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A DESCRIPTIVE STUDY TO DETERMINE ALTERATION IN LIPID PROFILE IN NEWLY DIAGNOSED PATIENTS OF THYROID DISORDER

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INTRODUCTION

Thyroid function regulates a wide array of metabolic parameters. It has long been known that thyroid hormones are of vital importance in maintaining the initial level of phospholipids in cell membranes and fatty acids composition of the lipids. [1] Thyroid function significantly affects lipoprotein metabolism as well as some cardiovascular disease (CVD) risk factors, thus influencing overall CVD risk. Indeed, even within the normal range of thyroid-stimulating hormone (TSH) values, change in total cholesterol (TC), low-density lipoprotein cholesterol (LDL-C) and triglycerides (TGs) and high-density lipoprotein cholesterol (HDL-C) levels has been observed with changing TSH. [2,3]

Thyroid hormones induce the 3-hydroxy-3-methylglutaryi coenzyme A (HMG-CoA) reductase, which is the first step in cholesterol biosynthesis. Moreover, triiodothyronine (T3) upregulates LDL receptors by controlling the LDL receptor gene activation. This T3-mediated gene activation is done by the direct binding of T3 to specific thyroid hormone responsive elements (TREs). Furthermore, T3 controls the sterol regulatory element-binding protein-2 (SREBP-2), which in turn regulates LDL receptor's gene expression. T3 has also been associated with protecting LDL from oxidation. [2]

Thyroid hormones can influence HDL metabolism by increasing cholesteryl ester transfer protein (CETP) activity, which exchanges cholesteryl esters from HDL2 to the very low density lipoproteins (VLDL) and TGs to the opposite direction. In addition, thyroid hormones stimulate the lipoprotein lipase (LPL), which catabolizes the TG-rich lipoproteins, and the hepatic lipase (HL), which hydrolyzes HDL2 to HDL3 and contributes to the conversion of intermediate- density lipoproteins (IDL) to LDL and in turn LDL to small dense LDL (sdLDL).

Another effect of T3 is the up-regulation of apolipoprotein AV (ApoAV), which plays a major role in TG regulation. Indeed, increased levels of ApoAV have been associated with decreased levels of TGs. Proposed mechanisms for this effect include the decrease of hepatic VLDL-TG production and the increase of plasma LPL levels and activity, resulting in increase of lipoprotein remnant generation due to enhanced LPL-mediated lipolysis of VLDL-TG. Moreover, a greater clearance of lipoprotein core remnants, caused by increased hepatic uptake due to an enhanced affinity for the LDL receptor, has also been ascribed to ApoAV. [3]

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AIM AND OBJECTIVE OF STUDY

To study lipid profile changes in patients of hypothyroidism and hyperthyroidism.

MATERIALS AND METHODOLOGY

Study Type: Cross-sectional descriptive study

The present study was done in patients admitted to Civil hospital Ahmedabad, Gujarat over a period of 2 years.

Sample size selected for study :

A total 50 patients with newly diagnosed thyroid disorder were selected for study.

The Institutional Ethics Committee approval has been taken before the commencement of the study.

Selection Criteria :

Inclusion Criteria:

1. Age>18 years.
2. Patients with newly diagnosed cases of hypothyroidism and hyperthyroidism were included in the study.
3. Those who gave informed consent.

Exclusion Criteria:

1. Those whose lipid abnormalities could be attributable to causes other than thyroid disorders.
2. Those who did not give consent.

Investigations :

The patients selected underwent the following investigations as and when required.

1. fT3, fT4, serum TSH
2. LIPID PROFILE

Total cholesterol

High Density Lipoprotein

Low Density Lipoprotein

Triglyceride

3. USG of neck

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RESULT

This study was carried out in 50 newly diagnosed thyroid disorder patients admitted in medicine department of civil hospital Ahmedabad, between October 2020 to December 2022.

Normal reference range for thyroid parameters was taken as below : TSH - 0.35 to 5.5 microIU/ml

Free T4 - 0.8 to 2.7 ng/dl

Free T3 – 2.8 to 4 pg/ml

They were divided in patients with hypothyroid (40 patients)and hyperthyroid disease (10 patients).

