



**PROSPECTIVE STUDY ON THE PREVALENCE OF THYROID DYSFUNCTION
AMONG TYPE 2 DIABETES MELLITUS PATIENTS IN A TERTIARY CARE
HOSPITAL IN CALICUT**

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ABSTRACT

Diabetes and thyroid disorders have been shown to mutually influence each other because of their intersecting pathology. Studies have shown that thyroid dysfunction is common in diabetic population. This study aimed to know the prevalence of thyroid dysfunction among type 2 diabetes mellitus patients. The study was conducted on 137 patients of type 2 diabetic patients aged between 31-70 years. The correlation of prevalence of thyroid dysfunction with age, gender, body mass index, duration of type 2 diabetes mellitus, serum creatinine, lipid profile, glycosylated hemoglobin was done. Prevalence of thyroid dysfunction in type 2 diabetes mellitus was found higher. Hypothyroidism was the most common thyroid dysfunction found. Elderly populations were at greater risk. Failure to recognize the presence of abnormal thyroid hormone level in type 2 diabetes may be a primary cause of poor management of type 2 diabetes. A regular screening for thyroid dysfunction among type 2 diabetic patients should be performed.

KEYWORDS: Type 2 diabetes mellitus, thyroid dysfunction, glycosylated hemoglobin, serum creatinine, lipid profile.

INTRODUCTION

Thyroid dysfunction is the disorders of the thyroid gland which manifests either as hyper or hypothyroidism and is reflected in the levels of thyroid stimulating hormone (TSH). Diabetes mellitus is a common endocrine disorder and leading cause of death worldwide.^[1] Diabetes mellitus is characterized by hyperglycemia due to reduced insulin secretion or reduced response of tissues to insulin or both. Insulin and thyroid being closely involved in cellular metabolism, excess or deficit of one of these hormones leads to abnormality of the other.^[2]

The prevalence of having diabetes mellitus with thyroid dysfunction is awfully variable from one study to another. Studies have deliberated the impact of thyroid dysfunction in the control of diabetes and the severity of its complication. The widely accepted pathogenesis being autoimmune mechanisms causing destruction of pancreatic β cells. Thyroid hormones exert a control over insulin secretion, hypothyroid states reduce insulin secretion and hyperthyroid states increase the insulin secretion and increase the metabolism of insulin.

Thyroid hormones cause an increase in the hepatocyte concentration of glucose 6-phosphate, glucose transporter 2 (GLUT-2) thereby leading to increased hepatic glucose output and abnormal glucose metabolism giving rise to the overproduction of lactate entering Cori's cycle and further promotes hepatic gluconeogenesis. Thyroid hormones also cause an increase in gut glucose absorption and increased lipolysis which further promotes hepatic gluconeogenesis. Thus, thyroid dysfunction may lead to the development of insulin resistance. Diabetes mellitus also influence thyroid function in two sites firstly at the level of hypothalamic control of TSH release and secondly at peripheral tissue by converting T_4 to T_3 . Thyroid hormone control metabolism and diabetes can alter metabolism.^[4]

The recognition of this interdependent relationship between thyroid disease and diabetes is of importance to guide clinicians on the optimal management of both these conditions. Thus, all patients with diabetes mellitus should be screened for thyroid function. The aim of this study was to know the prevalence of thyroid dysfunction in patients with type 2 diabetes mellitus and to find the

correlation of thyroid disorders with age, gender, body mass index and duration of type 2 diabetes mellitus.

MATERIALS AND METHODS

The study followed a prospective cross-sectional method which was carried out at PVS Hospital (P) Ltd a 350 bedded multispecialty tertiary care hospital in Calicut, Kerala over a period of six months (November 2019 to April 2020). Case sheets of inpatients of various wards and prescription order of outpatients were used to obtain necessary data for the study. The study population was type 2 diabetes mellitus patients of both gender between 31-70 years, both inpatients and outpatients, patients with proven thyroid dysfunction, and newly diagnosed patients with thyroid dysfunction. Type 1 diabetes mellitus, pregnant women, lactating mother, psychiatric patients and critically ill patients were excluded from the study.

