



## STUDY OF THYROID FUNCTION TEST IN PATIENTS WITH DIABETES MELLITUS

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### ABSTRACT

**Introduction:** Diabetes mellitus (DM) is a growing problem in our country and we have observed that many patients are associated with thyroid dysfunction later in their life. Hence, the prevalence of thyroid dysfunction in diabetes mellitus patients should be evaluated. **Aims and Objectives:** **Aim:** To access thyroid dysfunctions in patients with diabetes mellitus **Objectives:** To evaluate spectrum of thyroid disorders in diabetic patients and To access altered thyroid function in patients with diabetes mellitus regarding age, sex, duration of diabetes, family history, regularity of treatment and BMI.

**Materials and Methods:** In this cross sectional study, data of 280 DM patients who attended the OPD Department of Medicine, SAMC & PGI-Indore over period of 9 month, and whose thyroid stimulating hormone (TSH), free T3, free T4 level were investigated, were included. The inclusion criteria were known cases of DM. Exclusion criteria were patients with previous history of hypothyroidism and those on drugs affecting the thyroid profile, chronic renal failure and Diabetic nephropathy, acute illness, hepatic dysfunction, psychiatric illness, Pregnancy.

**Results:** Out of 280 DM patients 158 were males and 122 were females, 195 (69.64%) were euthyroid, 37 (13.22%) had subclinical hypothyroidism, 23 (8.21%) had hypothyroidism, 14 (5%) had subclinical hyperthyroidism and 11 (3.9%) were hyperthyroidism cases. Female sex ( $P < 0.0091$ ) and patient with irregular treatment ( $P < 0.001$ ) were at increased risk of having hypothyroidism. **Conclusion:** Prevalence of thyroid dysfunction was high in DM patients with female sex and patients with irregular treatment.

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### INTRODUCTION

Diabetes mellitus is a typical endocrine disorder that involves multiple organs of the body leading to significant morbidity and mortality due to its accompanying complications. It is described by high glucose because of irregularity in the carbohydrate, protein and fat metabolism. The basic pathology in diabetes mellitus is defective insulin secretion or action. The burden of diabetes mellitus in India as estimated by World Health Organization was 31.7 million in the year 2000 and 50.8 million in the year 2010. This number is expected to rise to 87 million in the year 2030<sup>1</sup>. The Indian Council of Medical Research estimated that India has a prevalence of 77.2 million people with prediabetes and 62.4 million people with diabetes in the year 2011.<sup>2</sup>

Autoimmunity is the main reason explaining the association between type 1 diabetes mellitus and thyroid dysfunction. Though the mechanism behind association between type 2 diabetes mellitus and thyroid dysfunction is not clear it could be due to abnormal TSH response to TRH, absence of nocturnal TSH peak and a low T3 state. Recognition and management of thyroid dysfunction in diabetes mellitus helps to achieve a good glycemic control, decrease the cardiovascular risk and improve the general wellbeing. In view

of background above, this study was taken up to study the relation between DM and thyroid dysfunction in patient admitted to the Sri Aurobindo Medical College & Hospital-Indore.

#### Aim and Objectives

**Aim:** To access thyroid dysfunctions in patients with diabetes mellitus visiting outpatient department of medicine in SAMC & PGI-Indore

**Objectives:** To evaluate spectrum of thyroid disorders in diabetic patients.

To access altered thyroid Function in patients with diabetes mellitus regarding age, sex, duration of diabetes, family history, regularity of treatment and BMI.

### REVIEW OF LITERATURE

#### Historical Review

The term diabetes was coined by Aretaeus of Cappadocia during second century<sup>3</sup>. The word diabetes is derived from Greek word dia (through) and baneon (to go) meaning a siphon "because fluid does not remain in body but uses man's body as a ladder whereby to leave it as if patient was a siphon" which described polyuria<sup>4</sup>. He described the disease as

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“melting down of flesh into urine, thirst unquenchable, kidneys never stop making water<sup>5</sup>. Charaka, Sushruta and Vaghbatha described the sweet taste of urine in patients with polyuria during 5th and 6th century BC and the disease is named, Madhumeha in Sanskrit literature. They described that the urine of these patients were sticky to touch, tasted like honey and ants were strongly attracted to it. They described two forms of disease where one form affects thin individual who has a lesser survival and the other form affects obese and elderly people. This observation is parallel to the two types of diabetes, type 1 and type 2. They also described the relation of diabetes to sedentary life style, obesity, diet and hereditary factors.<sup>6</sup>

Endemic goiter was known to doctors of antiquity in China, India and Greece. Wharton gave the name thyroid which means „shield“ and he considered that this is a structure especially in females that gives rotundity and beauty to the neck. In the 16th century, Andrekos Vesslius described thyroid gland as two glands situated on the root of the larynx which are large fungus like flesh colored and covered with blood vessels.

