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Thyroid dysfunction in insulin treated type 2 diabetes mellitus patients

L. Romesh Sharma,[1]Mossang K,[2]Kritirupa Sarkar,[2] Santa Naorem,[3]LallanPrasad,[3] Salam Ranabir[4]
[1.] Assistant Professor, [2.] Post graduate trainee [3.] Professor [4.] Associate Professor
Department of Medicine, Regional Institute of Medical Sciences, Imphal, Manipur, India
Corresponding Author: Salam Ranabir

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I. Introduction

Diabetes mellitus and thyroid disorders are the commonest endocrine disorders encountered in clinical practice.International Diabetes Federation reported that around 9% of population of the world are afflicted with diabetes.[1]In US the prevalence of thyroid disorders is around 6% according to US National Health and Nutrition Examination Survey (HNANES III).[2]As both disorders are quite common they may be seen together seen in the same patient as a co-existing disorder.

Several studies however have revealed that diabetic patients have a higher prevalence of thyroid disorders compared to the normal population.[3-19]

In a retrospective study among insulin treated type 2 diabetes, 27.3% had thyroid disorder and those patients who had thyroid disease prior to diabetes onset required insulin earlier than the type 2 diabetics.[13]This study wasundertaken to find out the prevalence of thyroid dysfunction in insulin treated type2 diabetes mellitus patients and its correlation with glycemic control in insulin treated type2diabetes mellitus.

The aim of the study was to determine the prevalence of thyroid dysfunction in insulin treated type2 diabetes mellitus patients and also to determine its correlation with glycemic control of insulin treated type2 diabetes mellitus patients.

II. Material and methods

This cross-sectional study was conductedin Endocrinology Clinic and Department of Medicine in a Medical Institute for two years fromOctober 2014 among 150 patients of type2 diabetes mellitus of which 75 were males and 75 were females.Type2DM patients were diagnosed using ADA criteria 2012.[20] Thyroid profile (T4 and TSH) was measured using immuno-chemiluminescence automated analyzer (VitrosMicrowell ECIQ assay, Ortho-Clinical Diagnostic, Bridgend, United Kingdom). Plasma glucose was estimated using glucose oxidase method using GLUC-PAP manufactured by Randox Laboratories Limited, 55 Diamond Road, Crumlin, County Antrim, BT29 4QY, United Kingdom.HbA1c estimation was done usingNycoCard Reader manufactured by Alere Technologies AS, Kjelsasveien 161, PO Box 6863 Rodelokka, NO-0504 Oslo, Norway.All routineinvestigations and other relevant investigations needed for the study were also done.Detailed clinical history of diabetes and history of duration of insulin treatment was taken from each patient or their relatives.Other physical examination like height,weight and waistcircumference were taken and BMI of each patient were estimated. The age group of study population was from 30-80years.Any associateddisease which can interfere with thyroid function tests like chronic liver disease, tuberculosis and malignancy were ruled out. Also diabetic patient taking any medication which can affect thyroid functionwere excluded from the study group. Ethical approval was obtained from appropriate institutional ethics committee before the beginning of study.Consent from the participating patients or their relatives were taken and confidentiality was maintained.All the observations were recorded in the database programme. Datawere analysed in SSPS ver.16. Data collected were presented in percentage and for testing statistical significance,test like Chi square and correlation was used. Probability value of less than 0.05 was taken as significant.

III. Result

In the present study, the mean age of the patients was 57.3 ±10.8 years. More than 80% of the patients were above 50 years. Majority had normal BMI (65.3%), 28% of them were overweight, 5.4%were obese and 1.3% of the cases were underweight. Mean duration of diabetes was 10.9 years. Most of the patients on insulin had diabetes for more than 5 years. Hypertension was also present in 34% of cases.

