



## A PROSPECTIVE STUDY OF THYROID DYSFUNCTION IN PATIENTS WITH TYPE 2 DIABETES - A CASE REPORT

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<p><b>Article Info</b> Received 15/05/2015 Revised 20/06/2015 Accepted 28/06/2015</p> <p><b>Key words:</b> Type 2 Diabetes Mellitus, Thyroid hormones, Thyroid disorders.</p>	<p><b>ABSTRACT</b> Diabetes Mellitus is a leading cause of death in developing countries like India. Diabetes Mellitus and Thyroid Disorders are two main endocrine disturbances interrelated to each other and encountered in clinical practice. In the general population, approximately 6% of people have some form of thyroid disorder. However, the prevalence of thyroid disorder increases to over 10% in people with diabetes. There is a higher occurrence of thyroid diseases, particularly hypothyroidism, among people with Type 2 diabetes. The aim of the present study was to find the prevalence of thyroid dysfunction in patients with type 2 diabetes mellitus. A total number of 100 subjects comprising of 50 non-diabetic and 50 type II diabetes mellitus cases were recruited for the study. In all the subjects fasting blood glucose, serum thyroid stimulating hormone (TSH), serum tetraiodothyronine (T4) and Serum triiodothyronine (T3) were estimated. TSH levels were increased in diabetic patients when compared to controls which were statistically significant. However serum T3 and T4 levels were within the normal range. This suggests that diabetics are prone to develop hypothyroidism which could be autoimmune. Complex mediated. Further studies are required to prove the autoimmune basis of development of hypothyroidism in diabetic patients. Studies investigating the necessity of screening subclinical hypothyroidism and the potential treatment of subclinical hypothyroidism in diabetic patients are also needed.</p>
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### INTRODUCTION

It is estimated that the total number of people with diabetes in 2015 to be around 50.8 million in India, rising to 87.0 million by 2030. According to the World Health Organization (WHO) criteria, the prevalence of known diabetes was 5.6% and 2.7% among urban and rural areas, respectively [1]. The association between diabetes and thyroid dysfunction was first published in 1979. Thyroid dysfunction is a disorder of the thyroid gland which manifests either as hyper or hypothyroidism and reflects in the levels of thyroid stimulating hormone (TSH). [2] Diabetes mellitus is a group of metabolic disease characterized by hyperglycemia resulting from defects in insulin secretion. The chronic hyperglycemia of diabetes is associated with failure of various organs, especially the

eyes, kidneys, nerves, heart, and blood vessels. Several pathogenic processes are involved in the development of diabetes. These range from autoimmune destruction of the  $\beta$ -cells of the pancreas with consequent insulin deficiency to abnormalities that result in resistance to insulin action. [3] DM appears to influence thyroid function in two sites; 1st at the level of hypothalamic control of TSH release and 2ndly at peripheral tissue level by converting T4 to T3. Hyperglycemia causes reduction in hepatic concentration of T4-5 deiodinase, low serum concentration of T3, raised levels of reverse T3 and low, normal, or high level of T4. Thyroid hormone regulates metabolism and diabetes can alter metabolism. [4] The aim of this study is to rule out the relationship between the diabetes and



thyroid dysfunction. The thyroid dysfunction was assessed on the basis of clinical findings and laboratory estimation of serum T3 and T4 and TSH levels. The present study was taken up to note the prevalence of thyroid dysfunction in Type 2 diabetics and spectrum of thyroid dysfunction.

## MATERIALS AND METHODS

The study includes type 2 diabetics from OPD'S of private clinic at cuddalore district .100 patients were selected from OPD in a random fashion. Among them 50 diabetic patients (type II) and 50 non diabetic patients were included in study .Inclusion Criteria: Diagnosed diabetic patients on treatment with no known complications. All patients with Type 2 diabetes aged between 30-65 years. All diabetics irrespective of glucose control. Exclusion Criteria: Type 1 DM, Gestational diabetes mellitus, Steroid induced Diabetes All those who had proven thyroid disorder and on treatment.

### Sample Collection

5ml of fasting venous blood sample was drawn from patients, into a sterile disposable syringe which was transferred into fluoride tubes. The samples were centrifuged at 3000 rotations per minute for 10 minutes and plasma was collected. The plasma and serum was

processed within one hour of collection. T3 and T4 estimated by using Chemi Lumination Immuno Assay (CLIA) and TSH was estimated using Ultra Sensitive CLIA method.[5] The following biochemical parameters were estimated. 1. Plasma fasting blood glucose (FBG) 2. Serum T3. 3. Serum T4. 4. Serum TSH. The normal readings are fasting blood glucose level 70-120 mg/dl T3 – 0.7- 2.0 ng/ml, T4 – 4.5- 11.0 microg/dl, TSH- 0.4- 5.0 microIU/ml.