Information collected for the study observations and analysis included demographics, duration of disease, laboratory investigations such as thyroid function test lipid profile, serum creatinine, glycosylated hemoglobin

(HbA1c), fasting blood sugar. Subjects were classified as obese and non-obese on the basis of body mass index (BMI). Based on thyroid hormone profile the subjects were classified as euthyroid, hypothyroidism, subclinical hypothyroidism, subclinical hyperthyroidism and hyperthyroidism. The study was approved by the Institutional Ethics Committee, PVS Hospital (P) Ltd, Calicut, Kerala. Descriptive statistical analysis was done with the clinical data obtained.

RESULTS AND DISCUSSION

A total of 137 patients during the study period as per the study criteria. Among them 61.31% patients had type 2 diabetes mellitus (DM) patients, and 38.69% had type 2 diabetes mellitus and thyroid dysfunction (TD). Both normal and overweight patients had more chances of diabetes mellitus as well as diabetes mellitus with thyroid dysfunction, but the sample size of overweight and underweight were very less in our study. The study had made an attempt to find the relationship of duration of diabetes with thyroid dysfunction. 38.69% of patient among the 137 had both diabetes mellitus and thyroid dysfunction.

Table 1: Demographic characteristics and duration of type 2 DM.

Parameter	Diabetes mellitus (84)	Diabetes mellitus with thyroid dysfunction (53)
Gender		
Male	29 (34.52%)	20 (37.73%)
Female	55 (65.48%)	33 (62.27%)
Age (in years)		
31 – 40	8 (9.53%)	4 (7.54%)
41 – 50	15 (17.86%)	8 (15.09%)
51 – 60	23 (27.38%)	12 (22.64%)
61 – 70	38 (45.23%)	29 (54.73%)
Body Mass Index (BMI)		
Underweight (<18.5)	8 (9.53%)	5 (9.44%)
Normal (18.5 - 24.9)	35 (41.66%)	20 (37.73%)
Overweight (25.0 - 29.9)	38 (45.23%)	25 (47.16%)
Obesity (≥30)	3 (3.58%)	3 (5.67%)
Duration of diabetes mellitus (in years)		
0 – 10	28 (33.33%)	14 (26.42%)
11 – 20	27 (32.14%)	21 (39.62%)
>20	29 (34.53%)	18 (33.96%)

Table 2: Categorization of thyroid dysfunction in study patients.

Thyroid dysfunction	Number of patients (%)
Hypothyroidism	38 (71.70%)
Hyperthyroidism	4 (7.54%)
Subclinical hypothyroidism	10 (18.86%)
Subclinical hyperthyroidism	1 (1.90%)

Table 3: Biochemical values in diabetics and diabetics with thyroid dysfunction.

Parameters		Diabetes mellitus (84)	Diabetes mellitus and thyroid dysfunction (53)
Glycosylated hemoglobin (%)	Normal (≤ 6)	55 (65.48%)	15 (28.30%)
	Abnormal (> 6)	29 (34.52%)	38 (71.70%)
Serum creatinine (mg/dL)	Normal (0.5 - 1.2)	66 (78.57%)	41 (77.36%)
	Abnormal (>1.2)	18 (21.43%)	12 (22.64%)
Lipid profile (mg/dL)	Normal	60 (71.43%)	35 (66.04%)
	Abnormal	24 (28.57%)	18 (33.96%)

DISCUSSION

The study has found that the number of patients in the diabetes mellitus group (61.31%) and in diabetes mellitus with thyroid dysfunction (38.69%) were the highest in the age group of 61 to 70 years. The study finding also showed that the female gender was more prone to both diabetes mellitus and diabetes mellitus with thyroid dysfunction. Scientists have not been able to understand why women are more prone to thyroid dysfunction but may be linked to autoimmunity, high estrogen levels and stimulation of human chorionic gonadotrophins. Aging causes changes in thyroid gland. Its size reduces and ability to uptake iodine diminishes. The daily production and metabolism of T4 slows down. The daily production of T3 reduces and diminishes the ability to secrete TSH after various stimuli. Thus, increase in TSH, decrease in T3 and normal T4 is observed in elderly. Our observations are consistent with previous similar studies performed by Ashok Khurana *et al.*^[11], Anuradha Deuriet *et al.*^[12], respectively.