Thyroid dysfunction was detected in 43.3% among 150 type2 DM patients studied, out of which 22.7% was found to be hypothyroidism,5.3% of hyperthyroidism,12% of subclinical hypothyroidism and 3.3% of subclinical hyperthyroidism. Hyperthyroidism was more in prevalent in elderly type 2 DM patients and among males.But hypothyroidism was more prevalent among type 2DM female patients and among middle age group patients. There was an increase inhyperthyroid cases with increase in the duration of diabetes. Hyperthyroid patients (mean HbA1c=8.5±1.9%) had poorerglycemic control than hypothyroid patients (mean HbA1c=7.7±1.0%)and euthyroid patients (mean HbA1c=7.6±1.8%).

Table 1: Distribution of thyroid function test among insulin treated T2DM

Thyroid function test	Frequency	Percentage
Normal	85	56.7
Abnormal	65	43.3
Overt thyroid dysfunction	42	28.0
Hyperthyroidism	8	5.3
Hypothyroidism	34	22.7
Subclinical thyroid dysfunction	23	15.3
Subclinical hyperthyroidism	5	3.3
Subclinical hypothyroidism	18	12.0
Total	150	100.0

Table 2: Relation of thyroid function test with the duration of diabetes among insulin treated T2DM

Duration of diabetes (in years)	≤ 1 n=12	1.1 - 5 n=28	5.1 – 10 n=52	> 10 n=58	Total n=150
Hyperthyroidism - n(%)	0(0.0)	0(0.0)	4(0.0)	4(0.0)	8(100.0)
Hypothyroidism - n(%)	0(0.0)	6(17.6)	16(47.1)	12(35.3)	34(100.0)
Euthyroid- n(%)	10(11.8)	18(21.2)	28(32.9)	29(34.1)	85(100.0)
Subclinical hyperthyroidism - n(%)	0(0.0)	4(80.0)	0(0.0)	1(20.0)	5(100.0)
Subclinical hypothyroidism -n(%)	2(11.1)	0(0.0)	4(22.2)	12(66.7)	18(100.0)
Thyroid dysfunction (all together) – n(%)	2(1.3)	10(6.6)	24(16.0)	27(18.0)	65(43.3)

Calculated Chi square value = 4.3 among * cells

P value = 0.1

Table 3: Relation of thyroid function test with the duration of insulin use among T2DM

Insulin therapy (in years)	≤ 1 n=48	1.1 - 5 n=71	5.1 – 10 n=29	> 10 n=2	Total n=150
Hyperthyroidism - n(%)	0(0.0)	6(75.0)	2(25.0)	0(0.0)	8(100.0)
Hypothyroidism - n(%)	12(35.3)	12(35.3)	8(23.5)	2(5.9)	34(100.0)
Euthyroid - n(%)	30(35.3)	44(51.8)	11(12.9)	0(0.0)	85(100.0)
Subclinical hyperthyroidism - n(%)	2(40.0)	3(60.0)	0(0.0)	0(0.0)	5(100.0)
Subclinical hypothyroidism - n(%)	4(22.2)	6(33.3)	8(44.4)	0(0.0)	18(100.0)
Thyroid dysfunction (all together) – n(%)	20(13.3)	27(28.0)	18(7.2)	2(1.3)	65(43.3)

Chi-square value = 7.735 among *cells

P-value = 0.05

IV. Discussion

In this study of 150 patients, the mean age of insulin treated T2DM was 57.3 years ±10.8 years. More than 80% of the patients were above 50 years and the mean duration of diabetes was 10.9 years.

Thyroid dysfunction was present in 43.3% of cases of which overt thyroid dysfunction was present in 28.8% of cases and subclinical thyroid dysfunction in 15.3% of cases. Similar findings were observed in the studies by Udionget al[5]and Pasupathi et al[6] where thyroid dysfunction in type2 diabetes mellitus patients was 46.5% and 45% respectively.In the study by Al-Geffari et al[10], Sahu et al[14], Demitrost et al[8], Pramanik et al[18], Ozair et al[19], thyroid dysfunction prevalence was around 26-32% which is lower than this study. However these studies did not specify whether patients are on insulin therapy or on oral medications.