**Thyroid and Diabetes**

Diabetes mellitus is characterized by high blood sugar as a result of complex inter play between environmental and hereditary factors. Hyperglycemia in diabetes mellitus is due to lack of or defective secretion of insulin. The thyroid hormones elevates blood glucose level by stimulating hepatic gluconeogenesis and glycogenolysis there by opposing insulin action. They also up-regulate the expression of genes such as GLUT-4 involved in glucose transport and phosphoglycerate kinase, involved in glycolysis respectively, thus acting as an insulin agonist in facilitating glucose disposal and utilization in peripheral tissues.<sup>7</sup> Thyroid hormones up regulates GLUT 2 expression there by facilitating increased hepatic glucose output.<sup>8</sup> This shows that the interaction between thyroid hormones and insulin is complex and thus there is an intersecting underlying pathology between diabetes mellitus and thyroid dysfunction.

**MATERIALS AND METHODS**

The present study is a Cross sectional study carried out in patients who make visit of SAIMS Indore (M.P.)

**Study design:** Cross sectional study.

**Period of study:** 9 month

**Study group:** The study group included 280 patients of diabetes without known thyroid disorders attending the outpatient departments who met the inclusion criteria.

**Inclusion Criteria**

Patients of diabetes mellitus who gave informed consent to participate in the study.

**Exclusion Criteria**

- Patients not willing for study
- Patients with known thyroid disease
- Patients with chronic renal failure and Diabetic nephropathy.
- Patients with acute illness (sepsis, acute MI, severe heart failure, recent admission in intensive care unit)

- Patients with hepatic dysfunction
- Patients with psychiatric illness.
- Pregnancy
- Patients on treatment with drugs interfering with thyroid function (amiodarone, propranolol, corticosteroids and oral contraceptives)

All patients in the study group were selected without any bias for sex, duration, severity or control of diabetes. A thorough history was recorded with particular emphasis on symptoms of hypothyroidism and hyperthyroidism. The presence of associated illness like coronary artery disease, hypertension and cerebrovascular accident were noted. Family history regarding diabetes mellitus and treatment history of oral hypoglycemic or insulin along with duration was also included.

A thorough general and systemic examination was carried.

**BMI calculation**

Body mass index (BMI) is calculated with height and weight of the subject using the following formula.

$$BMI = \text{weight (kg)} / \text{height (m}^2\text{)}$$

**Thyroid Profile**

Estimation done in fasting serum sample. Methods used:

- TSH - Ultrasensitive sandwich chemi luminescent immuno assay
- FT3 & FT4 - Competitive chemi luminescent immuno assay.

**RESULT**

**Table 1** Age Wise Distribution of Patients

Age (in yrs)	Number of patients	
30-39	23	8.21%
40-49	75	26.79%
50-59	97	34.64%
60-69	57	20.36%
70-79	21	7.5%
≥ 80	7	2.5%
<b>Total</b>	<b>280</b>	<b>100%</b>

In the present study, it was found that the age range for cases was 32 to 86 years with a mean age of 54.03 ± 10.93yrs. The maximum number of cases were between age group 50- 59 yrs.

**Table 2** Gender Wise Distribution of Patients

Age (in yrs)	Number of patients	
30-39	23	8.21%
40-49	75	26.79%
50-59	97	34.64%
60-69	57	20.36%
70-79	21	7.5%
≥ 80	7	2.5%
<b>Total</b>	<b>280</b>	<b>100%</b>

In the present study, the percentage of male patients presenting with DM was 158 (56.42%) to that of female patients which was 122 (43.57%). In addition, The ratio of male: female was 1.29:1.

In the present study, majority of cases that is 162 (57.85%) had duration of diabetes up to 5 years, 91 (32.5%) of patients had duration between 6-10 years and 27 (9.64%) of patients had duration of illness more than 10 years..

