

A Study of Thyroid Dysfunction in Patients of Type 2 Diabetes Mellitus: A Case Control Study

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Abstract

Thyroid dysfunction and Diabetes Mellitus type 2 are two leading endocrinal issues faced by majority of population in a developing country like India. Hypothyroidism is more common in patients with type 2 Diabetes Mellitus. Type 2 Diabetes Mellitus often predisposes to changes in circulating thyroid hormone causing subclinical hypothyroidism and low fT3 levels. Patients with type 2 Diabetes Mellitus have a higher TSH levels and lower fT3 than those their non-diabetic counterparts. Patient with type 2 Diabetes Mellitus should undergo testing for complete thyroid profile at regular intervals. However, there are no specific guidelines for frequency of thyroid monitoring in patients with poor glycemic index.

Keywords: Glycemic index, Hypothyroidism, Type 2 Diabetes Mellitus, Thyroid Dysfunction

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Introduction

Diabetes mellitus is a collection of common metabolic disorder mainly considered by hyperglycaemia which results commencing from defective insulin secretion or insulin action or together [1]. It is a diverse group of diseases with different group of etiology such as social, environmental and genetic factors which acting concurrently or mutually [2].

In India, Type 2 Diabetes mellitus is an epidemic disorder due to social influence and changes in life style. As per WHO estimation, the universal prevalence of Diabetes mellitus was 170 million (2.8%) in 2002, this number

expected to grow up to 366 million (4.4%) or more in 2030 [3-5].

There are numerous lines of evidence to suggest that Type 1 DM is a autoimmune disorder. These include the presence of insulinitis, presence of antibodies, auto-reactive T- cell's against islet antigens, an association with some other known organ specific autoimmune diseases (thyroid disorders and pernicious anemia) and a strong association between HLA genes and lastly remission of the disease with immunomodulator therapy. Thus association between

thyroid and Type 1 diabetics may be a auto-immune process [6].

A numerous study was reported the occurrence of thyroid disease in diabetes patients changing from 2.2% to 17 % [7,8]. However, few studies show even higher up to 46.5% [9]. The relationship between type 1 DM and thyroid dysfunctions are proved one and may be an autoimmune process. But in India, inadequate data is available on thyroid diseases in type 2 diabetes patients. So, our study designed to evaluate incidence of thyroid dysfunction among type 2 diabetes mellitus subjects residing in south Indian region. With these backgrounds, the present study aims to focus on to find out the prevalence of thyroid dysfunction in Type 2 DM population. An effort was made to compare and correlate these two metabolic disorders by taking into consideration of various biochemical parameters [10]. So, the present study was conducted with the objective to to investigate the relationship between diabetes mellitus and thyroid profile status in Type 2 Diabetes mellitus patients.

Materials and Methods

This case control study done among total 160 cases, out of which 80 cases of type 2 diabetes mellitus (old and newly diagnosed) and 80 controls whose fasting plasma glucose was less than 110 gm/dl on two occasions after ethical permission of institute at tertiary care centre, Gujarat, India during September 2018 to February 2019. Inclusion criteria was all patients with known case or newly diagnosed diabetes mellitus type 2, aged

above 18 years, all diabetics irrespective of glucose control and all diabetics irrespective of treatment (OHA/Insulin). Exclusion criteria was patients with Gestational diabetes, Steroid induced diabetes and age less than 18 years, who were unwilling to participate in study and who were under intensive care. Consecutively selected diabetic patients and non-diabetic volunteers were subjected to evaluation for detailed history, clinical examination and thyroid function tests i.e. they were screened for thyroid profile (T3, T4 and TSH) and glycaemic index (FBS, PPBS and Hb1AC). Diagnosis for diabetes mellitus was based on American Diabetic Association criteria for type 2 diabetes mellitus. CBC, S. Creatinine and SGPT was also done if required. The data were recorded in an Excel sheet and descriptive analysis was performed, of which data are presented in the tables. To know the association between dependent and independent variables chi-square was applied accordingly. P value less than 0.05 was considered as statistically significant.

Results

We studied 160 patients that included 80 diabetic patients and 80 non- diabetic patients. In the 80 diabetic patients, 47.5% were males and 52.5% were females. The mean age of study group was 57.59 (± 10.74) years. Most of the patients were in age group of 60-70 years (32.5%) followed by 50-60 years (27.5%). The mean FBS in the study group was 174.43 (± 79.91) mg/dl and mean PPBS was 243.76 (± 86.74) mg/dl.

Table 1: Prevalence of thyroid dysfunction in study and control group [N=160]

Parameter	Study Group (n=80)		Control Group (n=80)	
	Number	%	Number	%
Euthyroidism	65	81.3	70	87.5
Subclinical	3	3.8	2	2.5
Hypothyroidism	11	13.8	6	7.5
Overt Hypothyroidism	1	1.3	2	2.5
Hyperthyroidism	80	100	80	100

Table 1 shows that the prevalence of thyroid dysfunction in study group was 18.9%. of this, 17.6(13.8+3.8)% had hypothyroidism and 1.3% had hyperthyroidism. And thyroid dysfunction in control group was 12.5%. Of this, 10% had hypothyroidism and 2.5% had hyperthyroidism.

