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Correlation Between Lipid Profile and Thyroid Dysfunction in a Tertiary Care Hospital

Kiran Yadav[1]*, Ranjana Mandal[2]

[1]Associate Professor, Department of General Medicine, Amaltas Institute of Medical Sciences, Dewas, Madhya Pradesh, India

[2]Senior Resident, Department of General Medicine, AIIMS, Bhopal, Madhya Pradesh, India

***Address for Correspondence:** Dr. Kiran Yadav, Associate Professor, Department of General Medicine, Amaltas Institute of Medical Sciences, Dewas, Madhya Pradesh, India
E-mail: yadavkiran110@gmail.com

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ABSTRACT

Background: Thyroid hormones, which are categorized as catabolic hormones, have been found to regulate several metabolic functions, including the synthesis, mobilization, and breakdown of lipids. The total risk of CVD is influenced by thyroid hormones, which have a major impact on lipoprotein metabolism and certain risk factors for CVD. The aim is to find the relation between thyroid dysfunctions and lipid profile parameters in a tertiary care hospital.

Methods: The study is cross-sectional. A completely automated biochemistry analyzer was used to evaluate HDL cholesterol, triglycerides, and total cholesterol. A chemiluminescence assay was used to assess serum T3, T4, and TSH. Lipid ratio and thyroid hormone were correlated.

Results: The majority (40%) were in the 41–50 age range, and the majority were female (62.3%). The hypothyroid group had significantly greater average serum levels of TC, TG, VLDL, LDL cholesterol, and LDL/HDL ratio than the euthyroid group, while the hypothyroid group had significantly lower mean HDL levels than the euthyroid group ($p<0.05$). The hyperthyroid group had significantly lower mean serum levels of TC, TG, VLDL, LDL cholesterol, and LDL/HDL ratio than the euthyroid group ($p<0.05$), while the hyperthyroid group had significantly higher mean HDL levels ($p<0.05$).

Conclusion: All individuals with thyroid dysfunction should have their lipid profiles screened, and any underlying lipid problems must be found and addressed.

Key-words: Lipid Profile, Thyroid Profile, Hypothyroidism, Hyperthyroidism, Dyslipidemia

INTRODUCTION

Thyroid disease is among the most common endocrine disorders worldwide. In India, 42 million people suffer from a variety of thyroid conditions [1]. Because it produces the hormones tetraiodothyronine (T4) and triiodothyronine (T3), which are essential for healthy energy levels and an active lifestyle, the thyroid gland plays a vital role in human health. Thyroid hormones have long been recognized as being essential for preserving the starting concentration of phospholipids in cell membranes as well as the fatty acid composition of the lipids [2].

Lipid metabolism is mostly controlled by thyroid hormones, and thyroid dysfunction can lead to lipid abnormalities, which raise the risk of cardiovascular disease, hypertension, and endothelial dysfunction [3]. Increased use and oxidation of all major fuel substrates, such as protein, glucose, and lipids, are among the metabolic impacts of hyperthyroidism [4]. One of the most prevalent thyroid conditions in the globe is hypothyroidism [5]. It is described as a thyroid activity deficit. It is caused by decreased T4 and T3 secretion [6]. Abnormal thyroid function tests, which may or may not be associated with clinical symptoms, are a characteristic of a variety of disorders collectively referred to as hypothyroidism. Thyroid hormone production rate irregularities are the root cause of most thyroid

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disorders. While hypothyroidism is brought on by insufficient production, hyperactive tissue inside the thyroid gland results in overproduction and an excess of circulating free thyroid hormones, such as thyroxin (T4), triiodothyronine (T3), or both [7].

Common signs of hyperthyroidism include shortness of breath, palpitations, anxiety, tremor, heat sensitivity, weight loss despite increased or normal hunger, and bowel movements frequency were increased [8,9]. Common clinical signs of hypothyroidism include fatigue, weight gain, depression, joint and muscle pain, difficulty with cold tolerance, dry skin or dryness, thinning hair, heavy or irregular menstrual cycles or fertility problems, and reduced heart rate [10].

