%) of the total diabetes patients having thyroid disorder had hypothyroidism and hyperthyroidism respectively. Subclinical hypothyroidism was the most prevalent disorder in diabetic patients in the study occurring in 12.4% followed by subclinical hyperthyroidism in 6.5%, primary hyperthyroidism in 2.7% and primary hypothyroidism in none of the total 186 diabetic patients. Thus among thyroid dysfunction maximum prevalence was found to be of subclinical hypothyroidism whereas primary hypothyroidism was least found.

Table 2: Correlations of thyroid dysfunction with gender, age and HBA1C.

Thyroid disorder	Female	Male	P value	Age in years <50	Age in years 50-60	Age in years >60	P value	HbA1c <7	HbA1c ≥7	P value
	11 (27.5%)	29 (72.5%)	0.002	19 (47.5%)	7 (17.5%)	14 (35%)	0.030	17 (48.6%)	18 (51.4%)	0.004

Table 3: Correlations of thyroid dysfunctions with duration of diabetes, hypertension and family history.

Thyroid disorder	Duration of diabetes ≤1 year	Duration of diabetes 1-5 years	Duration of diabetes 6-10 years	P value	HTN Present	HTN Absent	P value	FH Present	FH Absent	P value
	5 (12.5%)	18 (45%)	17 (42.5%)	0.656	10 (25%)	30 (75%)	0.267	11 (27.5%)	29 (72.5%)	0.746

Table 4: Type of thyroid dysfunctions according to gender.

Distribution of subjects according to gender	Subclinical hypothyroidism	Primary hypothyroidism	Subclinical hyperthyroidism	Primary hyperthyroidism
Male (n=95)	7 (7.4%)	0 (0%)	5 (5.3%)	0 (0%)
Female (n=91)	16 (17.65%)	0 (0%)	7 (7.7%)	5 (5.5%)

Prevalence of thyroid dysfunction according to gender

In the present study, the prevalence of thyroid disorders in diabetic patients was more in males as compared to females (72.5% vs 27.5%)which when evaluated statistically was significant (p=0.002)(Table 2). Our results are consistent with the study of Shabaze in Hajieh et al which reported prevalence of thyroid disorder higher in diabetic males as compared to diabetic females.¹³ Thus the prevalence of thyroid disorder in diabetic patients is strongly influenced by gender.

Prevalence of thyroid dysfunction according to age group

Out of the 40 diabetic patients who had thyroid disorder, 19 (47.5%) belong to the age group of <50 years, 7 (17.5%) belong to the age group of 50-60 years and 14 (35%) belonged to the age group of >60 years. Thus the age specific trend in the prevalence of thyroid disorder was found to be highest in the age group of <50 years. This when evaluated statistically was significant (p=0.030) (Table 2). The results of our study are in accordance with the previous study of Penugonda Anveetha et al who also found high prevalence of thyroid disorder in diabetic patients with advancing age.¹⁵ Thus

with increasing age the prevalence of thyroid disorder in type 2 diabetes showed an increasing trend.

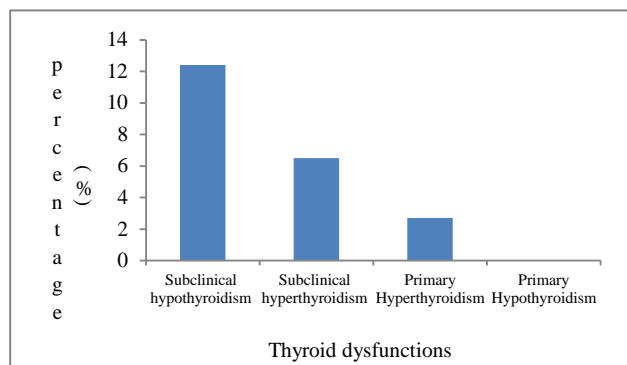


Figure 1: Prevalence of thyroid dysfunction in diabetic patients.

Prevalence of thyroid dysfunction according to HbA1c values

In the study out of 40 diabetic patients who had thyroid disorder, 17 (48.6%) had $HbA1c < 7$ and 18 (51.4%) had $HbA1c \geq 7$. The prevalence of thyroid disorder was found to be more in patients with $HbA1c \geq 7$ as compared to patients with $HbA1c < 7$. This difference was statistically significant ($p=0.004$) (Table 2). Our results are comparable with the previously conducted studies of Tajinder Singh et al and Jain G et al. Thus prevalence of thyroid disorder was more in patients with $HbA1c \geq 7$ i.e. in patients having poorly controlled diabetes.

Prevalence of thyroid dysfunction according to duration of diabetes

Out of the 40 diabetic patients with thyroid disorder, 5 (12.5%) had duration of diabetes ≤ 1 yr, 18 (45%) had a duration of diabetes for 1-5 yrs and 17 (42.5%) had duration of diabetes for 6-10 yrs. However this difference when evaluated statistically was not significant ($p=0.656$) (Table 3). Thus we found that prevalence of thyroid disorder was not significantly affected with duration of diabetes. Our results are in concordance with Athanasia et al (2010) who found out that no significant relationship is present between thyroid dysfunction and duration of diabetes.

Prevalence of co-morbid conditions in patients with thyroid dysfunction

In the study, out of 40 diabetic patients who had thyroid disorder, 30 (75%) were normotensive and 10 (25%) had hypertension. Although the prevalence of thyroid disorder was found to be more in patients who had hypertension, this difference observed was not significant statistically ($p=0.267$) (Table 3). Our results are in concordance with Roos A et al who also found that there was no significant association of hypertension and presence of thyroid dysfunction in diabetic patients.

Out of the 40 diabetic patients who had thyroid disorders, 2 (5.0%) had ischemic heart disease and 38 (95.0%) had no ischemic heart disease. The prevalence of thyroid disease was found to be in no relation with occurrence of ischemic heart disease and was statistically not significant ($p=0.782$).

The occurrence of hypotension ($p=0.158$) and osmotic symptoms ($p=0.192$) were not found in 40 diabetic patients who had thyroid disorders and thus the presence of both had shown no significance with thyroid disorder.

Prevalence of thyroid dysfunction according to family history

In this study, out of 40 diabetic patients who had thyroid disorder, 11 (27.5%) had a family history of thyroid disorder and 29 (72.5%) had no family history of thyroid disorders. In this study the prevalence of thyroid disorder was found to be more in patients who had no family history of thyroid disorder. However this difference observed was not significant statistically ($p=0.746$). To conclude there is a high prevalence of thyroid disorders in patients with diabetes mellitus which was further found to be more in males, in age group <50 years and in patients with uncontrolled diabetes, i.e. $HbA1c \geq 7$. So regular screening of thyroid function in all type 2 diabetic patients should be done especially with uncontrolled diabetes.

CONCLUSION

Thus this study shows the prevalence of abnormal thyroid hormone level (21.5%) among diabetic subjects. [15]The relationship between thyroid disorders and diabetes mellitus is characterized by a complex interdependent interaction. Failure to recognize the presence of abnormal thyroid hormone level in diabetes may be a primary cause of poor management often encountered in some treated diabetics. Therefore screening for thyroid disease among patients with diabetes should be routinely performed to rule out the possible aggravation of classical risk factors such as hypertension and dyslipidemia, which can lead to cardiovascular risk in these patients.

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