

Relationship between lipid profile and thyroid profile in type 2 diabetes patients

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Abstract

Diabetes and thyroid disorders are the most common endocrinopathies in the world, they are often associated with deranged lipid profile. The present study was cross-sectional study conducted in the tertiary care centre, Krishna Institute Of Medical Sciences, Karad. A total 400 patients of Type 2 diabetes mellitus were scanned for thyroid disorders, 97 participants had thyroid disorder. All the 97 thyroid disorder patients were further scanned for dyslipidemia. The study observed that 28.87% of the patients with thyroid disorder had dyslipidemia. The associations between type of thyroid disorder and total cholesterol levels ($p=0.04$) and level of triglycerides ($p=0.0390$) were found to be statistically significant. Dyslipidemia was seen majority (32.93%) in the cases of hypothyroidism compared to cases of hyperthyroidism with dyslipidemia (6.67%). Raised triglycerides were also more common in the cases of hypothyroidism (40.24%) than hyperthyroidism (13.33%). No any significant association was seen in the type of thyroid disorder and the HDL, LDL and VLDL levels of the patients ($p > 0.05$).

Key Word: Type 2 diabetes mellitus, Thyroid disorder, Total cholesterol, Triglycerides

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INTRODUCTION

Thyroid disorders and diabetes mellitus are the two most common endocrinopathies encountered in practice. Presence of these entities together or individually also affect the lipid profile of the individual. Diabetes mellitus is a clinical syndrome characterized by hyperglycemia caused by absolute or relative deficiency of insulin.¹ Thyroid disorders are widely common with variable prevalence among the different populations. Both conditions frequently coexist and many studies documented higher prevalence of thyroid dysfunction in

patients with diabetes in general population than normal prevalence of thyroid dysfunction in non-diabetic population.² How Thyroid hormones affect glucose metabolism via several mechanisms in diabetes, is a matter of investigation.³ In order to review common pathological mechanisms between diabetes and thyroid dysfunction it has to be acknowledged that thyroid hormones exert profound effects in the regulation of glucose homeostasis which include-modifications of the circulation levels of insulin and counter regulatory hormones, intestinal absorption, hepatic production and peripheral tissue uptake of glucose². The presence of thyroid disorders in diabetics also increases the lipid profile changes which altogether gives rise to increased cardiac risk in the patients.¹⁰ Evidence from many studies indicate that TSH within the reference levels may be positively associated with the total serum cholesterol and LDL cholesterol, and also negatively associated with high-density lipoprotein (HDL) cholesterol.¹⁰⁻¹² There might also be a gender wise differentiation between the type of thyroid disease and its effects on the lipid metabolism, as observed by A Iqbal *et al*, where females were seen having significantly higher levels of Total

Cholesterol and LDL as compared to males.¹³ We intended to take up this study in order to establish the possible relationship between Type 2 diabetes mellitus, thyroid and lipid profiles and in turn how thyroid disorders if present, influence the control of type 2 diabetes mellitus, glucose and lipid metabolism.

AIM AND OBJECTIVE

Assessment of thyroid profile and lipid profile in Type 2 diabetic patients.

OBJECTIVES

- To study the relationship between Type 2 diabetes mellitus and thyroid disorders.
- To study the association between thyroid status and lipid profile.

MATERIAL AND METHODS

The study was carried on patients with diagnosis of Type 2 diabetes mellitus and having thyroid disorder who were admitted in medical wards and attending medical OPD in

RESULTS

The above table showed that out of all 97 study participants having thyroid disorder in diabetes patients, 72 were female by gender and 25 were male. Maximum 70% study subjects were in the age group of 40 to 60 years of age followed by 21% in the age group of more than 60 years of age. Out of all 97 study individuals, 31 were having diabetes since 11 to 15 years, while 29 participants were having diabetes for more than 15 years. About 75% study individuals were having HbA1c level more than 7.5. When checked for thyroid status, about 53.61% study individuals were having subclinical hypothyroidism followed by 30.93% having hypothyroidism. Also, only 4.12% study individuals were having hyperthyroidism.

the department of medicine, Krishna Institute Of Medical Sciences, Karad during the study period of 1 October 2016 to 31 march 2018.

