



## STUDY OF THYROID DYSFUNCTION IN PATIENTS WITH TYPE 2 DIABETES MELLITUS

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### ABSTRACT

**AIMS AND OBJECTIVES** – The study was undertaken with an objective to study the thyroid functions in Type 2 diabetics and to know the spectrum of thyroid dysfunction in Type 2 DM.

**METHODS** – A total of 140 patients with Type 2 DM who were diagnosed on the basis of American Diabetes Association (ADA) criteria or who were taking treatment for Diabetes were included in the study. All patients in the study underwent thyroid profile tests and also target organ evaluation for Diabetes. TPO-Ab, thyroid USG and FNAC were done wherever required. A detailed history and examination was done on these patients.

**RESULTS** – A total of 140 Type 2 DM patients were included in the study. Thyroid disorders were present in 31.42%. Low thyroid function was seen in 28 patients and hyper functioning of thyroid gland was noticed in 16 patients. Overt Hypothyroidism in 3, sub-clinical hypothyroidism in 25 cases and hyperthyroidism in 16 patients. In this study 70 patients were males and 70 were females. Females (44.28%) had high incidence of thyroid disorders than males (17.14%). Sub-clinical hypothyroidism was more common among elderly (39.02%). Elderly females had high incidence of sub-clinical hypothyroidism (17.14%). Clinical features of hyperthyroid were present in 16 patients. Patients with hyperthyroidism had a poor glycemic control. Duration of diabetes had no relation with incidence of thyroid disorders. Patients with uncontrolled diabetes with micro vascular complication had sub-clinical hypothyroidism.

**CONCLUSION** – Prevalence of thyroid disorders in Diabetics was 31.42%. Elderly population had more incidence. Sub-clinical hypothyroidism was more common among females. Diabetics with hyperthyroidism had poor glycemic control. Severe diabetic complications were noted in patients with sub-clinical hypothyroidism. Duration of Diabetes had not impact on thyroid dysfunction.

**KEYWORDS** : Type 2 Diabetes Mellitus, sub-clinical hypothyroidism, hyperthyroid

### Introduction

Several studies were conducted to measure the prevalence of thyroid dysfunction in Type 2 diabetics and spectrum of thyroid dysfunction in different parts of the world. The present study was aimed to determine the impact of excess or deficit of insulin and thyroid hormone resulting in functional derangement of the other hormone, on the quality of life, and on morbidity and mortality through the complications that affect the small and large vessels resulting in retinopathy, nephropathy, neuropathy, IHD, and large vessel obstruction.

### AIMS AND OBJECTIVES OF THE STUDY

1. To study the thyroid functions in diabetes mellitus.
2. To know the spectrum of thyroid dysfunction in diabetes mellitus

### Materials and Methods

#### STUDY GROUP

The study includes all type 2 diabetics from OPD'S and IPD'S of all the departments of Katuri Medical College & Hospital, Chinakondrupadu, Guntur, A.P. in the period between January 2014 to June 2015.

**140 patients of type 2 are selected from OPD and IPD in a random fashion.**

#### Inclusion Criteria:

- 1) All patients with type 2 diabetes aged more than 30 years.
- 2) All diabetics irrespective of glucose control.
- 3) All diabetics irrespective of treatment (OHA/insulin).

#### Exclusions criteria:

- 1) Type 1 DM
- 2) Patients with:
  - a) Gestational diabetes mellitus.
  - b) Fibrocalculous pancreatitis.
  - c) Pancreatitis
  - d) Steroid induced diabetes
- 3) All those who had proven thyroid disorder and on treatment.
- 4) A detailed history was taken and examination done as per the

proforma. All patients in addition to hematological and routine urine work up underwent target organ evaluation for diabetes. All patients were evaluated for thyroid status, assessment of T3, T4 and TSH levels and as required FNAC and biopsy was done by our pathologist in KMC Hospital.

- 5) The laboratory evaluation of thyroid functions was done by estimation of serum T3, T4 and TSH levels by chemiluminescence assay method.
- 6) Patients were selected for the study who satisfied all the inclusion and exclusion criteria. Written consent was obtained from all the patients participating in the study..

