

## Evaluation of relation between thyroid dysfunction and diabetes

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**Abstract**

**Background:**Thyroid dysfunction is a spectrum of disorders of the thyroid gland which manifests either as hyperthyroidism or hypothyroidism and is reflected in the circulating levels of thyroid stimulating hormone. The present study was conducted to assess relationship between diabetes and thyroid dysfunction.**Materials & Methods:** 80 patients diagnosed with type II diabetes mellitus of both genders were included. Serum TSH (Thyroid Stimulating Hormone), free T<sub>3</sub>(Triiodothyronine) and free T<sub>4</sub> (Thyroxine) were assessed in the fasting serum samples of the study subjects using chemiluminescent immunoassay method technology. **Results:** Serum T3 was increased in 14% and decreased in 4%. Free T3 was increased in 6% and decreased in 10% and free T4 was increased in 8% and decreased in 3%. The difference was significant (P< 0.05). Maximum hypothyroidism patients (10) were seen with >7 HbA1C level followed by 3 having 8.1-9 HbA1C.**Conclusion:** Most of the type II DM patients had hypothyroidism than hyperthyroidism.

**Key words:**Diabetes, hypothyroidism, hyperthyroidism

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**Introduction**

Thyroid dysfunction is a spectrum of disorders of the thyroid gland which manifests either as hyperthyroidism or hypothyroidism and is reflected in the circulating levels of thyroid stimulating hormone (TSH)[1,2].Thyroid dysfunction may present in one of the following ways- thyroid enlargement (diffuse or nodular); symptoms of thyroid hormone deficiency (hypothyroidism); symptoms of thyroid hormone excess (thyrotoxicosis); some have no symptoms (i.e., the subclinical state)[3] Imbalance in the production of thyroid hormones arises from dysfunction of the thyroid gland itself, the pituitary gland, which produces TSH, or the hypothalamus, which regulates the pituitary gland via Thyrotropin Releasing Hormone (TRH)[4].Patients with type 2 diabetes mellitus are more prone to develop thyroid disorders. Many diabetic patients show features of thyroid dysfunction over a period of time. Insulin resistance plays an important role in the development of hypothyroidism in patients with type 2 diabetes mellitus[5]. Hypothyroidism in diabetic patients leads to an aggravation of dyslipidemia, hypertension and cardiovascular disease. Thus, it is necessary to recognize and treat hypothyroidism in diabetic patients to prevent worsening of diabetic complications[6]. Hypothyroidism can be diagnosed with the help of a simple blood test which is readily and easily available. This can be performed by the primary care physician involved in treating diabetic patients. Early treatment of thyroid dysfunction in diabetic patients will help in normalizing their glycemic status and lipid profile[7].The present study was conducted to assess relationship between diabetes and thyroid dysfunction.

**Materials & methods**

The present study comprised of 80 patients diagnosed with type II diabetes mellitus of both genders. All were taken into the study after they agreed to participate.

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Demographic data of each patient was recorded in case proforma. Assessment of body mass index (BMI) was done after recording body weight and height. BMI between 25 and 29.9 kg/m<sup>2</sup> was taken as overweight while BMI above 30 kg/m<sup>2</sup> was taken as obesity. Blood pressure was measured in the study subjects with the help of a digital BP instrument. Subjects with BP above 140/90 mm Hg were considered to be hypertensive.Measurement of glycosylated hemoglobin, fasting lipid profile and urine albumin was performed. Screening for diabetic retinopathy was done by dilated fundus examination. Serum TSH (Thyroid Stimulating Hormone), free T<sub>3</sub> (Triiodothyronine) and free T<sub>4</sub> (Thyroxine) were assessed in the fasting serum samples of the study subjects using chemiluminescent immunoassay method technology. Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

**Results**

**Table 1: Baseline characteristics**

Characteristics	Value
M:F	55:35
Mean age (years)	46.2
BMI (Kg/m <sup>2</sup> )	27.2
Duration of diabetes (years)	7.2
HbA1C (%)	8.2

Table 1 shows that there were 55 males and 35 females, mean age of patients was 46.2 years, mean BMI was 27.2 Kg/m<sup>2</sup>, duration of diabetes was 7.2 years and mean HbA1C level was 8.2%.

**Table 2: Thyroid function test in diabetes**

TFT	Normal	Increased	Decreased	P value
Serum T3	82%	14%	4%	0.02
Free T3	84%	6%	10%	0.01
Free T4	89%	8%	3%	0.03

Table 2, Fig 1 shows that serum T3 was increased in 14% and decreased in 4%. Free T3 was increased in 6% and decreased in 10% and free T4 was increased in 8% and decreased in 3%. The difference was significant (P< 0.05).

