

IMPORTANCE OF THYROID FUNCTION TEST IN DIABETES

Mohd. Riyaz¹

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ABSTRACT: BACKGROUND: Thyroid disorder and Diabetes are both hormone and endocrine and problems. When thyroid disease occurs in someone with diabetes, it can make blood glucose control more difficult. The incidence and occurrence of thyroid diseases in general population is increasing more and more day by day. As the prevalence of diabetes and thyroid both is more in India, correlation of these two diseases was studied in this study. **MATERIAL AND METHOD:** this study was conducted on 105 diabetic (both type I and II) patients attending Outpatient Department. Thyroid tests including TSH, and T4 were measured using enzyme immune assay. **RESULTS:** We have enrolled 105 patients which are Prediabetes, and Type 2 Diabetes Mellitus. Out of these 55 are male and 50 patients are females. 68 patients are on oral hypoglycemic drugs and 28 patients are on insulin with oral hypoglycemic agents, 09 patients were only on Diabetic Diet. We have observed that patient with diabetes predominantly females were having abnormal thyroid levels than compared to control group. Hypothyroidism was seen to be more common in females than in males in both the control and study group. Similarly hyperthyroidism also seems to be common in females compared to males in both diabetic and non-diabetic groups (Perros P 1995). **DISCUSSION:** Abnormal thyroid hormone levels were observed more commonly in study group than in control group. Hypothyroidism was seen to be more common in females than in males in both the control and study group. Similarly hyperthyroidism also seems to be common in females compared to males in both diabetic and non-diabetic groups. **KEYWORDS:** Thyroid Hormone, Thyroid function tests, Hypothyroidism, Hyperthyroidism, Diabetes, Enzyme linked immune assay.

INTRODUCTION: Thyroid disorder and Diabetes are both hormone and endocrine and problems (Cummings CW 1998).¹ When thyroid disease occurs in someone with diabetes, it can make blood glucose control more difficult.

Thyroid gland is a butterfly-shaped located in neck below the cartilage of thyroid. It helps in regulation of body's metabolism, processes and storing energy. It processes and participates in production of thyroid hormone (T3 & T4). Hormonal output from thyroid is regulated by TSH (produced by pituitary gland), TSH is under regulation form TRH (produced from Hypothalamus). If there is excess production of thyroid hormone it leads to hyperthyroidism, or if there is too little production it can lead to hypothyroidism (Williams PL 1995).²

The incidence and occurrence of thyroid diseases in general population is increasing more and more day by day (Rallison ML 1991).³ In 1927 Coller and Huggins have investigated for the correlation of Hyperthyroidism in diabetes and it was proved that the association of hyperthyroidism and worsening of diabetes. It was shown that surgical removal of parts of thyroid gland had an ameliorative effect on the restoration of glucose tolerance in hyperthyroid patients suffering from coexisting diabetes (Coller FA 1927).⁴ In U.K a Cross-sectional studies

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have reported that 2.8% of men and 7.5% of women of all ages had abnormal serum thyroid-stimulating hormone (TSH) levels⁴. In diabetic patients the thyroid diseases are more common.⁵

Tunbridge WM 1977⁶ has shown that in general population the prevalence range between 6.6% and 5.9% in the US National Health and Nutrition Examination Survey (NHANES III).⁶ In contrast, diabetes mellitus shows a higher prevalence - 10.8% in the community and up to 13.4% in a hospital diabetic clinic [Smithson MJ 1998, Perros P 1995].

