Original Research Paper

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# Thyroid Dysfunction and it's Relation With Type 2 Diabetes Mellitus in Meerut

Medical Science

**KEYWORDS :** TSH, T3, T4, Type 2 Diabetes Mellitus,

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## ABSTRACT

*Introduction - Diabetes mellitus 2 and thyroid disorders are the two most common endocrinological disorders seen in Indian population. Present study was done to know the prevalence of Thyroid dysfunction in Type 2 Diabetes Mellitus case subjects in and around Meerut city.*

*Materials and methods- In the our study 100 type 2 diabetic subjects and 50 healthy non diabetic subjects were investigated for fasting plasma glucose (FPG), total tri-iodo-thyronine (T3), tetra-iodo-thyronine (T4), thyroid stimulating hormone (TSH), total cholesterol(TC), serum trigyceride(TG), high density lipoprotein(HDL) and glycosylated haemoglobin (HbA1c).*

*Result- Prevalence of thyroid dysfunction is high at 31% in this study population of Type 2 Diabetes Mellitus as compared to 12% in controls. Mean HbA1c in T2DM subjects was 8.31%. Female suffered more from thyroid dysfunction in both case and control group as compared to male. Fasting plasma glucose and Lipid profile was significantly deranged in T2DM subjects as compared to control. In the thyroid profile; T3 in T2DM subjects was significantly decreased as compared to controls. TSH levels were significantly increased in T2DM subjects in comparison to control.*

*Conclusion- The study revealed that there is significant rise of TSH level among diabetic patients.*

**Introduction**

Thyroid dysfunction (TD) is defined as the altered serum thyroid stimulating hormone (TSH) According to a projection from various studies on thyroid diseases, it has been estimated that about 42 million people in India suffer from thyroid diseases1 and hypothyroidism is the most common thyroid disorder2 and also hypothyroidism is ten times more common in women than in men3.

Diabetes has emerged as pandemic health problem and it's prevalence is increasing at an alarming rate .World Health Organization (WHO) has declared that the incidence of diabetes is increasing rapidly world-wide to become a major public health concern4. It is the commonest endocrine disorder and is the leading cause of death worldwide5,6 .

Diabetic patients have higher prevalence of thyroid disorders compared with the normal population7. The prevalence of thyroid disease in patients with diabetes is significantly higher than the general population8. Number of studies have estimated the prevalence of thyroid dysfunctions among diabetes patients to be varying from 2.2 to 17 % 9,10.

There is lack of data reports about thyroid disease in T2DM in Western U.P. Our aim was to study the prevalence of thyroid disorders in T2DM subjects with previously undiagnosed thyroid dysfunction, and compare with normal adult population and thus find the relation between T2DM and thyroid dysfunctions. Therefore the present study has been aimed to find out any relation between thyroid dysfunction in T2DM subjects and hence the necessity of its analysis in T2DM studies patients. This study may be a foundation for future studies which can influence screening and management of thyroid dysfunctions in attempting to achieve glycemic control in T2DM.

**Patients and Methods**

It was a hospital based prospective study conducted by the Department of Biochemistry, Subharti Medical College and Chhatrapati Shivaji Hospital, Meerut. An Informed consent was taken from each subject. The study was carried out on patients attending the Endocrinology OPD and also on IPD patients falling within the age group of 35 to 65 years. Total 100 patients of Type 2 Diabetes Mellitus were selected.

Type 1 DM , Patients with: a)Gestational diabetes mellitus b)Patients with chronic renal failure and Diabetic nephropathy c) Postoperative subjects, chronic illnesses, other physical illnesses, and those who had proven thyroid disorder and on treatment were excluded.

A total of 50 age, sex matched control (nondiabetic) were selected randomly.