#### Patients were diagnosed based on the ADA criteria for diabetes.

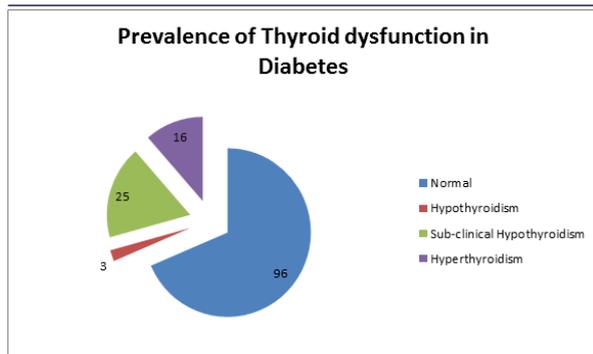
Symptoms of diabetes plus random blood glucose concentration of 11.1 mmol/L (200 mg/dl)
or
Fasting plasma glucose of 7.0 mmol/L (126 mg/dl)
or
Two-hour plasma glucose of 11.1 mmol/L (200 mg/dl) during an oral glucose tolerance test (OGTT) .

### RESULTS

- 1) In this study, 140 established diabetics were screened for thyroid disorders by TFT. Abnormal thyroid function was found in 44 T2DM cases and remaining diabetics had normal thyroid function. Among 44 cases low thyroid function was noted in 28 patients and 16 subjects had hyper functioning of thyroid gland.
- 2). Out of the 28 Hypothyroid subjects 3 had overt hypothyroidism and 25 had Sub-clinical hypothyroidism.

**Table 1 - Prevalence of Thyroid dysfunction in Diabetes**

Thyroid Disorders	No. of cases
Normal	96
Hypothyroidism	3
Sub-clinical Hypothyroidism	25
Hyperthyroidism	16

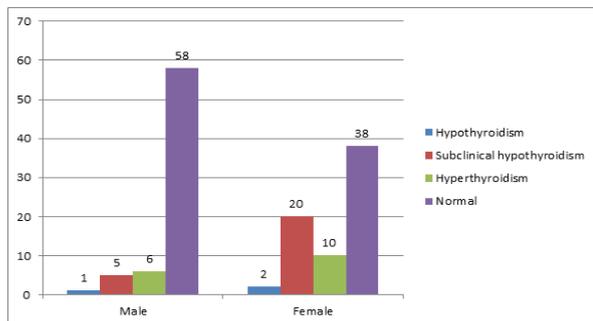


3). In the present study of 140 patients with type 2 diabetes, 70 were males and 70 were females. We have found that prevalence of thyroid dysfunction was more among females than in males. 12 out of 70 male patients had thyroid dysfunction where as 32 out of 70 females were suffering from thyroid disorders.

**Table 2 - Sex distribution of Thyroid dysfunction in Diabetes Type 2**

Sex	Hypothyroidism	Sub-Clinical Hypothyroidism	Hyperthyroidism	Normal	Total
Male*	1	5	6	58	70
Female*	2	20**	10	38	70

**Sex distribution of Thyroid dysfunction in Diabetes Type 2**



Hypothyroidism was present in one male patient and two female patients in this study. Sub-clinical hypothyroidism was present in 5 out of 70 male patients and 20 out of 70 females where p-value was significant. Hyperthyroidism was more among females compared to males.

In this study prevalence of thyroid disorders in male and female were 17.14% and 45.71%, of which 28.57% females had sub-clinical hypothyroidism, 14.28% had hyperthyroidism, Hypothyroidism in 2.85%. Among males Sub-clinical hypothyroidism was seen in 7.14%, hypothyroidism in 1.42% and hyperthyroidism in 8.57%.