Despite elevated levels of free thyroxine (fT4) and free triiodothyronine (fT3), hyperthyroidism is typified by decreased blood TSH levels. One well-known sign of thyroid dysfunction is an altered lipid profile. In hypothyroidism, plasma LDL-C and HDL-C both rise, while in hyperthyroidism, they both fall [11]. Lipid levels significantly alter when thyroid dysfunction occurs because thyroid hormones regulate the metabolism of lipids and lipoproteins [12]. The study investigated the relationship between lipid profiles and thyroid disorders, including hypothyroidism and hyperthyroidism.

MATERIALS AND METHODS

Study design- This was a prospective cross-sectional hospital-based study conducted at the Department of General Medicine, Amaltas Institute of Medical Sciences, Dewas, Madhya Pradesh, India from Dec 2023 to Oct 2024.

Participants and Study Setting- Three groups of thirty patients with hypothyroidism (the hypothyroid group), thirty patients with hyperthyroidism (the hyperthyroid group), and thirty individuals with normal thyroid function (the euthyroid group) comprised the participant pool, which consisted of 90 subjects in total.

Patients having a diagnosis of either hyperthyroidism or hypothyroidism between the ages of 30 and 60 who had received treatment for at least a year were enrolled in the hypothyroid and hyperthyroid groups. These people were selected from the corresponding wards as well as the medical and surgical outpatient sections. Age-matched, healthy adults with confirmed normal thyroid function made up the control group.

Inclusion Criteria

- Patient's ≥ 18 years of age with both genders
- Patients diagnosed with hypothyroidism, Hyperthyroid or euthyroid
- Patients not taking any hypolipidemic drugs and thyroxine
- Participants who give the study their signed informed permission

Exclusion Criteria

- Patient's less than 18 years of age.
- Patients having pregnancy, diabetes mellitus, hypercortisolism or pituitary diseases
- History of oral contraceptives, steroids, androgens, and immunosuppressant drugs
- The study did not include participants with a history of other infectious or systemic disorders.
- Patients who did not provide written informed consent for the study

Methodology- A thorough patient history was painstakingly gathered and recorded. All participant groups underwent routine systemic examinations and blood pressure checks. All patients and control subjects had their blood cholesterol levels and thyroid hormones measured. There was a classification into several groups. Based on the results of thyroid function tests and clinical assessments. The radioimmunoassay method was used to quantify T3, T4, and TSH. At the same time, all three of the previously mentioned groups' Triglycerides, high-density lipoprotein (HDL), very low-density lipoprotein (VLDL), low-density lipoprotein (LDL), total cholesterol, and the LDL/HDL ratio were all estimated.

Statistical Analysis- The SPSS software, version 20, was used to do the statistical analysis. The data were analyzed using the chi-square test. Statistical significance was defined as a significance level of $p<0.05$.

RESULTS

In the present study, 90 patients with thyroid disorders were recruited. Among the patient's majority of them (40%) were 41- 50 years age group, with female predominance (62.3%). Most of them (61.2%) were residing in urban areas and 42.2% of patients were overweight (Table 1).

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Table 1: Socio-Demographic variables of study participants

Socio-Demographic Variables		Frequency (90)	Percentage (%)
Age (In Years)	18-30	4	4.4
	31-40	21	23.3
	41-50	36	40
	More than 50	29	32.3
Gender	Male	34	37.7
	Female	56	62.3
Residential Area	Rural	35	38.8
	Urban	55	61.2
Body Mass Index	Under Weight	5	.5.5
	Normal	47	52.3
	Overweight	38	42.2

The lipid profile results showed that the hypothyroid group had significantly higher mean serum levels of TC, TG VLDL, LDL cholesterol, and the LDL/HDL ratio than the euthyroid group ($p<0.05$), while the hypothyroid group had significantly lower mean HDL levels than the euthyroid group ($p<0.05$) (Table 2).

Table 2: Lipid profile parameters in hypothyroid and control group

Lipid parameters (mg/dl)	Hypothyroid Group (n=30)	Control Group (n=30)	p-value
Total cholesterol	272.10±47.82	169.45±20.10	p<0.05
Triglycerides	153.20±33.55	86.72±9.88	p<0.05
VLDL	27.41±6.98	19.15±2.23	p<0.05
LDL	211.05±42.17	113.76±22.46	p<0.05
HDL	23.80±4.96	46.92±8.62	p<0.05
LDL:HDLratio	4.43±1.87	3.27±0.75	p<0.05

The hyperthyroid group's mean blood levels of TC, TG, VLDL, LDL cholesterol, and the LDL/HDL ratio were significantly lower than those of the euthyroid group ($p<0.05$), while the hyperthyroid group's mean HDL levels were significantly higher than those of the euthyroid group ($p<0.05$) (Table 3).