Diabetes mellitus, one of the commonest endocrine disorders is again influenced by other endocrine or non-endocrine disorders.³ Sometimes other endocrine disorders such as abnormal thyroid hormones levels are observed in diabetes mellitus.^{4,5} The association between type 1 diabetes (T1DM) and autoimmune thyroid disease (AITD) is well established. In many diabetic patients AITD is subclinical and only detected by routine measurements of thyroid auto-antibodies (TA) or serum thyrotrophin (s-TSH).⁶ The prevalence of TA and thyroid dysfunction increases with age and with duration of diabetes.⁶

Autoimmune thyroid disorders are the most prevalent immunological diseases in patients with type 1 diabetes.⁷ As the prevalence of diabetes and thyroid both is more in India, correlation of these two diseases was studied in this study. Diabetic patients have relatively higher prevalence of thyroid disorders compared with the normal population because patients with one organ-specific autoimmune disease are at risk of developing other autoimmune disorders.⁸ The presence of thyroid disorders usually affects diabetes control. There is underlying increased hepatic gluconeogenesis, rapid gastrointestinal glucose absorption, and probably increased insulin resistance. Indeed, thyrotoxicosis may unmask latent diabetes.⁸

Saunders J (1978) suggested that Poorly controlled diabetes mellitus may affect thyroid metabolism as uncontrolled hyperglycemia alters plasma triiodothyronine (T3) and in part thyroxine (T4) levels.⁹ Hyperinsulinaemia can also be associated with goitre as well as with thyroid nodules¹⁰ [Rezzonico J 2008]. Conversely, hyperthyroidism can aggravate glycemia by a stimulation of glucose absorption, glycogenolysis and hepatic glucose production¹¹ as well as enhanced insulin resistance [Maratou E 2010] and shortened half-life of circulating insulin concentrations¹² [Mohn A 2002]. Reverse effects have been observed in patients with hypothyroid metabolism.

Diabetes mellitus and thyroid disorders both are metabolic disorders that affect the levels of carbohydrates, proteins and lipids. The present study was carried out with the aim of detecting thyroid function status in the patients of diabetes mellitus.

MATERIAL AND METHODS: Study was carried out at Esani Diabetic Centre for 6 months, total 105 diabetic patients were enrolled and controls of 87 patients were taken.

INCLUSION CRITERIA:

- FBS more than 100mg/dl two or more occasions.
- Known Diabetic on OHA (oral hypoglycemic agents), Insulin, or both.
- Known Case or freshly diagnosed Prediabetic Patients on Diabetic Diet.

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EXCLUSION:

- Age more >70 years were excluded.
- Cardiac co-morbites associated with Diabetes were excluded.
- Bronchial asthmatic on steroids or any other drugs which can influence the glycemic control were excluded.
- Acute or chronic renal failure patients were excluded.

We have enrolled 105 patients which are Prediabetes, and Type 2 Diabetes Mellitus. Out of these 55 are male and 50 patients are females. 68 patients are on oral hypoglycemic drugs and 28 patients are on insulin with oral hypoglycemic agents, 09 patients were only on Diabetic Diet.

Control was constituted by 87 healthy people without diabetes and whose blood plasma levels were less than 100mg/dl on two different occasions. The physical examination was carried out of both cases and controls to rule out any thyroid diseases. There was no history of thyroid diseases in the past also.

Blood samples were collected from all subjects after minimum 8 hours fasting. Thyroid function tests conducted were TSH, T3 and T4 using enzyme immuno assay. The collected data was tabulated and analyzed using statistical software SPSS.

RESULTS:

Group	Cases (105)	Control (87)
Male	55 (52.38%)	45 (51.72%)
Female	50 (47.61%)	42 (48.27%)
Mean Age	47.9	49.8
Treatment		
Diet	09	NA
OHA+ DIET	68	NA
OHA+INSULIN +DIET	28	NA
Mean Body Mass Index	20.2	18.4

Table 1

We had selected 105 cases that were diagnosed as diabetic or prediabetic. Patient with co-morbidity diseases were excluded from the study. We have found that the patients with diabetes were having more BMI than compared to control group.

CASES:

	Euthyriod	Low Level	High Level
Male	37	6	9
Female	14	20	19
Total	51	26	28

Table 2

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We have observed that patient with diabetes predominantly females were having abnormal thyroid levels than compared to control group. Hypothyroidism was seen to be more common in females than in males in both the control and study group. Similarly hyperthyroidism also seems to be common in females compared to males in both diabetic and non-diabetic groups (Perros P 1995). Diabetes mellitus shows a higher prevalence - 10.8% in the community and up to 13.4% in a hospital diabetic clinic [Smithson MJ 1998, Perros P 1995].