Table 2 shows that more than half of our study group had diabetes for less than 5 years (51 patients, 63.8%). In the hypothyroid subgroup, out of 14, 7 (50%) had diabetes less than 5 years duration. Increased duration of diabetes had no significance with relation to increase in thyroid dysfunction in this study.

Table 2: Thyroid dysfunction in relation to duration of diabetes [N=160]

Duration of Diabetes (in year)	Euthyroidism	Hypothyroidism	Hyperthyroidism	Total
0-5	43 (66.15%)	7 (50%)	1 (100%)	51 (63.75%)
6-10	12 (18.46%)	4 (28.57%)	0 (0%)	16 (20%)
11-15	6 (9.23%)	2 (14.29%)	0 (0%)	8 (10%)
16-20	3 (4.62%)	1 (7.14%)	0 (0%)	4 (5%)
>20	1 (1.54%)	0 (0%)	1 (100%)	1 (1.25%)
Total	65 (100%)	14 (100%)	1 (100%)	80 (100%)

Table 3 shows that more than 50% of individuals were taking OHA and 25% subjects were not on any medication. In hypothyroid group, 7 were on OHA, 2 were on OHA + insulin and 5 were not on any treatment.

Table 4 shows that 21.5%, 1.17% & 0.0% participants had diagnosed with Euthyroidism, hypothyroidism & hyperthyroidism have HbA1c level was <7% respectively.

Table 3: Thyroid dysfunction in relation to treatment of diabetes.

Treatment	Euthyroidism	Hypothyroidism	Hyperthyroidism	Total
OHA	44 (67.69%)	7(50%)	1 (100%)	52(65%)
OHA+ Insulin	6 (9.23%)	2 (14.29%)	0 (0%)	8 (10%)
No treatment	15 (23.08%)	5 (36.71%)	0 (0%)	20 (25%)
Total	65 (100%)	14 (100%)	1 (100%)	80 (100%)

Table 4: Correlation between thyroid dysfunction and diabetes control

HbA1c levels	Euthyroidism	Hypothyroidism	Hyperthyroidism	Total
<7%	14 (21.54%)	1 (7.14%)	0 (0%)	15 (18.75%)
≥7%	51 (78.46%)	13 (92.86%)	1 (100%)	65 (81.25%)
Total	65 (100%)	14 (100%)	1 (100%)	80 (100%)

Discussion

Among the endocrinal diseases, diabetes occupies major share. India has dubious distinction of being home to the largest number of people suffering from diabetes in any country. This disease is responsible for significant morbidity and mortality.

Table 5: Comparison of studies- prevalence of Thyroid dysfunction in diabetes

Study	Prevalence of TD in DM (%)	Hypothyroidism (%)	Hyperthyroidism (%)
Pashupathi <i>et al</i> [11]	45	28.0	17.0
Udiong CEJ <i>et al</i> [12]	46.5	26.6	19.9
Perros <i>et al</i> [13]	6.9	--	--
Radaideh ARM <i>et al</i> [14]	12.5	--	--
Papazafiropoulou A <i>et al</i> [6]	12.3	--	--
Champakamalini M <i>et al</i> [15]	29	16	13
Vikhe VB <i>et al</i> [16]	30	22	8
Ghazali SM <i>et al</i> [17]	29.7		
Singh P <i>et al</i> [18]	30		
Demitrost L <i>et al</i> [19]	31.2	23	8
Diaz <i>et al</i> [20]	32.4		
Makandar A <i>et al</i> [21]	32	22	10

Present study found that 70% participants were taking oral hypoglycemic drug for DM, and 10% using both (OHA & Insulin).

Insulin is an anabolic hormone which enhances levels of fT4 while suppressing T3 levels by inhibiting conversion of T4 to T3. Metformin on the other hand, inhibit binding of T4 and T3 to Thyroxine binding globulin, thereby inhibiting thyroid hormone synthesis but it also reduces TSH. This then indicates that medication used by patients with type 2 Diabetes may alter thyroid function; hence care should be taken when interpreting thyroid function tests in this cohort of patients.

Present study found that more than half of our study group had diabetes for less than 5 years (51 patients, 63.8%). This finding is comparable with the similar studies done by AL-Wazzan *et al* [22], Radaideh *et al* [14] and Ozair M *et al* [23]. Present study found that 21.5%, 1.17% & 0.0% participants had diagnosed with Euthyroidism, hypothyroidism & hyperthyroidism have HbA1c level was <7% respectively.

These findings are comparable with the similar study done by Ozair M *et al* [23] and Pramanik S *et al* [24]

Conclusion

Prevalence of thyroid dysfunction was 18.9% in diabetics and 12.5% in non-diabetic group. Diabetics (14 out of 80) are more prone to thyroid dysfunction than non-diabetics (9 out of 80). Thyroid dysfunction is likely to be hypothyroidism (13 out of 80) than hyperthyroidism (1 out of 80). There was higher prevalence of hypothyroidism above 50 years of age in diabetic group (10 out of 14). The duration of diabetes and treatment of diabetes had no correlation with thyroid disorder. There was higher prevalence of thyroid dysfunction in females (9 out of 14) as compared to males (7 out of 9) in non-diabetic group.

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

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