Study Area–Krishna Institute Of Medical Sciences, Karad.

Study Population–The present study included patients admitted with type 2 diabetes mellitus and thyroid disorder in medical wards in Krishna Hospital, Karad.

Study Design–Observational Cross-sectional study.

Duration of study–The present study was conducted from October 2016 to 31 March 2018.

Sample size and sampling technique–According to a study conducted by C. E. J. Udionget *al*⁴, the prevalence of prevalence of thyroid dysfunction in diabetes is 46.5%. So, $p = 46.5\%$ Using formula for sample size (n) A minimum of 399 patients was included in the study, rounding it up to 400. All the 400 patients attending OPD or admitted in OPD were asked for the thyroid status and those who were having sort of thyroid disorder were selected in the present study. Total I got 97 patients who were having thyroid disorder along with Type 2 diabetes.

Table 1: Socio-demographic profile and Thyroid profile of study participants

Socio-demographic profile and Thyroid Profile	Number (n=97)	Percentage
Gender wise classification of thyroid disorder		
Male	25	25.77%
Female	72	74.23%
Age (in years) classification of thyroid disorder		
< 40	8	8.25%
40 – 60	68	70.1%
> 60	21	21.65%
(Mean ± SD = 60.11 ± 12.62)		
Duration of Diabetes classification of thyroid disorder		
< 5	14	14.43%
6 – 10	23	23.71%
11 – 15	31	31.96%
> 15	29	29.9%
(Mean ± SD = 13.18 ± 6.8)		
HbA1c level classification of thyroid disorder		
< 6.5	7	7.22%
6.6 to 7.4	14	14.44%
> 7.5	74	76.28%
(Mean ± SD = 9.65 ± 1.67)		
Type of Thyroid Disorder		
Subclinical Hypothyroidism	52	53.61%
Hypothyroidism	30	30.93%
Subclinical Hyperthyroidism	11	11.34%
Hyperthyroidism	4	4.12%

The mean for HbA1c in all the study participants were found to be 9.65 ± 1.67 indicating poor diabetic control in study participants with thyroid disorder. The mean fasting were 192.54 mg/dl and mean post meal sugar were 311.22 mg/dl. While above table showed that the mean of all lipid profile parameter were found to be in normal range. Also, TSH value were having in the higher range even double the normal range.

Table 2: various mean \pm standard deviation

Tests	Mean \pm standard deviation
HbA1C (%)	9.65 \pm 1.67
FBS (mg/dl)	192.54 \pm 81.05
PMBS (mg/dl)	311.22 \pm 98.65
Total Cholesterol (mg/dl)	173.73 \pm 49.55
Triglycerides (mg/dl)	152.47 \pm 136.4
LDL (mg/dl)	107.78 \pm 52.06
VLDL (mg/dl)	45.43 \pm 27.44
HDL (mg/dl)	45.32 \pm 15.47
T3 (ng/ml)	85.92 \pm 33.13
T4 (mcg / ml)	7.04 \pm 3.3
TSH (IU /ml)	13.45 \pm 19.36

Thyroid profile when compared with the value of cholesterol and triglyceride, it was found that total 28 of 97 study participants were having abnormal total cholesterol. Out of all having abnormal total cholesterol, 27 participants were having either subclinical hypothyroidism or hypothyroidism indicating that patients with Type 2 diabetes plus hypothyroidism will have more deranged total cholesterol. And the association between total cholesterol and type of thyroid disorder was found to be statistically significant (**p-value = 0.04**). Also, when compared with triglyceride level, about 33 study participants of all 35 having deranged triglyceride level were having subclinical hypothyroid or hypothyroid. Thus indicating that person with type 2 diabetes plus hypothyroidism have more chances to have abnormal triglyceride levels and this association was found to be statistically significant (**p-value = 0.039**).

