

Original Research Article

Prevalence of thyroid dysfunction in patients with type 2 diabetes

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ABSTRACT

Background: Diabetes mellitus, a leading cause of death worldwide, is the most common endocrine disorder. Type 2 Diabetes (T2D) and Thyroid Dysfunction (TD) often present together and complicate each other at many levels. Recent studies find out the prevalence of TD in T2D in Malwa Region. Objective of the purpose of this study was to find out the prevalence of TD in patients with T2D.

Methods: A match cross-sectional study design was conducted at Department of Medicine, Sri Aurobindo Medical College, from March 2018 to April 2019. Source populations were all patients who live in Malwa Region, Indore. A total of 150 cases were enrolled in this study, 75 cases (TD in T2D) and 75 controls were taken into study.

Results: There was no significant difference in age and body mass index (BMI) between groups. The average duration of diabetes was 7.76 ± 5.57 years and mean Hemoglobin A1c (HbA1c) was $8.17 \pm 1.66\%$. Only 29(38.6%) of patients had HbA1c below 7%. There was significant difference ($p=0.001$) in HbA1c. Prevalence of TD in T2D was significantly more in females. Out of TD in T2D patients, sub-clinical hypothyroid was present in 14.6% hypothyroidism was present in 8% patients and sub-clinical hyperthyroidism and hyperthyroidism was present in 1.3% patients.

Conclusions: This study reveals about one in four people living with T2D are suffering from TD in Malwa Region. TD is common in T2D patients and can produce significant metabolic disturbances.

Keywords: Hemoglobin A1c, Hypothyroidism, High-density lipoprotein, Low-density lipoprotein, Thyroid Dysfunction, Thyroid stimulating hormone, Type 2 Diabetes, Very-low-density lipoprotein

INTRODUCTION

Diabetes is the most common among the metabolic disorders and next in the order would be of thyroid disease.¹ The prevalence (6.6%) of thyroid disease is common in the general population and increases with age. The prevalence of thyroid disease in diabetes has been estimated at 10.8%, with the majority of cases occurring as hypothyroidism (~30%) and subclinical hypothyroidism (~50%). Hyperthyroidism accounts for 12% and postpartum thyroiditis accounts for 11%. [2,3] Many studies have reported varying prevalence (10%–24%) of Thyroid Dysfunctions (TD) in Type 2 Diabetes

(T2D).⁴ The prevalence of TD in T2D varies in literature from very low (5.5%) to very high (75%).^{5,6} According to World Health Organization (WHO), the worldwide prevalence of diabetes in 2002 was 170 million and the number projected to grow up to 366 million or more by 2030.⁷ Thyroid disorders are also common in the general population and it is the second most common endocrine disorder. It is common for an individual to be affected by both diabetes and thyroid disease.⁸ Hypothyroidism, on the other hand, is accompanied by a variety of abnormalities in plasma lipid metabolism, including elevated triglyceride and low-density lipoprotein (LDL) cholesterol concentrations, leading to increased risk of

atherosclerosis.^{9,10} Diabetes mellitus appears to influence thyroid function in two sites; firstly, at the level of hypothalamic control of Thyroid Stimulating Hormone (TSH) release and secondly at the conversion of Thyroxine (T4) to Triiodothyronine (T3) in the peripheral tissue.

Hyperglycemia causes reversible reduction of the activity and hepatic concentration of T4-5-deiodinase, low serum T3, increase in reverse T3 and also variation in the level of T4.¹¹ Both diabetes and thyroid disorders are autoimmune in nature.¹² The purpose of this study was to find out the prevalence of TD in T2D in Malwa Region, Indore population.

METHODS

A match cross-sectional study design was conducted at department of medicine, Sri Aurobindo Medical College, from March 2018 to April 2019. Source populations were all patients who live in Malwa Region, Indore. The study was approved by clinical research and ethics committee of institute, Indore. A total of 150 cases enrolled in this study, the 75 cases (TD in T2D) and 75 controls were taken into study. Age and sex case matched healthy volunteers were recruited who has no history of diabetes. Before the recruitment first be informed and take the concern to all participants.

All the cases in diabetic group were confirmed diabetics who were on treatment for diabetes mellitus and level of Hemoglobin A1c (HbA1c) International Diabetes Federation (IDF) criteria.¹³

Data regarding the age, sex, weight, height, blood glucose, HbA1c, thyroid profile, lipid profile, liver function tests, blood urea and creatinine were collected from all participants., habits (smoking, alcohol, and gutka), type of TD (hyper/hypothyroidism). The correlation of TD in T2D patients with age, sex, body mass index (BMI), duration of diabetes, HbA1C, was then done. The observations and interpretations were recorded and results obtained were statistically analyzed.

Blood samples fasting blood sample were obtained for biochemical analysis. BMI was calculated as kg/m². Normal range for thyroid hormones were taken as, T3 (77-135 ng/dL), T4 (5.4 -11.7 ug/dL) and TSH (0.34-4.25

mIU/L).¹⁴ Subclinical hypothyroidism was defined as an elevated TSH level with normal serum thyroid hormone levels. Hypothyroidism was defined as an elevated TSH together with a reduce serum thyroid hormone levels. Subclinical hyperthyroidism was defined as a decreased TSH with normal thyroid hormone levels and hyperthyroidism was defined as a decreased TSH with elevated thyroid hormone levels.

Inclusion criteria

Diabetic patients attending medicine OPD, referral from diabetic OPD, and indoor patients at SAIMS. All the patients between 20 and 80 years of age and who are accessible.