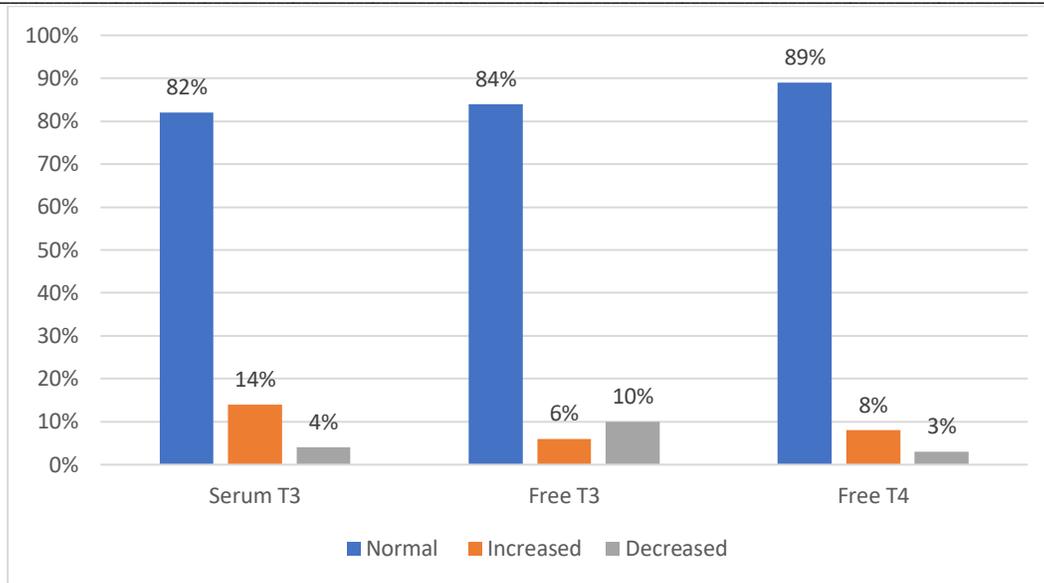


Fig 1:Thyroid function test

Table 3: Thyroid dysfunction based on glycemic status

HbA1C (%)	Hypothyroidism	Hyperthyroidism
6.5-7	2	3
7.1-8	2	4
8.1-9	3	7
>9	10	14

Table 3, Fig 2 shows that maximum hypothyroidism patients (10) were seen with >7 HbA1C level followed by 3 having 8.1-9 HbA1C.

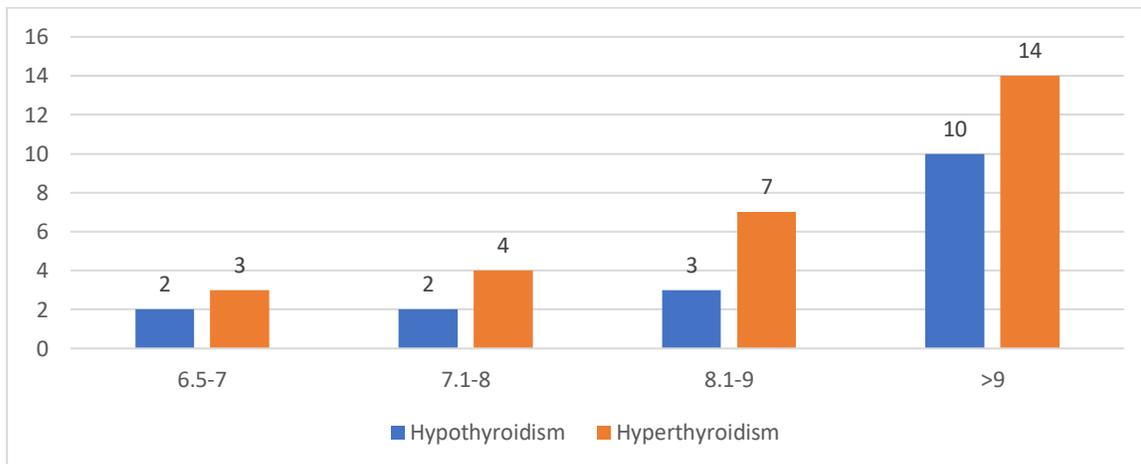


Fig 2: Thyroid dysfunction based on glycemic status

**Discussion**

Thyroid dysfunction is a spectrum of disorders of the thyroid gland which manifests either as hyperthyroidism or hypothyroidism and is reflected in the circulating levels of thyroid-stimulating hormone (TSH)[8]. Thyroid dysfunction may present in one of the following ways – thyroid enlargement (diffuse or nodular); symptoms of thyroid hormone deficiency (hypothyroidism); symptoms of thyroid hormone excess (thyrotoxicosis); some have no symptoms (ie the subclinical state)[9]. Thyroid hormones affect glucose metabolism through several mechanisms. In hyperthyroidism, the half-life of insulin is reduced, most likely due to an increased rate of degradation and enhanced release of biologically inactive insulin precursors[10]. Untreated hyperthyroidism has been reported to be associated with a reduced c-peptide to pro-insulin ratio, suggesting an underlying defect