CONTROL:

	Euthyroid	Low Level	High Level
Male	44	1	0
Female	41	0	1
Total	85	1	1

Table 3

Mean±SD level of thyroid hormones and TSH in diabetic & non diabetic patients.

	TSH	T4
Cases	7.18±5.93	9.91± 1.02
Control	2.82± 2.40	7.40± 0.89

Table 4

DISCUSSION: Various studies have been undertaken to understand the role, importance, and need of determination of thyroid dysfunction in the patients of T2DM. It has been unequivocally apparent that testing for thyroid dysfunction in T2DM patients is necessary and should be carried out annually.¹³

Guidelines for screening of thyroid in diabetes patients in UK and USA are presented in Table below. The "American Thyroid Association" guidelines for T2DM patients require frequent testing for thyroid dysfunction. They recommend testing from 35 years of age, and every 5 years thereafter in adults. High-risk patients may require more frequent testing. The American Association of Clinical Endocrinologists, Thyroid Disease Clinical Practice Guidelines (2002) recommends thyroid palpation and TSH in diagnosis, especially if goitre or other autoimmune disease presents in association with T2DM. Regular screening for thyroid abnormalities in all diabetic patients will allow early treatment of subclinical thyroid dysfunction. A sensitive serum TSH assay is the screening test of choice. It has also been proposed that in T2DM patients, a TSH assay should be performed at diagnosis and then repeated at least every 5 Years.

Sl. No	Guidelines	Type 2 diabetes	Comments
1	American Thyroid Association guidelines	Patients with diabetes may require more	Recommended TSH Test to be done from the age of 35 yrs, and every 5

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	for detection of thyroid dysfunction ¹³	frequent testing	yrs thereafter in all adults; frequent test to be done in high risk persons, Diabetes mentioned as high-risk but does not distinguish between T1DM and T2DM
2	American Association of Clinical Endocrinologists, Thyroid disease clinical Practice guidelines, 2002 ¹⁴	Palpation of Thyroid gland and TSH at diagnosis and at regular intervals, especially if goitre or other autoimmune disease presents	No specific recommendation for T2DM
3	British Thyroid Association and Association of Clinical Biochemistry Guidelines, 2006 ¹⁵	Baseline TFT to be done but annual Thyroid Function Test is not recommended	In patient with diabetic history during pregnancy and postpartum the TSH and antibodies are recommended.

Guidelines for thyroid screening in patients with diabetes

Diabetes patients run a higher risk of developing thyroid disorders.^{16,17} In both the general population and diabetes patients¹⁸ thyroid diseases were reported to be more common in women than in men. Whether thyroid disorders develop prior to or after diabetes may affect prognosis and metabolic control.

Maratou et al.¹¹ as well as Mohn et al.¹² already showed subclinical hypo- and hyperthyroidism may impact on glucose metabolism, an earlier requirement for insulin. BMI indicates insulin resistance and correlates inversely with beta-cell function.^{19, 20} We analysed the correlation between insulin-free period and BMI of our patients, but could not observe any.

CONCLUSION: Our study suggests an interaction of thyroid diseases with metabolic control in type 2 diabetes resulting in an earlier need of insulin treatment. Our study shows higher prevalence of hypothyroidism among Type2 Diabetic patient and females are more vulnerable to thyroid disorder as compared to males. Patients with compensated as well as newly diagnosed thyroid disorders required significantly earlier insulin therapy compared to patients without thyroid diseases at the time of diabetes onset. These data reinforce that diabetes patients with thyroid comorbidity need more endocrine attention.

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AUTHORS:

1. Mohd. Riyaz

PARTICULARS OF CONTRIBUTORS:

1. Associate Professor, Department of General Medicine, M. N. R. Medical College, Sanga Reddy, Telangana, India.

NAME ADDRESS EMAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Mohd. Riyaz,
#11-5-337/2, Red Hills,
Hyderabad, Andhra Pradesh-500004.
E-mail: riyazesani@hotmail.com
riyazesani@gmail.com

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