Table3: Lipid profile parameters in hyperthyroid and control group

Parameters (mg/dl)	Hyperthyroid Group (n=30)	Control Group (n=30)	p-value
Total cholesterol	138.82±7.15	174.49±18.99	p<0.05
Triglycerides	85.17±4.38	88.95±10.09	p<0.05
VLDL	15.28±0.83	18.41±1.97	p<0.05
LDL	77.52±9.07	105.63±21.14	p<0.05
HDL	51.12±4.94	47.27±7.86	p<0.05
LDL:HDLratio	1.52±0.33	2.47±0.80	p<0.05

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DISCUSSION

After diabetes mellitus, hypothyroidism is the second most common endocrine disorder, although often being underdiagnosed. Hypothyroidism has been linked to lipid issues, according to numerous studies. Thyroid hormone affects every metabolic system, including lipid metabolism. If hypothyroidism is not treated, it can lead to early atherosclerosis and associated problems. Atherosclerosis, the underlying cause of CAD, in particular, is one of the leading causes of death and morbidity in humans.

The results of the current study showed a female preponderance, which was in line with studies conducted by Kebamo *et al.* [13] and Agarwal *et al.* [14]. Thyroid dysfunction is more common in women, which may be explained by a sex difference in the prevalence of autoimmune diseases.

The bulk of the participants in our study were between the ages of 41 and 50; similar results were also reported by Yadav *et al.* [15] and Al-odat *et al.* [16].

During the current investigation, the hypothyroid group's average serum total cholesterol levels were statistically significantly greater than the euthyroid group's. A similar increase in total cholesterol has been documented in earlier research by Upadhyay *et al.* [17] and Bansal *et al.* [18]. One explanation for this increase may be the modified hepatic lipase activity. Interestingly, hypothyroidism has been linked to a decrease in lipoprotein lipase activity.

The hypothyroid group's average serum triglyceride level was considerably greater than that of the normal euthyroid group, according to Zhenjiang *et al.* [19] and Chaudhuri et al. [20]. The greater triglyceride levels in the hypothyroid group are thought to be caused by decreased lipoprotein lipase activity. Plasma triglyceride production is unaffected by hypothyroidism, however, the fractional clearance of endogenous and exogenous triglycerides is significantly reduced.

In our investigation, the hypothyroid group's HDL levels significantly decreased in comparison to the euthyroid group; our findings are in line with those of Jawzal *et al*. [21] and Madhura *et al.* [22] These findings show that the lipid profile of overt and subclinical hypothyroidism is atherogenic. As compared to the euthyroid group, the hyperthyroid group's triglycerides, total cholesterol, VLDL, LDL, and LDL: HDL ratio significantly decreased. These findings were in line with those of Ramachandran *et al.* [23] and James *et al.* [24].

The current study found that the mean LDL/HDL ratio was significantly greater among the hypothyroid group than the euthyroid group. These results align with the findings of Ashwani *et al.* [25] and Ambrish *et al.* [26]. According to Fathima *et al.* [27], the mean LDL values in the hypothyroid group were statistically substantially higher than those in the euthyroid group. This could be due to a decreased fractional clearance of LDL particles.

CONCLUSIONS

A major risk factor for cardiovascular illnesses, the lipid profile, can fluctuate greatly due to dysregulated thyroid function. As a result, regular thyroid hormone monitoring may offer substantial benefits for the therapy and early management of heart disorders linked to thyroid malfunction. It is crucial to keep in mind that treating hyperlipidemia without developing systemic thyrotoxicosis may be possible if thyroid hormone analogues are appropriately targeted.

CONTRIBUTION OF AUTHORS

Research concept- Kiran Yadav, Ranjana Mandal
Research design- Kiran Yadav
Supervision- Ranjana Mandal
Materials- Kiran Yadav
Data collections- Kiran Yadav
Data analysis and interpretation- Ranjana Mandal
Literature research- Kiran Yadav, Ranjana Mandal
Writing article- Kiran Yadav
Critical review- Kiran Yadav, Ranjana Mandal
Article editing- Kiran Yadav
Final approval- Kiran Yadav, Ranjana Mandal

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