**Table 3** Duration of DM Wise Distribution

Duration of DM	Number of patients	
< 1 yrs	37	13.21%
1-5yrs	125	44.64%
6-10yrs	91	32.5%
>10yrs	27	9.64%
<b>Total</b>	<b>280</b>	<b>100%</b>

**Table 4** Treatment Wise Distribution

Treatment	No of patients	
Regular	211	75.35%
Irregular	69	24.64%
<b>Total</b>	<b>280</b>	<b>100%</b>

In the present study, out of 280 subjects of the study group 211 (75.35%) were on regular treatment and 69 (24.64%) were irregular.

**Table 5** Distribution of Thyroid Function

Thyroid Function	Number of patients	
Euthyroid	195	69.64%
SC Hypothyroidism	37	13.22%
Overt Hypothyroidism	23	8.21%
SC Hyperthyroidism	14	5.0%
Overt Hyperthyroidism	11	3.93%
<b>Total</b>	<b>280</b>	<b>100%</b>

In the present study, It was found that 37 (13.22%) of the patients had report suggestive of sub clinical hypothyroidism, 23 (8.21%) of the patients had overt hypothyroidism, 14 (5.0%) of the patients had sub clinical hyperthyroidism and 11 (3.93%) of the patients had overt hypothyroidism. Remaining, 195 (69.64%) had Normal Thyroid profile.

**Table 6** Correlation of Thyroid Function in Diabetic Patients

	Normal TSH (n=195)	Abnormal TSH (n=85)	P value
Age (in yrs)	54.01 ± 10.88	54.10 ± 11.02	0.9495
<b>Gender</b>			
• Male	120(61.53%)	38 (44.7%)	<b>0.0091</b>
• Female	75 (38.46%)	47 (55.29%)	
Duration of DM (yrs)	5.73 ± 4.55	5.40 ± 3.78	0.5583
<b>Family History of DM</b>			
• Yes	97 (49.74%)	35 (41.17%)	0.1866
• No	98 (50.25%)	50 (58.82%)	
<b>Treatment</b>			
• Regular	169 (86.66%)	42 (49.41%)	<b>&lt;0.0001</b>
• Irregular	26 (13.33%)	43 (50.85%)	
BMI (Kg/m <sup>2</sup> )	25.69 ± 2.88	26.01 ± 3.01	0.3998

In the present study, it was found that abnormal thyroid profile of gender (p=0.0091) and treatment taken (p<0.0001) were statistically significant with normal thyroid profile respectively. While others parameters such as age, duration of DM, Family history and BMI (kg/m2) were statistically not significant. (p>0.05)

## DISCUSSION

Diabetes mellitus is the most common endocrine disorder which involves multiple organ systems and leads to significant morbidity and mortality due to accompanying complications. Thyroid diseases are also a common endocrinopathy seen in the adult population. Thyroid hormones are intimately involved in cellular metabolism. Thus excess or deficit of either insulin or thyroid hormone could result in the functional derangement of the cellular metabolism. Majority of cases that is 162 (57.85%) had duration of diabetes up to 5 years followed by 91 (32.5%) of patients had duration between 6-10

years. Similar study was done by<sup>9</sup> in which 65.3% had duration of diabetes up to 5 years

Duration of DM appears to influence thyroid function in two sites; firstly at the level of hypothalamic control of TSH release and secondly at peripheral tissue by converting T4 to T3. Hyperglycaemia causes reduction in hepatic concentration of T4-5deiodinase, 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.

### Correlation of normal and abnormal thyroid with other parameters

In the present study, it was found that abnormal thyroid profile of gender (p=0.0091) and treatment taken (p<0.0001) were statistically significant with normal thyroid profile respectively. While others parameters such as age, duration of DM, Family history and BMI (kg/m2) were statistically not significant. (p>0.05) This is consistent with the results of<sup>9,10</sup> who also reported that there is no significant association between thyroid disorders and duration of diabetes and age.

## CONCLUSION

The prevalence of thyroid disorders was high (30.35%) in patients with type-2 diabetes. Among the thyroid disorders, subclinical hypothyroidism was the most common. Duration of diabetes had no significant impact on thyroid disorders. Therefore, considering the higher prevalence of thyroid disorders, early and routine screening for thyroid disorders is suggested to reduce the morbidity and mortality among the diabetic patients.

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