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## RESEARCH ARTICLE

### COMPARISON OF LIPID PROFILE IN TYPE-II DIABETES MELLITUS PATIENTS WITH AND WITHOUT THYROID DYSFUNCTIONS

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#### ABSTRACT

**Introduction:** Thyroid dysfunctions, both hyperthyroidism and hypothyroidism, have been associated with insulin resistance which has been reported to be the major cause of impaired glucose metabolism in type-II Diabetes mellitus (T2 DM). Dyslipidemia is a common metabolic derangement seen in both diabetic patients and patients with thyroid dysfunction. In patients with both these disorders, dyslipidemia is more likely to be present. Dyslipidemia is an important risk factor for cardiovascular events. Therefore, effective management in such patients may help to significantly reduce the incidence of cardiovascular events.

**Methods:** This study is a cross-sectional study done over a period of 18 months. The study included 60 patients with known T2 DM in Victoria hospital affiliated to Bangalore medical college & research institute. These diabetic patients were divided into 2 groups, one with euthyroid status (n=30) and the other with thyroid dysfunction (n=30) and a comparison of fasting lipid profile between these two groups were done.

**Results:** The mean age of the diabetic patients in the group with thyroid dysfunction was  $57.56 \pm 8.55$  years and mean age of diabetic patients in the group without thyroid dysfunction was  $54.6 \pm 9.08$  years. The male: female distribution among the former group was 43.3% and 56.7%, and that among the latter group was 46.66% and 53.44% respectively. The two groups were age & sex matched. The fasting lipid profile was significantly abnormal in diabetic patients with thyroid dysfunction ( $p=0.001$ ), when compared with those without thyroid dysfunction and HDL was found to be significantly low in the group with thyroid dysfunction ( $p=0.01$ ).

**Conclusion:** Dyslipidemia is predominantly seen among diabetic patients with thyroid dysfunction. There is an increase in LDL/VLDL/TGs, along with reduction in HDL cholesterol among diabetic patients with thyroid dysfunction.

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## INTRODUCTION

Thyroid dysfunctions, both hyperthyroidism and hypothyroidism, have been associated with insulin resistance which has been reported to be the major cause of impaired glucose metabolism in type-II Diabetes mellitus (T2 DM). In subclinical hypothyroidism, GLUT 2 expression is reduced, leading to insulin resistance (Perros et al., 1995). The relation between T2 DM and thyroid dysfunction has been a less explored arena which may behold answers to various facts of metabolic syndrome including atherosclerosis, hypertension and related cardiovascular disorders. The term harmonious quartet is used to address the core pathology of insulin resistance. Dysregulated glucose disposal and metabolism in adipocytes, muscles, and liver, along with impaired insulin secretion by the pancreatic beta cells, constitute the

abnormalities of the four major organ systems which play a definitive role in the pathogenesis of T2 DM. Insulin resistance is a proven condition in hyperthyroidism as well as hypothyroidism (Wang, 2013). Insulin resistance also leads to impaired lipid metabolism according to recent studies. Hence, it appears that insulin resistance is the possible link between T2 DM and thyroid dysfunction. Dyslipidemia is a common metabolic derangement seen in both diabetic patients and patients with thyroid dysfunction. In patients with both these disorders, dyslipidemia is more likely to be present. Dyslipidemia is an important risk factor for cardiovascular events.

## MATERIALS AND METHODS

This study is a cross-sectional study done over a period of 18 months. The study was conducted in Victoria hospital affiliated to Bangalore medical college & research institute.

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Duration of the study was Eighteen months from September 2013 to February 2015.60 patients were enrolled in the study diagnosed with T2 DM, who were willing to participate in the study were evaluated and compared as per the proforma designed for the purpose of the study. As per the aim of the study, the comparison was done among two groups with 30 patients in each group. Thyroid function tests was done in all the patients and 2 groups was made, the first group included diabetic patients with thyroid dysfunction and the second group included diabetic patients without thyroid dysfunction. Then, lipid profile was done for patients in both these groups. An inclusion criterion was T2 DM patients aged more than 18 years. Exclusion criteria were patients taking drugs affecting thyroid profile and patients with known hypertension, ischemic heart disease, smokers and chronic alcoholics.

**Statistical analysis**

Statistical analysis was done using spss 16 software. Since the distribution of data was parametric, Chi square test and Fischers exact test were used to study the differences between categorical data. Student ‘t’ test was used to assess associations between numerical variables.