Table 1 Gender distribution in hypo and hyperthyroidism

	Hypothyroidism	**Hyperthyroidism**
Gender	**Frequency**	**Frequency**
Female	36 (90%)	8 (80%)
Male	4 (10%)	2 (20%)
Total	40 (100%)	10 (100%)

So, from this table it is clearly evident that both hypo and hyperthyroidism is more common in females than males.

Table 2 Distribution of lipid profile in hypothyroidism

Lipid parameter	**Total cholesterol (mg/dl)**	**LDL (mg/dl)**	**Triglyceride (mg/dl)**	**HDL (mg/dl)**
	Frequency	**Frequency**	**Frequency**	**Frequency**
Normal	16 (40%)	14 (35%)	30 (75%)	26 (65%)
High/Abnormal	24 (60%)	26 (65%)	10 (25%)	14 (35%)
Total	40 (100%)	40 (100%)	40 (100%)	40 (100%)

Total cholesterol

- Normal: <200 mg/dl
- High : >=200 mg/dl

LDL

- Normal: <100 mg/dl
- High: >=100 mg/dl

Triglyceride

- Normal: <150 mg/dl
- High: >=150 mg/dl

HDL

- Normal: >=50 mg/dl
- Abnormal: <50 mg/dl

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Table 3 Mean value of lipid parameters in hypothyroidism

Lipid parameter	Present study	Canaris et al[4]	Waled et al[5]
Mean total cholesterol (mg/dl)	223	251	191.84
Mean LDL (mg/dl)	135.85	170	124.50
Mean triglyceride (mg/dl)	143	180	210
Mean HDL (mg/dl)	52	53	38.44

Table 4 Mean value of lipid parameters in hyperthyroidism

Lipid parameter	Present study	Canaris et al[4]	Waled et al[5]
Mean total cholesterol (mg/dl)	176	202	191.84
Mean LDL (mg/dl)	104.5	130	104.12
Mean triglyceride (mg/dl)	115.9	140	103.25
Mean HDL (mg/dl)	43.6	50	40.37

In present study , in 10 patients with hyperthyroidism

- The mean total cholesterol value is 176.5 mg/dl with standard deviation of 12.12 mg/dl.
- The mean LDL value is 104.5 mg/dl with standard deviation of 12.71 mg/dl.
- The mean triglyceride value is 115.9 mg/dl with standard deviation of 6.83 mg/dl.
- The mean HDL value is 43.6 mg/dl with standard deviation of 5.73 mg/dl.

DISCUSSION

Thyroid disorders (hypothyroidism and hyperthyroidism) are endocrine disorders which are diagnosed by clinical features and values of fT3, fT4 and TSH. In subclinical hypothyroidism and subclinical hyperthyroidism clinical features are mostly absent. The rate of conversion of subclinical hypothyroidism to overt thyroidism is 2 to 5% per year.

In this study I screened patients for hyperthyroidism and hypothyroidism and evaluated for dyslipidemia. In these patients, 40 patients were of hypothyroidism and 10 patients were of hyperthyroidism.

Among 40 patients of hypothyroidism, about 60% patients were between 36-55 years of age. The mean age of presentation was found to be 42.5 years. According to our inclusion criteria all patients were above 18 years. Age is distributed from minimum 18 years to maximum 71 years. This prevalence rate increases as age increases.

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In regard to the sex distribution of patients (Table 1), it was clearly evident that the prevalence of hypothyroidism is more common among women. Among 40 cases of hypothyroidism, there were 36 females(90%) and only 4 males(10%). Among 10 cases of hyperthyroidism, there were 8 females (80%) and only 2 males (20%).

For analysing the lipid profile abnormalities, patients were subjected to fasting lipid profile comprising of serum total cholesterol, serum triglyceride, serum LDL and serum HDL.