Overnight fasting 5 ml venous blood was collected. 1 ml was collected in EDTA vial for HbA1c measurement. 1 ml was collected in fluoride oxalate vial for fasting plasma glucose measurement and 3 ml was collected in a plain vial and allowed to clot and centrifuged at 2500 r.p.m. for 10 minutes for other blood parameters. The hormonal analysis Total T3, T4 & TSH were carried using Biomerieux Vidas under standard quality control measures. Fasting Plasma Glucose (FPG), serum TG, TC and HDL-C were processed in Vitros-250 auto analyzer using readymade dry chemistry kits procured from Ortho-Clinical Diagnostics, Johnson & Johnson, USA. HbA1c was processed in Bio-Rad D-10 HbA1c analyzer. Levi-Jenning Plot was fed in equipment and reading checked. Readings outside the range of 2 SD were reprocessed / discarded.

Mean, standard deviation, student independent t tests, chi-

square test used to calculate p-value. Data was analyzed by using Excel 2007, R2.8.0 and Statistical Package for the Social Sciences

(SPSS) for windows version 20.0 (SPSS Inc; Chicago, IL,USA). A p-value of <0.05 was used to establish statistical significance.

**Results**

In our study, mean HbA1c of patients were 8.31± 2.29%, with 66 subjects having HbA1c ≥7% and 34 having HbA1c <7%. We observed that T2DM with TD (n=31) patients had poorly controlled glycaemia, which is seen with HbA1c ≥7% in 20 (64.5%) patients. Only 11(35.5%) patients had HbA1c <7%. This relation was significant with p value<0.05

We observed that a total of 31 out of 100 (31%) case subjects were affected with thyroid dysfunction in comparison to 6 (12%) out of 50 subjects from control group. We observed that in T2DM cases out of 31 TD cases, 25(41.67%) were females and 6 (15%) were males, whereas in control out of 6 TD cases 5 (17.24%) were females and 1 (4.76%) was male respectively. (Table 1)

**Table 1 - Prevalence of Thyroid dysfunction in T2DM case and control**

| THYROID DYSFUNCTIONS | CASE | | CONTROL | |
|---|---|---|---|---|
| | FEMALE | MALE | FEMALE | MALE |
| HYPOTHYROID/SUBCLINICAL HYPOTHYROID | 22 (36.66%) | 5(12.5%) | 5(17.24%) | NIL |
| HYPERTHYROID/SUBCLINICAL HYPERTHYROID | 3(5%) | 1(2.5%) | NIL | 1(4.76%) |
| EUTHYROID | 35(58.34%) | 34(85 %) | 24(82.75%) | 20(95.23%) |
| TOTAL | 60(100%) | 40(100%) | 29(100%) | 21(100%) |
| | N=100 | | N=50 | |

**p-value = <0.05 (statistically significant) using chi- square test**

It was also observed that out of 100 T2DM cases 69% (n=69) of the patients were euthyroid and 31% (n=31) had thyroid dysfunction. Among thyroid dysfunction affected patients, majority had subclinical or overt hypothyroidism (n= 27) and only 4 had subclinical or overt hyperthyroidism. In hypothyroid cases (n=27) females were more with n=22(36.66%), and males were n=5(12.5%). In hyperthyroid cases (n=4) females were more with n=3(5%) and males n=1(2.5%). In control subjects, out of 50 subjects, 6 subjects were affected with TD in which 5 (17.24%) females were affected with hypothyroidism with no males affected by this TD.

**Table 2 - Biochemical parameters in case and control**

| PARAMETER | CASE | CONTROL | P-value |
|---|---|---|---|
| FPG(mg/dl) | 194.8±72.64 | 82.48 ±8.86 | <0.05* |
| HbA1c (%) | 8.31±2.29 | 5.2±1.1 | <0.05* |
| TC(mg/dl) | 196.25 ±41.73 | 175.96 ±27.96 | <0.05* |
| HDL(mg/dl) | 39.75± 10.76 | 47.7 ±13.4 | <0.05* |
| TG(mg/dl) | 186.92 ±83.83 | 140.2 ±34.23 | <0.05* |
| T3(nmol/L) | 1.37±0 .49 | 1.64±0 .67 | <0.05* |
| T4(nmol/L) | 83.14± 18.29 | 86.9 ±16.07 | >0.05 |
| TSH(μIU/L) | 4.14± 4.77 | 2.55±1.94 | <0.05* |

***statistically significant**

Table 2 shows the levels of various laboratory parameters in T2DM case and control. FPG, HbA1c, serum cholesterol, serum triglycerides, were significantly higher in T2DM case as compared to control subjects while serum HDL was significantly lower in T2DM case as compared to control.