**RESULTS**

Sixty patients with T2 DM were divided into two groups of 30 each- those with thyroid dysfunction and those without thyroid dysfunction. These patients were the outpatients or inpatients of Victoria hospital affiliated to Bangalore medical college & research institute. The study was conducted over a period of 18 months.

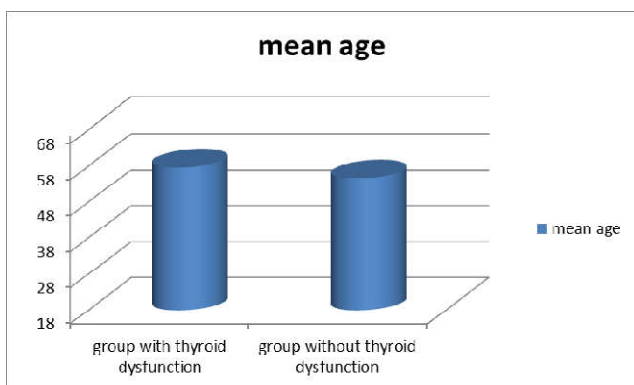
**Age distribution**

The minimum age of diabetic patients in the group with thyroid dysfunction was 41 years and the maximum age was 75 years; with a mean age of 57.56 years and standard deviation of 8.5. Minimum age of diabetic patients in the group without thyroid dysfunction was 35 years and the maximum age was 68 years; with a mean age of 54.6 years and standard deviation of 9.08. (Table 1)

**Table 1. Age distribution**

	Mean age in yrs	Standard deviation
Group with thyroid Dysfunction	57.56	8.5
Group without thyroid Dysfunction	54.6	9.08

P value : 0.162(Pearson Chi-Square test)



**Figure 1. Mean age of distribution in patients of two groups**

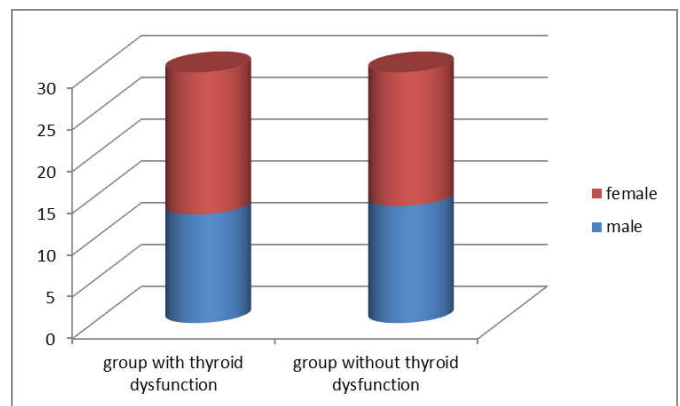
**Sex distribution**

The male and female distribution among diabetic patients in the group with thyroid dysfunction was 43.3% and 56.7% respectively, and that of diabetic patients in the group without thyroid dysfunction was 46.66% and 53.44% respectively. The gender distribution was matched. (Table 2)

**Table 2. Sex distribution**

Sex	Group with thyroid dysfunction	Group without thyroid dysfunction
Male	13	14
Female	17	16
Total	30	30

P value 0.795(Pearson Chi-Square test)



**Figure 2. Sex distribution among the two groups**

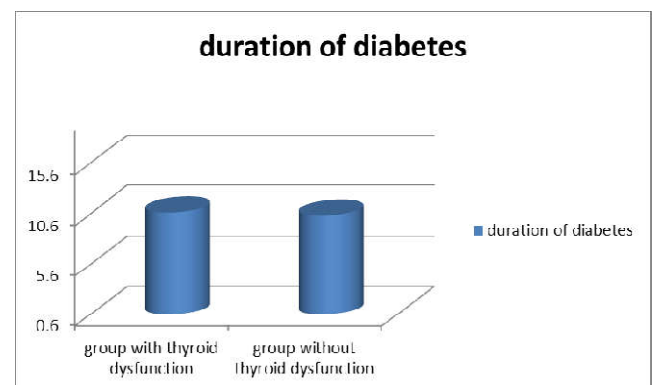
**Duration of diabetes**

Among patients in the group with thyroid dysfunction, the duration of diabetes was minimum of 1 year, maximum of 20 years with a mean duration of 8.62 years and standard deviation of 4.4. The duration of diabetes was minimum of 6 months, maximum of 13 years with a mean duration of 6.27 years and standard deviation of 3.29 among patients in the group without thyroid dysfunction. (Table 3)

