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THYROID HORMONE STATUS IN DIABETICS AS A PREDICTOR OF GLYCEMIC CONTROL: A CASE CONTROL STUDY AT TERTIARY CARE CENTRE

Dr. Manoj Saluja[1], Dr Krishan Kumar Verma[2], SR Meena[3]

1. Associate professor, Department of Medicine, 2. Resident, Department of Medicine, 3.Professor, Department of Medicine, Govt. Medical college, Kota

***Email id of corresponding author- kkrishan1987@gmail.com**

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ABSTRACT:

Background: The association between Diabetes and Thyroid dysfunction has been recognized since 1979.Thyroid hormones are insulin antagonist, both thyroid hormone and insulin are involved in cellular metabolism and excess/deficit of anyone can result in functional derangement of each other. This study is aimed to study the prevalence of thyroid dysfunction & correlation between glycosylated haemoglobin (HbA1c) and thyroid hormone status (T3, T4, TSH) in Diabetes Mellitus type-2 patients. **Methods:** A case control study of 240 patients, 160 diabetic (as per ADA criteria, age>40) and 80 non diabetic controls recruited as per inclusion/exclusion criteria, was undertaken at tertiary care hospitals of Kota. After detailed clinical & physical examination, all patients were subjected to thyroid profile and HbA1c estimation. **Result:** Hypothyroidism was more common as compared to hyperthyroidism among diabetic patients. Subclinical hypothyroidism constituted 12.5% of cases and clinical hypothyroidism was 5% of cases. Thyroid disorder in diabetics was more common in females (20%) as compared to males (15%). Thyroid disorder among diabetics (i.e. cases) was higher among overweight (27.5%) and obese (15.9%) as compared to those with normal BMI (7.1%). There was negative correlation between HbA1c and T3 level with Pearson correlation coefficient – 0.372 and this correlation was statistically significant ($p<0.001$).**Conclusion:** This study demonstrated that firstly, subclinical hypothyroidism has greater prevalence & second, serum T3 may be reliable index of glycemic control in diabetic patients. Overweight and obese diabetic patients are more prone to subclinical as well as clinical hypothyroidism. These patients with larger waist circumference must be screened for thyroid dysfunction.

Keywords: Thyroid Profile (T3,T4, TSH), Glycosylated hemoglobin (HbA1c)

INTRODUCTION

The Thyroid dysfunctions may present as various forms. It may be manifest either as hyperthyroidism (thyroid hormone excess), hypothyroidism (thyroid hormone deficiency) or without any symptoms (subclinical hypothyroidism). **(1)**

Thyroid hormones affect glucose metabolism through several mechanisms. Both thyroid & insulin hormones are involved in cellular metabolism. Thyroid hormones (T3, T4) are insulin antagonists.

Thyroid hormone affects insulin and glucose metabolism in following ways-first) in hyperthyroidism rate of degradation of insulin is increased so biologically inactive insulin precursors are released. **(1,2)** If hyperthyroidism remains

untreated then, it has been reported to be associated with a reduced c-peptide to pro-insulin ratio, suggesting an underlying defect in pro-insulin processing.**(3)** Second) Increase in gut absorption of glucose, mediated by excess thyroid hormones, **(4,5)** thyroid hormones produce an increased hepatocyte plasma membrane concentrations of GLUT-2 (glucose transporter in the liver), which leads to an increased hepatic glucose output and abnormal glucose metabolism.**(6,7)**

The influence of diabetes mellitus (DM) on thyroid function has been established at the following sites: a) at the level of hypothalamic control of thyroid-stimulating hormone (TSH) release, b) at the conversion of T4 to T3 in the peripheral tissues and c) the effect of hyperinsulinemia on the thyroid gland.**(8,9)** In most of previous studies subclinical hypothyroidism has been reported as the most common thyroid dysfunction in T2DM patients.**(8,9)** Thyroid dysfunction has been widely reported among persons with diabetes in other parts of the world.

This study planned to find out association of glycosylated hemoglobin (HbA1C) and thyroid hormone status and distribution of thyroid dysfunction among type 2 diabetics.

Material and Method: This is a case control study conducted in Govt. Medical College and MBS hospital, Kota, Rajasthan from the period of October 2013 to July 2014.

Inclusion criteria:1)Type 2 Diabetics on OHA or insulin treatment 2)Normal healthy subjects for control

Exclusion criteria:1) Patients with type 1 diabetics.2) Patients on drugs known to alter thyroid hormone level viz. amiodarone, beta blocker, corticosteroid 3) Diabetics who are on treatment for thyroid disorder 4) Critically ill patients & with chronic conditions 5) Pregnant women.

Study population included 280 subjects divided in 2 groups: total 140 patients included type 2 diabetics (according to ADA) as case in group 1 and 140 non diabetics taken as control.

Anthropometric parameters including weight, height, BMI, Waist circumference, waist hip ratio was measured. Blood sugar levels were measured after overnight fasting for 8-10 hrs and 2-hrs postprandial levels along with HbA1C (ELISA method). Fasting T3,T4,TSH levels were measured after overnight fasting for 8-10 hrs by electrochemilumuniscene method (Cobas). Statistical analysis was done by chi squire test & Z test and p value <0.05 is considered significant.