In T2DM case FPG (193.6±72.64, $p < 0.001$), HbA1c (8.31±2.29), total cholesterol (196.25 ± 41.73, $p < 0.01$), serum tri- glyceride (186.92 ± 83.83, $p < 0.05$), were increased compared to FPS (82.48 ±8.86), HbA1c (5.2±1.1), total cholesterol (175.96±27.96), serum triglycerides (140.2 ±34.23) in control, and HDL-C levels were significantly ($p < 0.05$) decreased in T2DM case (39.75± 10.76, $p < 0.05$) when compared with control.(47.7 ±13.4).

In the thyroid profile;T3 in T2DM case was significantly decreased (1.37±0.49, p<0.05) as compared to control(1.64±0 .67). T4 was decreased in T2DM case (83.14±18.29) but it was nonsignificant compared to control (86.9±16.07). TSH levels was significantly increased in T2DM case (4.14± 4.77) compared to control (2.55 ±1.94) (Table 2).

FPG level was significantly and positively correlated with HbA1c (r=0.598, p=<0.001). FPG was nonsignificant and very weakly correlated with T3(r=0.08, p=0.40), T4 (r=0.1, p=0.34), and TSH (r= -0.15, p=0.133) (Table 2).

**Discussion**

Diabetes mellitus is a worldwide major problem and despite advances in treatment a large number of patients present with complications due to poor glycemic control. One of the possible factors that contribute to poor glycemic control is thyroid dysfunction, which tends to occur concomitantly with diabetes mellitus.

The present study of T2DM patients have higher prevalence of thyroid dysfunction compared with the control subjects. The prevalence of thyroid disease was found to be 31% in patients with diabetes compared to 12% in controls. Our study findings are supported by Radaideh,et al11 who found that there was a significant difference between thyroid dysfunction in T2DM patients 12.5% versus 6.6% in control subjects p=0.0064.in diabetic cases. Domala Prasad,et al12 in their study observed, 13% of the total 108 patients with DM had abnormal thyroid profile. The prevalence of thyroid disease in the non diabetic control group was 6.6%. Anil kumar, et al13 reported abnormal thyroid functions in 24% of diabetic patients vs. 13% of controls in their study from South India. Ghazali,et al14 saw thyroid dysfunction in 29.7% of type 2 DM patients, and in 2.8% of controls (P⊛0.002).

Study highlights that, females are affected more than males with TD both in T2DM cases and also in control subjects. Hypothyroidism was the most common thyroid abnormality found in T2DM patients and was much more common than in control. This was statistically significant in our

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study.(p=0.009) This finding was also supported by many other studies. [15-23]

In the present study, FPG was significantly correlated with HbA1c. There was no significant correlation of FPG with any of the parameters of thyroid profile in our study but increased level of FPG was associated with decrease level of TSH, which is similar to the study by Taksali,et al24. No correlation was found between fasting sugar levels and parameters of thyroid profile25,26. This may point out that there may or may not be a role of blood sugar level in thyroid dysfunction. Pranav,et al27 in their study of 80 subjects found significant correlation between FPG and T3 & TSH which is contradictory to our study finding.

**Conclusion**

The prevalence of thyroid dysfunction was found higher at 31% in type 2 diabetes mellitus subjects as compared to non-diabetic i.e. control. Diagnosis and treatment of thyroid dysfunction might be important in management of T2DM patients as this condition affects glycemic control. There is little information about diabetes and thyroid dysfunction in India and also, there is a need for baseline studies and there is still a great need for further research and studies in this field to combat with thyroid dysfunction.

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