**Table 3. Duration of diabetes**

	Mean duration of Diabetes in years	Standard Deviation
Group with thyroid Dysfunction	8.62	4.4
Group without thyroid dysfunction	6.27	3.29

P value : 0.328(Pearson Chi-Square test)



**Figure 3. Mean duration of diabetes among two groups**

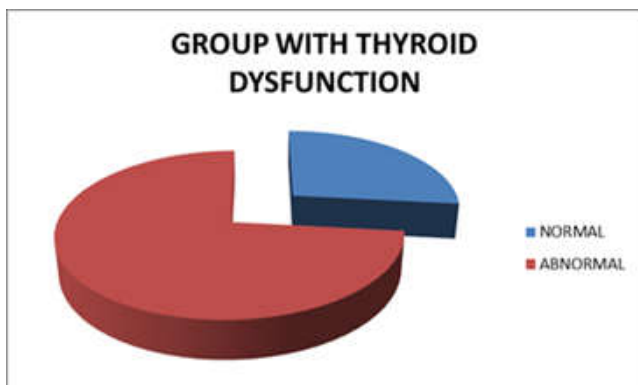
**Fasting lipid profile**

Fasting lipid profile was considered abnormal when one of its components such as total cholesterol / LDL / HDL / triglycerides was abnormal. Majority of diabetic patients in the group with thyroid dysfunction were having abnormal lipid profile (73.3%). This value was found to be statistically significant with a p value of 0.01. (Table 4)

**Table 4. Fasting lipid profile**

FLP	Group with thyroid dysfunction	Group without thyroid dysfunction
Abnormal	22	10
Normal	8	20

P value: 0.002(Pearson Chi-Square test)

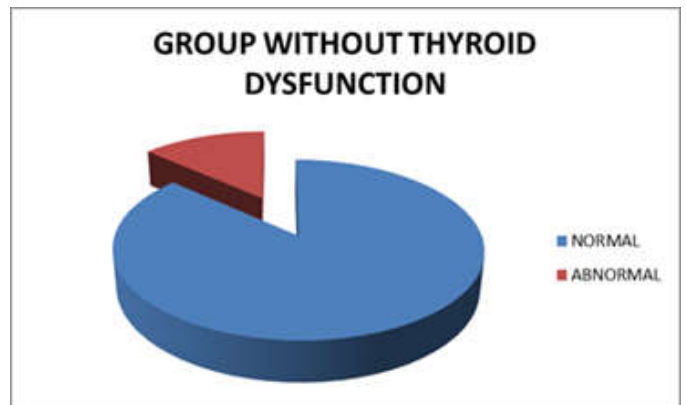
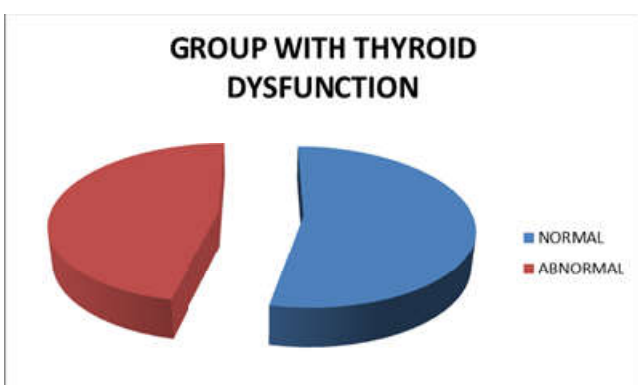


**Figure 4. Variability in fasting lipid profile among the two group**

**Table 5. HDL cholesterol**

HDL	Group with thyroid dysfunction	Group without thyroid dysfunction
Abnormal	14	4
Normal	16	26

P value: 0.01(Fisher's Exact Test)



**Figure 5. Variability in HDL Cholesterol among the two groups**

**HDL cholesterol**

HDL cholesterol was low in 46.6% of patients in the group with thyroid dysfunction and in patients in the group without thyroid dysfunction, HDL cholesterol was low in 13.6%. This value was found to be statistically significant with a p value of 0.01. (Table 5)

**Conclusion**

Dyslipidemia is predominantly seen among diabetic patients with thyroid dysfunction. There is an increase in LDL/VLDL/TGs, along with reduction in HDL cholesterol among diabetic patients with thyroid dysfunction.