RESULTS:

In this study, 140 established diabetics were screened for thyroid disorders by Thyroid function tests that were further divided in two age groups; < 60 years and patients over the age of ≥60 years (elderly). We had 90 people with type 2 diabetes below the age of 60 years and 50 people over the age of 60 years (elderly). The spectrum of thyroid disorders among these groups was as follows –

Table1 shows that 11.4% of Diabetic cases had Sub clinical Hypothyroidism and 6.4% had Clinical Hypothyroidism. 4.3% of the control subjects had Sub Clinical Hypothyroidism and none of the control had Clinical Hypothyroidism. Hypothyroidism was significantly more in diabetics (P<0.001)

Prevalence of Thyroid dysfunction among age <60 years and ≥60 years was 14.4% and 24% respectively. However this difference was not statistically significant (P=0.236).(Table2)

Among Diabetic case aged <60 years 10% had Subclinical hypothyroidism and 4.4% had Clinical Hypothyroidism, whereas among those aged >60 years 14% had Subclinical Hypothyroidism and 10% had clinical Hypothyroidism. Pattern of thyroid status was not associated with age (P=0.309) (table3)

Table1: Distribution of study subjects according to type of thyroid dysfunction

Row Labels	Case	control	Grand Total
Euthyroid	115(82.1%)	134(95.7%)	249(88.9%)
Sub clinical hypothyroidism	16(11.4%)	6(4.3%)	22(7.9%)
Clinical hypothyroidism	9(6.4%)	0	9(3.2%)
Grand Total	140	140	280

Table no.2 – Thyroid dysfunction in relation to age

Age (years)	Case			Control			Grand Total
	Thyroid Dysfunction	Euthyroid	Total	Thyroid Dysfunction	euthyroid	Total	
<60	13(14.4%)	77(85.6%)	90 (100%)	3(3.5%)	83(96.5%)	86 (100%)	176
≥60	12(24%)	38(76%)	50 (100%)	3(5.6%)	51(94.5%)	54 (100%)	104
Total	25(17.9%)	115(80.1%)	140 (100%)	6(4.3%)	134(95.7%)	140 (100%)	280
P value	0.236			0.874			

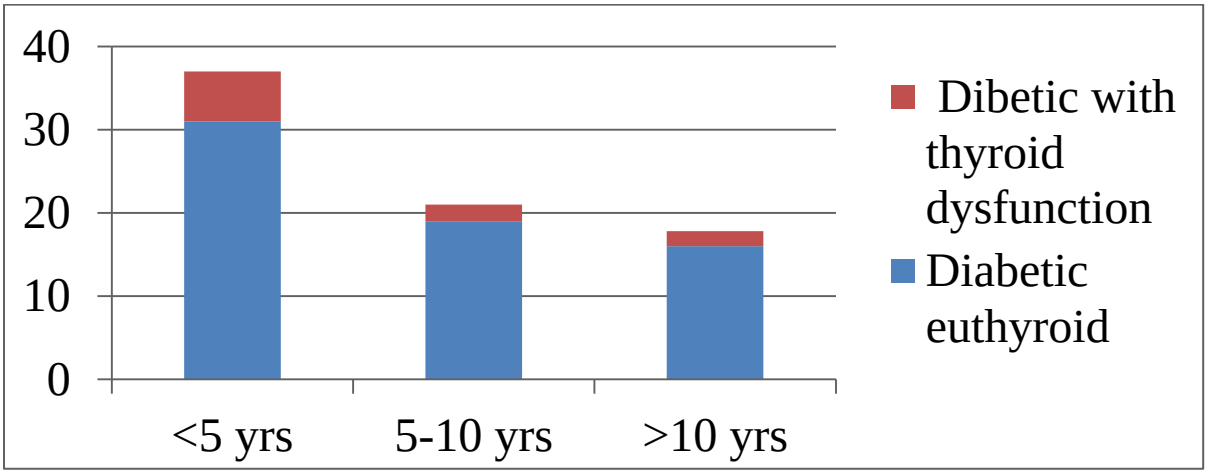
Table no.3 – Thyroid status among diabetic patients in relation to age

Thyroid status	Age in years		Total
	<60 years	≥60 years	
Euthyroid	77(85.6%)	38(76%)	115(82.1%)
Sub clinical hypothyroidism	9(10%)	7(14%)	16(11.4%)
Clinical hypothyroidism	4(4.4%)	5(10%)	9(6.5%)
Grand Total	90(%)	50(%)	140(%)