Table 3: Association between type of thyroid disorder and level of total cholesterol and Triglycerides

Lipid level	Thyroid disorder		Total	p-value
	Subclincinal hypothyroidism + hypothyroidism	Subclincinal hyperthyroidism + hyperthyroidism		
Total Cholesterol				
< 200	55 (67.07%)	14 (93.33%)	69	0.04*
> 200	27 (32.93%)	1 (6.67%)	28	
Triglycerides				
< 150	49 (59.76%)	13 (86.67%)	62	0.039*
> 150	33 (40.24%)	2 (13.33%)	35	
HDL				
<40	36 (43.90%)	4 (26.67%)	40 (100%)	0.212
>40	46 (56.10%)	11 (73.33%)	57 (100%)	
LDL				
<130	26 (31.71%)	7 (46.67%)	31 (100%)	0.261
>130	56 (68.29%)	8 (53.33%)	66 (100%)	
VLDL				
<30	54 (65.85%)	11 (26.67%)	65 (100%)	0.571
>30	28 (34.15%)	4 (26.67%)	32 (100%)	

Significant*

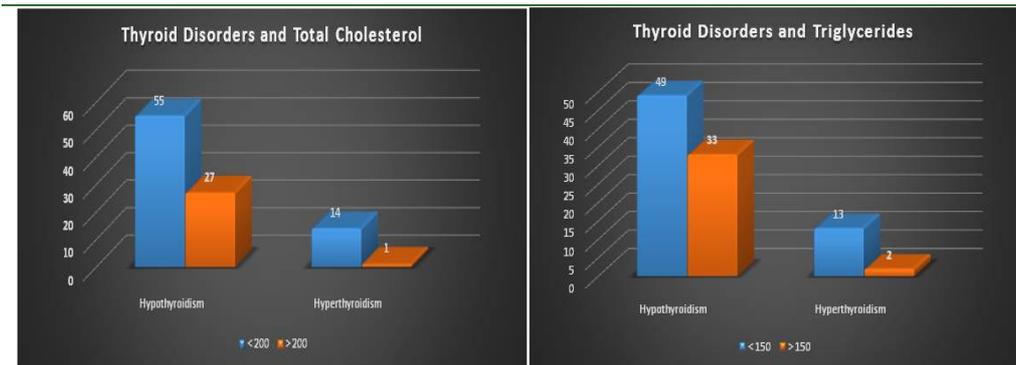


Figure 1: Type of thyroid disorder and total cholesterol levels Figure 2: Type of thyroid disorder and triglyceride levels.

The HDL cholesterol was seen in abnormal levels in 40 patients out of all 97. Majority of the hyperthyroidism (73.33%) had good HDL cholesterol levels than hypothyroidism patients (56.10%) patients. The LDL cholesterol was seen raised in 31 patients, with 7 patients from hyperthyroidism and 26 patients from hypothyroidism with cases of hyperthyroidism (46.67%) affected more than the hypothyroidism (31.71%). The VLDL cholesterol was seen raised in 65 out of all patients, with majority of the hypothyroid patients (65.85%) having high VLDL compared to the hyperthyroid patients (26.67%). On comparison of thyroid disorder types with HDL, LDL and VLDL cholesterol levels, We found no any significant association between them. (p = 0.212, 0.261, 0.571 respectively)