**DISCUSSION**

A descriptive study was done among 60 patients with known type 2 diabetes mellitus who visited the Medicine OPD or who were admitted in the medical wards of Victoria Hospital; attached to Bangalore medical college and research institute. The patients were divided into two groups; based on the presence or absence of thyroid dysfunction, with 30 patients in each group, and a comparison between the groups was done with respect to the fasting lipid profile. Baseline thyroid function tests – TSH/T3/T4 was done in all patients and those with thyroid dysfunction were included in one group and patients without thyroid dysfunction were included in the other group. Fasting lipid profile was also done in both these groups and comparison made. In this study, all the patients in the group with thyroid dysfunction were found to be hypothyroid. The age of patients in the group with thyroid dysfunction ranged from 41-75 years, mean age 57.56 ± 8.553 yrs. The age of patients in the group without thyroid dysfunction ranged from 35-68 years, mean age 54.6 ± 9.08 yrs. The male and female distribution among the former group was 43.3% and 56.7% respectively, and that of latter was 46.66% and 53.44% respectively. The difference in mean age and sex was not statistically significant (p value of 0.162 and 0.795 respectively). In the group with thyroid dysfunction, the duration of diabetes ranged from 1 – 20 years with a mean duration of 8.62 years and standard deviation of 4.4 years. In the group without thyroid dysfunction duration of diabetes ranged from 6 months- 13 years with a mean of 6.27 years and standard deviation of 3.29 years. The duration of diabetes between the two groups was not statistically significant (p value 0.328). Fasting lipid profile was considered abnormal when one of its components – total cholesterol /LDL /HDL/ triglycerides was abnormal. Majority of patients in the group

with thyroid dysfunction were having abnormal lipid profile (73.3%). Only 33.3% of patients in the group without thyroid dysfunction were having abnormal lipid profile. This association was found to be statistically significant with a p value of 0.01. Study by Yang *et al.* also showed significant difference in the fasting lipid profile especially with a significant difference in LDL in the group of diabetic patients with thyroid dysfunction (Yang *et al.*, 2010) HDL cholesterol was low in 46.6% of patients in the group with thyroid dysfunction. Among patients in the group without thyroid dysfunction, HDL was low only in 13.6%. This association was found to be statistically significant with a p value of 0.01. Mean HDL in patients with thyroid dysfunction was  $37.64 \pm 1.42$  mg/dl and in patients without thyroid dysfunction, mean HDL was  $44.18 \pm 3.39$  mg/dl Yang *et al.*, although SCH patients had lower mean value of serum HDL, compared with euthyroid subjects, the difference was not statistically significant (Yang *et al.*, 2010)

According to the CDC, 97% of adults with diabetes have one or more lipid abnormalities while the prevalence of diabetic dyslipidemia varies from 25% to 60% in other studies (Luboshitzky *et al.*, 2002). The major lipid abnormality is elevated total cholesterol, TG, and LDL. SCH is associated with increased levels of TC and LDL-C (Toruner *et al.*, 2008). In addition, some studies have shown that in SCH, dyslipidemia may also be accompanied by increased TGs (Erdem *et al.*, 2008) and decreased HDL-C levels (Efstathiadou *et al.*, 2001). Moreover, subjects with high normal TSH levels (2-4 mIU/L), with positive antithyroid antibodies may also exhibit elevated cholesterol levels. Most studies have shown increased Lp(a) levels related to SCH (Canaris *et al.*, 2000). The Colorado Health Fair study showed that the mean total cholesterol level was 216 mg/dL for euthyroid patients and 224 mg/dL for patients with SCH (Jameson *et al.*, 2015). A study done by Shashi *et al.* showed that there was a significant decrease in HDL levels and increase in LDL, triglycerides, VLDL levels in subclinical and overt hypothyroid diabetic patients. Another study conducted by Handisurya *et al.* (2008) whose results showed that thyroxine [T4] replacement therapy improves the insulin secretion profile and reduced demand on beta-cells of pancreas thereby improving insulin sensitivity. This in turn reduces the dyslipidemia seen in hypothyroid diabetic patients. The significant number of type 2 diabetic patients with thyroid dysfunctions had dyslipidemia. The increase in LDL/VLDL/TGs in the group with thyroid dysfunction was found in 64% and the group without thyroid dysfunction was found to be 63%. HDL cholesterol was low in 46.6% of patients in the group with thyroid dysfunction. Among patients in the group without thyroid dysfunction, HDL was low only in 13.6%. This association of HDL abnormality was found to be statistically significant with a p value of 0.01.

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