in pro-insulin processing. Increase in gut absorption of glucose, mediated by excess thyroid hormones, is yet another mechanism through which thyroid hormones affect glucose metabolism[11]. Thyroid hormones produce an increased hepatic plasma membrane concentrations of GLUT-2 which leads to an increased hepatic glucose output and abnormal glucose metabolism. 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<sup>3</sup> and c) the effect of hyperinsulinemia on the thyroid gland. The present study was conducted to assess relationship between diabetes and thyroid dysfunction. In present study, there were 55 males and 35 females, mean age of patients was 46.2 years, mean BMI was 27.2 Kg/m<sup>2</sup>,

duration of diabetes was 7.2 years and mean HbA1C level was 8.2%. Mehalingam et al[12] assessed the level of thyroid dysfunction in patients with type 2 diabetes mellitus and to identify the association of thyroid dysfunction with diabetic complications. Hypothyroidism was seen in 13.9%, while hyperthyroidism was observed in 3.6% of the study subjects. Thyroid dysfunction was more common among females than males. No correlation was seen between thyroid dysfunction and diabetic complications in the study subjects. We found that serum T3 was increased in 14% and decreased in 4%. Free T3 was increased in 6% and decreased in 10% and free T4 was increased in 8% and decreased in 3%. Ogbonna et al[13] focused on risk factors for thyroid dysfunction in type 2 diabetes mellitus (T2DM) patients. Three hundred and fifty-four T2DM patients and 118 non-diabetic persons (controls) were recruited for the study. A pretested questionnaire was filled for each subject after due explanations. The subjects were subsequently examined and the findings, including anthropometric values and clinical parameters were documented. Their blood samples were tested for HbA1c, fT3, fT4, and TSH. Information retrieved from patients medical records included: age at diagnosis of DM, duration of DM, complications of DM. About 56.5% of the T2DM patients who participated in this study were females and 62.7% of the controls were females. The T2DM patients had significantly higher BMI than controls ( $27.6 \pm 5.0$  kg/m<sup>2</sup> vs.  $26.2 \pm 3.8$  kg/m<sup>2</sup>,  $p = 0.002$ ). Mean HbA1c was significantly higher in T2DM patients than in the controls ( $7.8 \pm 2.0\%$  vs.  $5.8 \pm 1.2\%$ ,  $p = 0.001$ ). Female gender (OR = 3.8,  $p = 0.002$ ), central obesity (OR = 2.5, 95%CI = 1.5–5.2,  $p = 0.001$ ), DM nephropathy (OR = 4.8,  $p = 0.001$ ), HbA1c  $\geq 7\%$  (OR = 4.3,  $p = 0.025$ ) and duration of DM >5years (OR = 3.3,  $p = 0.012$ ) were significantly associated with thyroid dysfunction in T2DM patients in this study.

We found that maximum hypothyroidism patients (10) were seen with >7 HbA1C level followed by 3 having 8.1-9 HbA1C. The pathological features of T2DM include increased intestinal glucose absorption, reduced insulin secretion, and change in the  $\beta$ -cell mass. Further, symptoms also include increased insulin degradation, increased glucagon secretion, increased hepatic glucose production, enhanced catecholamines, and insulin resistance. These factors have been investigated to be an integral part of hyperthyroidism as well. Hence, an intersection of pathological basis occurs which gives us cue to an array of physiological aberrations which are common in hyperthyroidism and T2DM. Among the above-mentioned symptomatology, insulin resistance has been the most important facet connecting thyroid dysfunction and T2DM. Insulin resistance is a condition which occurs in both hypothyroidism and hyperthyroidism. Insulin resistance in the muscles and liver is a characteristic feature of T2DM[14]. An undisturbed glucose homeostasis and intact insulin secretory response and unperturbed sensitivity of the tissues to insulin are essential to maintain normal blood glucose levels.

**Conflict of Interest: Nil**

**Source of support: Nil**

### Conclusion

Authors found that most of the type II DM patients had hypothyroidism than hyperthyroidism.

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