In the study among insulin treated type2 diabetic patients by Witting et al [13] thyroid dysfunction was prevalent in only 27.3% which is much lower than the finding of the present study.

Subclinical hyperthyroidism was present in 5 of the patients (3.3%) and subclinical hypothyroidism in 18 cases (12.0%). Regarding overt hyperthyroidism and hypothyroidism in the study by Al-Geffariet al[10], it was 0.5% and 15.3% respectively which is also less compared with this study. In the study by Vikheet al[11] among 50 diabetic subjects, 30% showed abnormal thyroid hormonelevels (22 % had hypothyroidism and 8 % had

hyperthyroidism). In a study by Raghuwanshiet al[15], prevalence of hypothyroidism and subclinical hypothyroidism was found to be 4(10.00%) and 6(15.00%) respectively, while the prevalence of subclinical hyperthyroidism and hyperthyroidism was found to be 0(0.0%) and 1(2.5%) respectively.

More females had thyroid dysfunction than males (24% vs. 21.3% of males). This finding is in concordance with the study by Ravishankeret al[12].In the same study, 22% females had subclinical hypothyroidism, 14% had hyperthyroidism. Among males Sub-clinical hypothyroidism was seen in 8%, hypothyroidism in 2% and hyperthyroidism in 12%.

All the overt hyperthyroid patients were males but in case of overt hypothyroidism most of the patients were females. In case of subclinical cases most of them were females.

In the previous studies of Devi et al[16], Venkateshwarlu et al[17] it was seen that thyroid dysfunction especially, hypothyroidism is more prevalent in the diabetics than the normal population.

Our study tried to establish a link with the duration of diabetes and insulin use with the thyroid dysfunction. More than 62% of patients on insulin therapy for more than 5 years have thyroid dysfunction. All patients on insulin therapy for more than 10 years had thyroid dysfunction. But this could be a chance finding as the number is small (only 2 patients)

There was an increase in hyperthyroid cases with increase in the duration of diabetes. Witting et al,[13]reported increased prevalence of hyperthyroidism with advancing age compared to other thyroid disorders. Also hyperthyroidism occurred significantly more frequently among the insulin treated type 2 DM patients who had thyroid dysfunction detected after diabetes onset compared to those who had thyroid dysfunction prior to or within same year of diabetes onset.

Hyperthyroid patients (mean HbA1c=8.5±1.9%) had poorer glycemic control than hypothyroid patients (mean HbA1c=7.7±1.0%) and euthyroid patients (mean HbA1c=7.6±1.8%). This finding is contrast to previous studies which showed no difference in HbA1c level among T2DM patients with and without thyroid dysfunction. Witting et al,[13] reported significantly lower HbA1c among insulin treated T2DM with thyroid dysfunction compared to those without.Hyperthyroidism can aggravate hyperglycemia by stimulation of glucose absorption, glycogenolysis and hepatic gluconeogenesis, insulin resistance and metabolism.[24],[25,26] Reverse has been observed in metabolism with hypothyroidism with increased risk of symptomatic hypoglycaemia among type 1 diabetics.[27]

Limitation of the study

Antibody to Glutamic acid decarboxylase (GADAb) or any other antibodies to exclude latent autoimmune diabetes of adult (LADA), considered to be variant of T1DM, was not performed. UKPDS have reported that around 10% of clinically diagnosed T2DM can have antibodies which are present in T1DM.[28]T1DM and autoimmune thyroid disease share common susceptibility genes, there is much higher prevalence of thyroid dysfunction among patients with T1DM.23Another limitation is the small sample size. Third we did not try to identify the onset of thyroid disease onset in relation to diagnosis of diabetes as done in study by Witting et al.[13]

V. Conclusion

Thyroid disorders are highly prevalent amonginsulin treated type2 DM. Those with longer duration of diabetes and longer duration of insulin therapy are more likely to have thyroid dysfunction.

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