Exclusion criteria

Patients below 18 years of age, pregnant or lactating women, patients suffering from malignancy and tuberculosis or recently diagnosed diabetics patients, or those on drugs known to affect thyroid function were excluded from the study.

Statistical analysis

Data collected were analyzed by student's 't' test or chi-square test as appropriate. Pearson correlation test was used to analyze the correlation of TD in T2D with independent variables like Age, Sex, BMI and HbA1c. Probability (P) value less than 0.05 was regarded as statistically significant.

RESULTS

Overall 150 cases included in the final analysis. The data are presented in Table 1. Out of 68(45.3%) patients were male, and 82(54.6%) females, mean age was 35±5.6 years and mean BMI was 24.1±4.28kg/m². There was no significant difference in age, gender and BMI between groups. The average duration of diabetes was 7.76 ± 5.57 years and mean HbA1c was 8.17±1.66%. Only 29(38.6%) of patients had HbA1c below 7%. There was significant difference (p=0.001) in HbA1c (Table 1).

The levels of serum T3 and T4 were significantly low while serum TSH levels were significantly high in TD in T2D group compared to control group.

Table 1: Correlation of TD in T2D with Age, Sex, BMI and HbA1c.

Parameters	TD in T2D (n=75)	Control (n=75)	p value
Age, (years)	35±5.6	34±4.5	0.431
Gender (M:F)	34(45.3):4(54.7)	34(45.3):4(54.7)	1.00
BMI (kg/m ²)	24.1±4.28	23.8±3.27	0.352
HbA1c levels (%)	8.17±1.66	5.7±1.5	0.001

T2D: Type 2 Diabetes; TD: Thyroid Dysfunction; BMI: Body Mass Index; HbA1c: Hemoglobin A1c Data was presented in mean± standard deviation; number (percentage)

Whereas addiction to smoking/alcohol/ gutka was found only in 6(8%) TD in T2D patient and 2(2.6%) in control patient. Prevalence of TD in T2D was significantly more in females. Out of 75 patients, sub-clinical hypothyroid

was present in 11(14.6%) vs 3(4%), hypothyroidism was present in 6(8%) vs 1(1.3%) patients and sub-clinical hyperthyroidism was present in 1(1.3%) vs 1(1.3%) and hyperthyroidism was present in 1(1.3%) no patients of hyperthyroidism in control patient (Table 2).

Table 2: Hypothyroidism and thyroid function in cases and controls.

Thyroid function	TD in T2D(n=75)	Control(n=75)	p value
T3 (ng/dL)	102.8±19.0	111.2±17.5	0.002*
T4 (ug/dL)	7.4±3.6	8.7±4.3	0.020*
TSH (mIU/L)	5.1±3.0	3.3±1.3	0.001*
Addiction smoking/alcohol/ gutka	6(8%)	2(2.6%)	NS
Sub clinical hypothyroidism	11(14.6%)	3(4%)	NS
Hypothyroidism	6(8%)	1(1.3%)	NS
Sub clinical hyperthyroidism	1(1.3%)	1(1.3%)	NS
Hyperthyroidism	1(1.3%)	0(0%)	-

T2D: Type 2 Diabetes; TD: Thyroid Dysfunction; T3: Triiodothyronine; T4: Thyroxine; TSH: Thyroid Stimulating Hormone; NS: Non-Significant

Data was presented in mean± standard deviation; number (percentage)

*Significant

DISCUSSION

Diabetes is a metabolic derangement caused by lack of insulin or its action whereas TD does the same due to imbalance in thyroxin levels. Thyroid hormone itself affects intermediary metabolism and thus alter glucose homeostasis. Hypothyroidism leads to reductions in hepatic glucose output, gluconeogenesis, and peripheral glucose utilization thus predisposing to hypoglycemia.¹⁵ Thyroid disorders are also very common endocrine disorders in the general population. Hence it is common for an individual to be affected by both thyroid diseases and diabetes. Use of medications for diabetes also alters thyroid function. For example, use of metformin has been as high as 27%. Most of the studies Showed lower prevalence (12.5%, 13.4% and 12.3% respectively) of thyroid dysfunctions in diabetic patients.¹⁶⁻²¹ In the present study Most prevalent thyroid disorder in diabetic patients was subclinical hypothyroidism occurring in 14.6 %, followed by hypothyroidism in 8%, subclinical hyperthyroidism in 1.3%, and hyperthyroidism in 1.3%. Out of 29 diabetic patients who had thyroid dysfunctions, in the present study, the prevalence of thyroid disorders was more in females as compared to males. However, study by Diez et al, found no significant relationship between presence of thyroid dysfunction and duration of diabetes.²² There was no significant difference in age and BMI between groups. The average duration of diabetes was 7.76±5.57 years and mean HbA1c was 8.17±1.66%. Only 29(38.6%) of patients had HbA1c below 7%. There was significant difference (0.001) in HbA1c We found that the prevalence of thyroid disorders was affected by control HbA1c of diabetes. However, studies by Schlienger et al, Bazrafshan et al and Ardekani et al, found thyroid dysfunctions significantly higher in

diabetics with higher HbA1c.²³⁻²⁵ Multiple studies revealed the increased prevalence of TD in type 2 diabetics.⁴

CONCLUSION

This study reveals about one in four people living with diabetes are suffering from TD. TD is common in diabetic patients and can produce significant metabolic disturbances. Therefore, regular screening for thyroid abnormalities in all diabetic patients will allow early treatment of subclinical TD. Subclinical hypothyroidism and hypothyroidism were the most common thyroid abnormality in T2DM. TD was more prevalent in female diabetic patients than in males.

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Conflict of interest: None declared

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

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