### Classification of thyroid disorders based on the values:

- Primary Hypothyroidism – when TSH more than 5.5 mIU/ml and T3, T4 less than normal.
- Primary Hyperthyroidism – when TSH is less than 0.3 mIU/ml and T3, T4 more than normal.
- Subclinical Hypothyroidism – when TSH is more than 5.5 mIU/ml and T3, T4 is within normal range.
- Subclinical Hyperthyroidism – when TSH is less than 0.3 mIU/ml and T3, T4 is within normal range

### Statistical analysis

The results obtained and expressed in mean  $\pm$  SD. The comparison was done by student t test and each parameter was done by SPSS statistical package version 15.0

## RESULTS

**Table 1. Sex and age wise distribution of diabetic and non diabetic patients**

Group	Male	Female	Mean age
Type 2 DM patients n = (50)	28	22	47.18 $\pm$ 7.06
Non DM patients Controls n = (50)	32	18	51.37 $\pm$ 5.19

**Legend: 1** The sex and age distribution of diabetic and non diabetic patients is shown in table 1. Type 2 DM patients include 28 males and 22 females whereas non diabetic patients include 32 males and 18 females with mean age of 47.18  $\pm$  7.06 and 51.37  $\pm$  5.19 respectively.

**Table 2. Comparison of Thyroid Function Test in Type 2 Diabetic and Non Diabetic Subjects**

Investigations	Serum T3(ng/dl)	Serum T4(ug/dl)	Serum TSH(uIU/ml)
Type 2 Diabetic Subjects (N = 50)(Mean $\pm$ SD)	128.6 $\pm$ 44.13	9.21 $\pm$ 3	9.61 $\pm$ 6.28
Non Diabetic subjects (N = 50) (Mean $\pm$ SD)	141.42 $\pm$ 12.97	9.12 $\pm$ .78.11	3.49 $\pm$ 1.11
P Value	<0.0001	0.0007	<0.0001

**Legend: 2** Shows the level of serum thyroid hormones in diabetic and non diabetic patients. The serum levels of T3 and T4 were significantly lower in diabetic compared to non diabetic patients whereas level of serum TSH was significantly higher in diabetic patients as compare to non diabetic patients.

**Table 3. Type of Thyroid disorders according to gender in type 2 DM and non diabetic group**

Group	Subclinical Hypothyroidism	Primary Hypothyroidism	Subclinical Hyperthyroidism	Primary Hyperthyroidism
Type 2 DM (N = 50)	7	3	4	6
Non Diabetic (N = 50)	3	0	3	2

**Legend: 3** Out of 50 type 2 DM subjects, 20 % shows abnormal thyroid functions (12% had hypothyroidism and 6 % had hyperthyroidism) and 70 % shows normal thyroid functions.



## DISCUSSION

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. The hyperglycemia seen in diabetics is known to have negative effects on thyroid function precisely blunting the pituitary TSH response to stimulation by hypothalamic TRH.[6] This may be due to possible alteration of post translational glycosylation of TRH thus affecting the biological activity. This mechanism suggests that diabetes may predispose to thyroid dysfunction [7].

Although secondary hypothyroidism is believed to be very rare in the general population, there is no report on its prevalence in a special population like type 2 diabetics. Age 50 years or above, female sex, pituitary disease, surgery or irradiation and Sheehan's syndrome are some of the predisposing factors to secondary hypothyroidism. Hypothalamic TRH deficiency (tertiary-hypothyroidism) is a differential diagnosis which may be discountenanced in this situation because hyperglycemia itself is known to induce a low T3 state and absence of TSH response to TRH. Chronic hyperglycemia in these patients via the above mechanism results in atrophy of the thyroid gland. Most (66.7%) of these patients are females above 50 years of age and suffer from chronic hyperglycemia as a result of poor glycaemic control.

The diagnosis of thyroid dysfunction in diabetic patient based solely on clinical manifestation can be difficult. Poor glycaemic control can produce features similar to hyperthyroidism such as weight loss other hand severe diabetic nephropathy can be mistaken for hypothyroid since patient with this condition can present with edema, fatigue, pallor and increased weight [8]. A lot of studies in different countries have tried to estimate the

prevalence of thyroid dysfunction among diabetic patients that was varying from 2.2 to 1.7%.[ 6-10].There was significant correlation between thyroid dysfunction and diabetes mellitus. In the control group 2 were hypothyroid {1.16%} subclinical hypothyroidism seen in 3 patients {1.74%} and 2were hyperthyroid {1.16%}, subclinical hyperthyroidism seen in 10 patients. The changes in TSH levels in normal ranges are significantly associated with insulin resistance that elevated T4 and TSH are related to abnormal glycaemic levels.[9,10] The prevalence of thyroid disease in the patient with diabetes is significantly higher than that in the general population. This study did not show any effect of thyroid on sugar control of DM patients or further follow up study will be require to correlate by glycosylated hemoglobin level. It was found out that diabetes showed the trend towards hypothyroidism. Therefore it needs to be emphasized that all diabetic patients need to be regularly screened for thyroid level.

## CONCLUSION

There is no relation of thyroid disorders with duration of diabetes. A serum TSH within euthyroid range almost always eliminates the diagnosis of hypo or hyperthyroidism. This shows that TSH is preferred screening test for thyroid dysfunction in diabetics. Heat intolerance and palpitations are specific symptoms of hyperthyroidism in Diabetes. This study show high prevalence (30 %) of thyroid dysfunction in type 2 DM.

## ACKNOWLEDGEMENT

I am thank full to the lab technician and staff nurses of the private clinic for their inspiration to take up this study and they helped me in each and every step of this research work to complete it successfully.

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