In present study (table 2 & 3) patients with hypothyroidism, about 60% patients had high cholesterol. Mean cholesterol is 223mg/dl ranging from minimum 102mg/dl to maximum 311 mg/dl. Among 40 patients of hypothyroidism, 65% of patients were having LDL value more than 100 mg/dl. The mean LDL value was 135.85mg/dl ranging from 61 to 209 mg/dl. Triglyceride was elevated above normal value in about 25% patients with 10 patients with TG value above 150 mg/dl. The mean value of TG was 143 mg/dl with range of minimum 89 to maximum 252mg/dl. HDL value was found normal (>50 mg/dl) in 65% of patients. The mean HDL was 52 mg/dl ranging from minimum 30mg/dl to maximum 76mg/dl.

In table 3 Analysis of Colorado thyroid prevalence study by Canaris et al. showed mean Level of total cholesterol in patients of hypothyroidism was 251mg/dl, which is more in compared to euthyroid people. Mean triglyceride level in patients with hypothyroidism was 180 mg/dl. Mean LDL level was 170 mg/dl and mean HDL level of 53 mg/dl.[4] So this study also showed significant elevation of total cholesterol, TG and LDL in hypothyroidism patients compared to euthyroid patients.

In table 3 Study in clinical medical journal by American institute of science by Waled et al. showed mean level of total cholesterol in patients of hypothyroidism was 191.84 mg/dl. Mean triglyceride level in patients with hypothyroidism was 210 mg/dl. Mean LDL level was 124.50 mg/dl and Mean HDL level of 38.44 mg/dl.[5] So, this study also shows increase in LDL,TG and Total cholesterol level in patients with hypothyroidism.

In patients with hyperthyroidism in present study(table 4), the mean value of cholesterol is 176.5 mg/dl. It ranges from minimum value of 154 mg/dl to maximum value of 191 mg/dl. The mean value of LDL is 104.5 mg/dl, ranging from minimum value of 87 mg/dl to 130 mg/dl. The mean value of triglyceride in patients with hyperthyroidism is 115.9 mg/dl. The range of distribution is from minimum value of 107 mg/dl to maximum value of 125 mg/dl. The mean HDL level is 43.6 mg/dl, which ranges from minimum 33mg/dl to maximum 52 mg/dl.

In table 4 Analysis of Colorado thyroid prevalence study by Canaris et al. showed mean Level of total cholesterol in patients of hyperthyroidism was 202 mg/dl. Mean value of LDL in that study was 130 mg/dl in hyperthyroid patients. In regard to triglyceride level in patients with hyperthyroidism, the mean value of triglyceride was 140 mg/dl. The mean value of HDL in that study was 50 mg/dl in patients of hyperthyroidism.[4] So, this study shows only LDL level is elevated significantly and HDL level is borderline low in hyperthyroid patients.

In table 4 Study in clinical medical journal by American institute of science by Waled et al. showed mean level of total cholesterol in patients of hyperthyroidism was 191.84 mg/dl. Mean value of LDL in that study was 104.2 mg/dl in hyperthyroid patients, mean value of triglyceride in patient with hyperthyroidism was 103.25 mg/dl and of HDL was 40.37 mg/dl.[5] So, this study also shows only HDL level is abnormal in hyperthyroid patients.

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So, in present study, there is significant increase in total cholesterol and LDL level in patient with hypothyroidism. As the TSH level increases, serum total cholesterol and LDL level increases. There is no increase in values of components of lipid profile in patients with hyperthyroidism. HDL level of <50 mg/dl seen in most of the patients with hyperthyroidism.

CONCLUSION

This study showed prevalence of both hypothyroidism and hyperthyroidism is more in females. Most patients with newly diagnosed hypothyroidism are between 36-55 years. Significant elevation in total cholesterol and LDL level seen in patients with hypothyroidism. Not much significant changes seen in triglyceride and HDL levels in patients of hypothyroidism. Significant proportion of people with hyperthyroidism are underweight. Most patients with newly diagnosed hyperthyroidism were < 60 years of age. Most patients of hyperthyroidism have HDL levels <50mg/dl. Level of total cholesterol and triglycerides are within normal limit in patients with hyperthyroidism. So regular monitoring of lipid profile level particularly in hypothyroid patients is advisable to prevent future dyslipidemia related consequences.

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