4). In this study we had 100 people with type 2 diabetes below the age of < 60 years (adult and middle age) and 40 people over the age of 60 years (elderly). The spectrum of thyroid disorders among this groups were as follows –

Out of the 100 patients below the age of 60 years 9 had sub-clinical hypothyroidism, 3 hypothyroid and 15 of them were hyperthyroid and out of 40 elderly patients we found 16 with sub-clinical hypothyroidism and 1 had hyperthyroidism. None had hypothyroidism in elderly people

In this study prevalence of sub-clinical hypothyroidism (40%) was more in elderly compared to 9% in adult and middle age group, where as 15% below the age of 60 years had hyperthyroidism to that of 2.5% among elderly. Hypothyroidism was present in 3% of people below the age of 60 yrs. where as none of the elderly had hypothyroidism.

In this study we also found that Sub-clinical hypothyroidism is more in elderly people with type 2 Diabetes, where as hyperthyroidism was more among the adult and middle age group

In this study sub-clinical hypothyroidism is more among females

(30%) than males (5.71%). Hyperthyroidism showed no much difference in females (12.85%) and males (10%)

**Table 3 - Age and sex distribution of Thyroid dysfunction in Diabetics**

Age	Male (70)				Female (70)			
	Hypot hyroid	Hypert hyroid	Sub Clinic al hyroid	Normal	Hypot hyroid	Hypert hyroid	Sub Clinic al thyrod	Normal
<60	1	7	0	45	2	8	9	28
>60	0	0	4	13	0	1	12	10
Total	1	7	4	58	2	9	21	38

**Table 4 -Thyroid dysfunction in patients with Diabetic complications-**

	TOTAL NO. OF Pt's	Pt's with thyroid disease	%
DM WITH MICROVASCULAR COMPLICATIONS	64	14	21.87
NO COMPLICATIONS	76	30	39.47

**Table 5 -Thyroid dysfunction in patients with Diabetic complications-**

DM Complications	Total number of Patients.	No. of Pt's with thyroid disorders
Retinopathy	(Proliferative-3, Non Proliferative-14) 17	3
Nephropathy	22	3
Neuropathy	25	8

**DISCUSSION**

A total of 140 type 2 diabetics were studied. All were confirmed diabetics who previously had plasma glucose levels of >126 mg/ dl or RBS of >200 on more than one occasion and were receiving treatment such as Insulin, OHA's or physical exercise therapy

**Prevalence and spectrum of thyroid disorders in Type 2 Diabetics**

In this study of 140 patients with type 2 diabetes 70 were males and 70 females. We have found 44 patients with thyroid disorders that is 31.42%, and number of reports have also indicated higher than normal prevalence of thyroid disorders.

Pasupathi et al<sup>1</sup> 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<sup>2</sup> 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.

A prevalence of 12.3% was reported among Greek diabetic patients<sup>3</sup> and 16% of Saudi patients with type 2 diabetes were found to have thyroid dysfunction<sup>4</sup>.

In Jordan, a study reported that thyroid dysfunction was present in 12.5% of type 2 diabetic patients<sup>5</sup>

Perros et al<sup>6</sup> demonstrated an over all prevalence of 13.4% of thyroid diseases in diabetics with the highest prevalence in type 1 female diabetics (31.4%) and lowest prevalence in type 2 male diabetics (6.9%).

Ravishankar et al<sup>7</sup> in their study found that prevalence of thyroid disorder was 29% among type 2 diabetics. Hypothyroidism was present in 16%, and 13% had hyperthyroidism

In this study the prevalence of thyroid disorder is 31.42% among type2 diabetics. Hypothyroidism was present in 20%, and 11.42% had hyperthyroidism

**Table 6 - Comparison of studies prevalence of Thyroid dysfunction in Diabetics.**

STUDIES	Prevalence of TD in T2DM	Hypothyroidism	Hyperthyroidism
Pasupathi et al	45%	28.00%	17.00%

C. E. J. Udiong	46.50%	26.60%	19.90%
Perros et al	6.90%	---	---
A. R. M. Radaideh (Jordan study)	12.50%	---	---
A. Papazafropoulou (Greek study)	12.30%	---	---
Present study	31.42%	20%	11.42%

It is noted that there is a lower incidence of Thyroid dysfunction in diabetics among Europeans as compared to that of Indians as per the Indian studies.