The study had made an attempt to find the relationship of BMI with the study disease. It was found that both normal and overweight patients had more chances of diabetes mellitus as well as diabetes mellitus with thyroid dysfunction. Out of 53 diabetic patients with thyroid dysfunction 20 (37.73%) had normal BMI and 25 (47.16%) were overweight. The plausibility of association between TSH and BMI could be due to TSH directly stimulating preadipocyte differentiation and resulting in adipogenesis. Leptin is another explanation. Leptin interferes with negative feedback mechanisms and increases TSH secretions. Production of leptin increases with increase in body fat. As the thyroid hormones regulate the thermogenesis and basal metabolism the elevated serum TSH levels causing hypothyroidism which is associated with decreased thermogenesis and decreased metabolic rate in turn leads to a higher BMI and increased prevalence of obesity. Our observations are consistent with previous similar studies performed by Dr. Krunal Talsaniya *et al.*^[7] and Madavaram Sreelatha *et al.*^[10] respectively.

The study had made an attempt to find the relationship of duration of diabetes with thyroid dysfunction. Out of 53 diabetic patients with thyroid dysfunction 14 (26.42%) had duration of diabetes 0-10 years, 21 (39.62%) had duration of diabetes 11-20 years, 18 (33.96%) had duration of diabetes >20 years. It was found that there is no significant relationship between duration of diabetes mellitus and thyroid dysfunction. Our observations are consistent with previous similar studies performed by K. Sankar Reddy *et al.*^[2], Ashok Khurana *et al.*^[11]

Out of 53 diabetic patients with thyroid disorders 38 (71.70%) had hypothyroidism, 4 (7.54%) had hyperthyroidism, 10 (18.86%) had subclinical hypothyroidism, 1 (1.90%) had subclinical hyperthyroidism. Hypothyroidism was the most common of thyroid dysfunction 71.70%. Our observations are

consistent with previous similar studies performed by S.A Vaidya *et al.*^[6], Krunal Talsaniya *et al.*^[7], Nidhi Kaeleyet *et al.*^[13]

The study had made an attempt to find the association between HbA1c and thyroid dysfunction. Out of 53 diabetic patients with thyroid dysfunction 15 (28.30%) had HbA1c ≤ 6 and 38 (71.70%) had HbA1c > 6 . It was reported that HbA1c levels are increased in thyroid patients. In thyroid disorders the increase in HbA1c might be due to different actions of thyroid hormones on liver, skeletal muscles and adipose tissues. Our observations are consistent with previous similar studies performed by Krunal Talsaniya *et al.*^[7], Madavaram Sreelatha *et al.*^[10]

It was found that 41 (77.36%) had normal serum creatinine and 12 (22.64%) had abnormal serum creatinine. Hyperthyroidism is associated with decrease in creatinine and hypothyroidism is associated with increase in creatinine. Thyroid hormone increases the renal blood flow and GFR. Hypothyroidism is associated with reduced GFR and increase in creatinine whereas hyperthyroidism is associated with increase in GFR and reduce in RAAS activation. Our observations are consistent with previous similar studies performed by Astha Goyal *et al.*^[14]

The study had made an attempt to study the association between lipid profile and thyroid dysfunction it was found that 35 (66.04%) had normal lipid profile and 18 (33.96%) had abnormal lipid profile. Thyroid hormones induce HMG-COA reductase protect LDL from oxidation, stimulate lipoprotein lipase and influence adipocyte metabolism by the production of adipokines. Thus, thyroid dysfunction may cause an increase in total cholesterol, triglycerides, LDL and HDL due to increased activity of lipoprotein lipase enzymes or limited lipoprotein clearance. Our observations are consistent with previous similar studies performed by Dr. Krunal Talsaniya *et al.*^[7], Khema Raj Bhushalet *et al.*^[8], C. V. Rizoset *et al.*^[15]

CONCLUSION

The study concluded that the prevalence of thyroid dysfunction was higher in type 2 diabetes patients, females were affected more than males. Hypothyroidism was most common thyroid disorder. Failure to recognize the presence of thyroid dysfunction in type 2 diabetes mellitus patients maybe a primary cause of poor management of diabetes. Therefore a regular screening of thyroid function in all type 2 diabetic patients should be done, especially in those with uncontrolled diabetes.

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