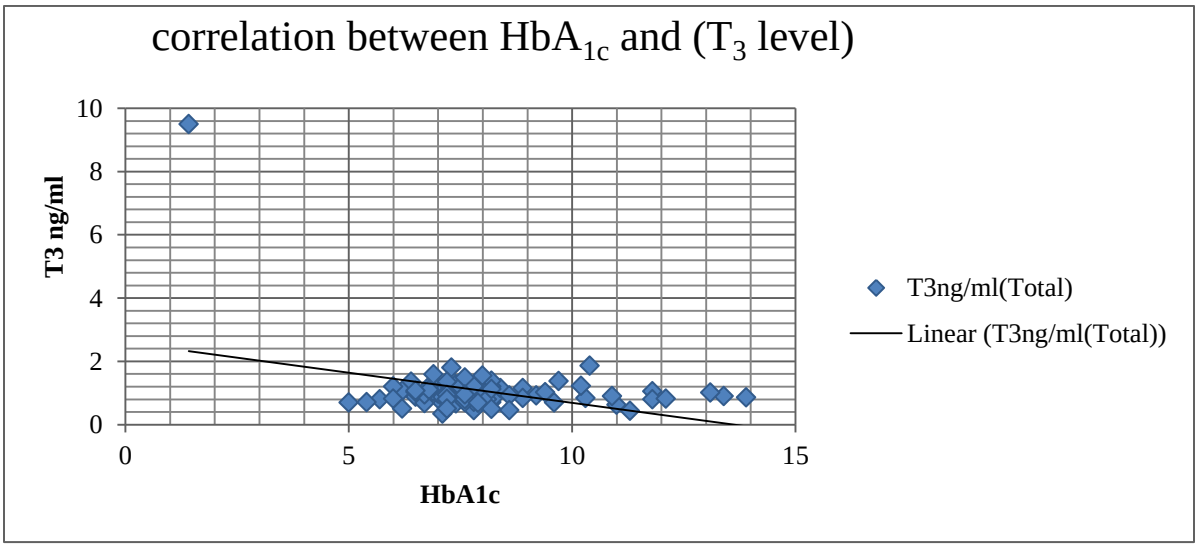
Table 4: HbA1c among diabetic patients in relation to thyroid status

HbA1c	N	Mean	Standard deviation	P value
Diabetic with thyroid dysfunction	25	8.17	1.47	0.904
Diabetic Euthyroid	115	8.12	1.95	

Graph 1: Thyroid dysfunction and duration of DM



Graph 3: Correlation between Hba1c and T3 level



Mean HbA1c level was higher among Diabetics patients with thyroid dysfunction as compared to Diabetic Euthyroid, however this difference was not statistically significant (P=0.904) (table4)

Duration of DM was also studied regarding thyroid dysfunction. Thyroid dysfunction was higher in cases with diabetes for >10 yrs, however the difference was not statistically significant (p = 0.298). (graph 1)

There was a negative correlation between HbA1C & T3 level with Pearson correlation coefficient -0.372 & this was statistically significant. (P<0.001). (graph 2) While, there was a positive correlation between HbA1C and T4 level. But this was not statistically significant. (Pearson correlation coefficient =0.042 P = 0.715)

When correlation between TSH and HbA1C was studied, it was found to be negatively correlated. (Pearson correlation coefficient = -0.028, P = 0.746).

DISCUSSION:

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

In this study of 140 patients with type 2 diabetes 70 were males and 70 females. We have found 25 patients with thyroid disorders that is 17.9%, this corroborates with number of reports given below showing higher than normal prevalence of thyroid disorders.

Pasupathi et al **(10)** in their study found that prevalence of thyroid disorder was 45% among type 2 diabetics. Hypothyroidism was present in 28% and 17% had hyperthyroidism. C. E. J. Udiong **(11)** in his study from Nigeria found that prevalence of thyroid disorder was 46.5%. Hypothyroidism was present in 26.6% and 19.9% had hyperthyroidism.

In this study out of the 25 patients with thyroid dysfunction 16 had sub clinical hypothyroidism, 9 had overt hypothyroidism and no patient had hyperthyroidism. Among study population 24% patients with thyroid disorders over the age of 60 years and 14.4% below the age of 60 years.

Flatau E, Trougoubof P **(12)** have also observed similar findings. They have reported 38% with sub-clinical hypothyroidism after the age of 60 years. Diabetes mellitus and thyroid disorders were common in the elderly.

In this study we have found that HbA1c level was higher among Diabetics patients with thyroid dysfunction as compared to Diabetic Euthyroid, however this difference was not statistically significant (P=0.904)

We did not find hypoglycaemia in any of our patients with sub-clinical hypothyroidism and this differs from studies carried out by Leong et al. as they found recurrent hypoglycaemic episodes as the presenting signs for the development of hypothyroidism. **(13)**

JIN-KUI YANG et al, had shown that HbA1c was significantly higher in subjects with subclinical hypothyroidism with type 2 diabetes compared with age and sex matched euthyroid diabetic subjects. **(14)** These observations are not consistent with our results.

CONCLUSION

Prevalence of thyroid dysfunction was seen in 17.8% of diabetics studied. Hypothyroidism was more common in which subclinical hypothyroidism constituted 11.4% & clinical hypothyroidism constituted 6.4%.Elderly patients had increased risk of thyroid dysfunction. There is no significant correlation between HbA1C, T4 & TSH. This study shows that serum T3 may be a reliable index of glycemic control in diabetics

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