In this study sub-clinical hypothyroidism was more among females 28.57% compared to males 7.14%. Sub-clinical hypothyroidism was more common among elderly females 30%. Hyperthyroidism was almost equal in either sex with 10% in males and 12.85% in females. Overt hypothyroidism was present in one male patient and two female patients in our study.

The study conducted by Ravishankar et al<sup>7</sup> also shows increased incidence of sub-clinical hypothyroidism in elderly females compared to males.

Many studies have shown increased incidence of sub-clinical hypothyroidism in elderly females compared to males.

Hyperthyroidism was more common in females than in males<sup>8</sup>.

The presence of both high and low levels of thyroid hormones in diabetics in this study may be due to modified TRH synthesis and release, and may depend on the glycemic status of the diabetics studied. Glycemic status is influenced by insulin, which is known to modulate TRH and TSH levels

#### Thyroid dysfunction in Diabetics in relation to age.

In this study we have found 42.5% patients with thyroid disorders over the age of 60 years compared to that of 27% below the age of 60 years. Sub-clinical hypothyroidism was 40% in patients above 60 years.

Flatau E, Trougouboff P<sup>8,9</sup> have also observed similar findings. They have reported 38% with sub-clinical hypothyroidism after the age of 60 years. Diabetes Mellitus and thyroid disorders are common in the elderly

Since the clinical features of hypothyroidism in the elderly are often atypical, we suggest that elderly subjects should be screened for hypothyroidism.

#### TPO antibodies and Thyroid disorders.

TPO antibodies were positive in 30% of patients and the others were negative. Other studies have reported higher prevalence of TPO-Ab both in general population and diabetics and opined that they have a 90% negative predictive value. The association of positive TPO-Ab and future development of hypothyroidism is known. Hence this cannot be used as the diagnostic tool because of the high negative predictive value<sup>10</sup>

#### Effect of Thyroid disorder on Diabetes

In this study we have found that 36% hyperthyroid patients had a poor glycemic control compared to that of hypothyroid patients. We did not find hypoglycemia in any of our patients with sub-clinical hypothyroidism.

Hypothyroidism may increase susceptibility to hypoglycemia thus complicating diabetes management<sup>11</sup>.

Furthermore, it seems that unidentified thyroid dysfunction could negatively impact diabetes and its complications. A higher frequency of retinopathy and

nephropathy was observed in diabetic patients with sub-clinical hypothyroidism, and more severe retinopathy was noted as well. Therefore, management of sub-clinical hypothyroidism in patients with diabetes may prove beneficial

Diabetic complications were present in 64 patients of which 14

patients had thyroid disorders. 3 had retinopathy of which 2 were sub-clinical hypothyroid. 1 patient with sub-clinical hypothyroidism had proliferative retinopathy and 2 sub-clinical hypothyroidism had NPDR. 3 patients who had retinopathy also had nephropathy

Our findings of diabetic complications like retinopathy (proliferative) and nephropathy were more among sub-clinical hypothyroid patients. These findings were similar to those observed by Mirella Hage<sup>12</sup> in their study

#### CONCLUSION

Prevalence of thyroid dysfunction was seen in 31.42% of diabetics studied.

Sub-clinical hypothyroidism was more common than other conditions which constituted 17.85% of the thyroid dysfunction in the Diabetics.

Elderly patients had higher incidence (42.5%) of thyroid dysfunction.

Thyroid disorders are more in females (44.28%) than males 17.14%.

Patients with hyperthyroidism presented with clinical features of thyroid disorders (60%) where as hypothyroid patients did not have any signs and symptoms.

Thirty six percent of people with thyroid dysfunction had poor glycemic control even with treatment.

Severe forms of diabetic complications were noted in sub-clinical hypothyroidism. Hence, patients with sub-clinical hypothyroidism must undergo frequent ophthalmic check-ups to rule out retinopathy and also renal function test for nephropathy

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.

One must have strong suspicion of thyroid dysfunction in patients with uncontrolled glycemic levels and must be evaluated for hyperthyroidism especially in young and middle aged diabetics with poor glycemic control

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