DISCUSSION

In the present study, about 74% study participants were female by gender. Also, maximum 70% study participants were in the age group of 40 to 60 years of age followed by 21% in the age group more than 60 years of age with the mean age of 60.11 ± 12.62 . This result was different from the results by published by Essam H Jiffri⁵ where the mean age of his study participants were 49.28 ± 6.17 years. About 32% study participants were having diabetes since 11 to 15 years followed by 30% having diabetes more than 15 years indicating that most of the study participants in the presents study were having long standing diabetes. In the present study more than 75% study participants were having HbA1c more than 7.5 with the mean value of 9.65 ± 1.67 indicating that bad glycaemic control. When done fasting blood sugar, mean value was found to be 192.54 ± 81.05 and post meal sugar was found to be 311.22 ± 98.65 thus, this also indicate the poor glycemic control. Out of all 97 study participants, 53.61% were subclinical hypothyroidism, 30.93% were hypothyroidism, 11.34% subclinical hyperthyroidism, 4.12% were hyperthyroidism of type 2 diabetic patients. The study conducted by Udiong⁴ showed low thyroid

hormone in about 26.6% and hyperthyroidism in about 19.9% study participants which is contrary to the present study results. This may be due to the differential flow of patients to the hospital. While study conducted by Pranav Kumar Raghuwanshi *et al* study which had hypothyroidism and subclinical hypothyroidism found to be 4(10.00%) and 6 (15.00%) respectively and subclinical hyperthyroidism and hyperthyroidism found to be 0(0.0%) and 1(2.5%) respectively which was very low to our current study.⁶ Kanhaiya Prasad *et al* showed 23% of the diabetic patients of study group had hypothyroidism and 10% had hyperthyroidism, which was less as compared to our study and also has no subclinical hyperthyroidism and hyperthyroidism.⁷ In the present study, it was found that there is derangement in the total cholesterol more in patients with hypothyroidism (32.93%) than hyperthyroidism (6.67%) and this association was statistically significant (p-value = 0.04) while the same thing is seen with triglycerides level which was found to be more in patients with hypothyroidism (40.24%) than hyperthyroidism (13.33%) and this association was found to be statistically significant (p-value = 0.039). The mean values of different lipid profile parameters observed in our study were Total Cholesterol 173.73 ± 49.55 mg/dl, Triglycerides 152.47 ± 136.4 mg/dl, LDL 107.78 ± 52.06 , VLDL 45.43 ± 27.44 and HDL of 45.32 ± 15.47 . Similar results of positive correlation of thyroid disorders with total cholesterol were also observed by Asvold BO *et al*.⁸ A study by SA Chubb *et al*⁹ showed strong positive associations were present between TSH and lipid parameters with adverse cardiac risks at low insulin sensitivity in the patients. Another study by Ruhla S *et al*¹¹ found out the higher fasting triglyceride levels in cases of deranged TSH values. However there was no any significant association seen between the type of thyroid disorder and HDL, LDL and VLDL cholesterol levels. (p> 0.05), Hyperthyroidism patients were observed to have better HDL cholesterol levels (73.33%) than that of hypothyroidism patients (56.10%). The LDL cholesterol

was seen raised in 7 patients from hyperthyroidism and 26 patients from hypothyroidism where cases of hyperthyroidism (46.67%) being affected more than the hypothyroidism (31.71%). The VLDL cholesterol was seen raised in 65 out of all patients, with majority of the hypothyroid patients (65.85%) having high VLDL compared to the hyperthyroid patients (26.67%). In a similar study, association was seen between the serum TSH levels and LDL values, especially in the subclinical thyroid disease.¹²

CONCLUSION

About 1/3rd of all type 2 diabetes patients attending the tertiary care centre were having thyroid disorder. Of all 97 patients which were further evaluated maximum participants were having subclinical hypothyroidism followed by hypothyroidism. While, few participants were having hyperthyroidism. Maximum study participants were female by gender and most of the study participants were in the age group of 40 to 60 years of age. About 1/3rd study participants were having diabetes from 11 to 15 years while more than 3/4th of all study participants were having HbA1c value more than 7.5. When assessed with the blood test and clinically, it was found that more than half of study participants were having subclinical hypothyroidism followed by 1/3rd participants having hypothyroidism. There was significant association between the total cholesterol, triglycerides and the thyroid status of the patients with type 2 diabetes. While there was no any association seen between the type of thyroid disorder and HDL, LDL and VLDL cholesterol levels.

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