



CORRELATION BETWEEN LIPID ABNORMALITIES AND CARDIOVASCULAR RISK IN HYPOTHYROIDISM AT TERTIARY CARE HOSPITAL.

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Abstract

Background: Hypothyroidism is associated with significant metabolic disturbances, particularly affecting lipid metabolism. These lipid abnormalities may contribute to an increased risk of cardiovascular disease (CVD). Understanding the relationship between hypothyroidism and dyslipidemia is essential for early intervention and prevention of cardiovascular complications.

Objective: To evaluate the correlation between lipid abnormalities and cardiovascular risk in patients with hypothyroidism at a tertiary care hospital. **Methods:** This observational, cross-sectional study was conducted in the Department of Biochemistry in collaboration with the Department of General Medicine at Manipal College of Medical Sciences, Nepal, from June to November 2013. A total of 69 patients aged 18–60 years with overt or subclinical hypothyroidism were included. Lipid profiles were compared between hypothyroid patients and healthy controls. Demographic data, BMI, and age distribution were also analyzed. Statistical significance was set at $p < 0.05$.

Results: Of the 69 patients, 67% were female and 33% male ($p = 0.012$). BMI distribution showed 41% had normal BMI, 35% were overweight, and 17% were obese ($p = 0.038$). The 41–50 age group showed a significant representation (26%, $p = 0.031$). Lipid analysis revealed significantly higher levels of total cholesterol (220.5 ± 35.2 mg/dL), LDL-C (140.6 ± 28.4 mg/dL), and triglycerides (160.8 ± 45.7 mg/dL) in the hypothyroid group compared to controls, while HDL-C was significantly lower (42.1 ± 6.3 mg/dL) (all $p < 0.05$).

Conclusion: Hypothyroidism is significantly associated with dyslipidemia, including elevated total cholesterol, LDL-C, triglycerides, and reduced HDL-C levels, which collectively contribute to increased cardiovascular risk. Early screening and appropriate management of lipid profiles in hypothyroid patients are critical to prevent long-term cardiovascular complications.

Keywords: Hypothyroidism, Dyslipidemia, Cardiovascular Risk, Lipid Profile, Thyroid Hormones, LDL, HDL

Introduction:

Hypothyroidism, whether overt or subclinical, is increasingly recognized not only as an endocrine disorder but also as a condition with significant systemic metabolic effects. Thyroid hormones are integral to the regulation of lipid metabolism, influencing lipid synthesis, transport, and degradation.

A deficiency in thyroid function disrupts these processes, often resulting in elevated levels of total cholesterol (TC), low-density lipoprotein cholesterol (LDL-C), triglycerides (TG), and alterations in high-density lipoprotein cholesterol (HDL-C).¹

Subclinical hypothyroidism has been reported to have prevalences from 4–10% in the general population to 7–26% in the geriatric population.²

These lipid abnormalities are of clinical importance because they are established risk factors for atherosclerosis and cardiovascular disease (CVD). Overt hypothyroidism has been more consistently associated with adverse lipid profiles and increased cardiovascular risk.³

Thyroid disease is associated with various metabolic abnormalities, due to the effects of thyroid hormones on nearly all major metabolic pathways. Thyroid hormones regulate the basal energy expenditure through their effect on protein, carbohydrate, and lipid metabolism. This might be a direct effect or an indirect effect by modification of other regulatory hormones such as insulin or catecholamines.⁴

Effects of Thyroid Hormones on Lipid Metabolism

Thyroid hormones influence all aspects of lipid metabolism including synthesis, mobilization, and degradation.⁵ Thyroid hormones stimulate cholesterol synthesis by inducing 3-hydroxy-3-methylglutaryl coenzyme A reductase in the liver.⁶

an increased liver fatty acid synthesis and oxidation is observed due to enhanced acetyl-CoA carboxylase 1 and carnitine palmitoyl transferase Ia expression leading to increased VLDL biosynthesis.⁷

Lipid Abnormalities in Hypothyroidism

Thyroid hormones are essential regulators of lipid synthesis, mobilization, and degradation; hence, their deficiency leads to significant lipid disturbances. Research consistently showed that individuals with hypothyroidism tend to have elevated total cholesterol (TC) and low-density lipoprotein cholesterol (LDL-C), which are key contributors to atherosclerosis and cardiovascular risk.⁸

Material and methods: Study was conducted in the of department of Biochemistry in collaboration with department of General Medicine, a period from June to November 2013 at Manipal college of Medical Sciences, Nepal.

Study design: observational, cross-sectional study

Sample size: total 69 samples

Inclusion criteria:

1. Patients aged 18-60 years with both genders
2. Diagnosed with overt or subclinical hypothyroidism (based on TSH and free T4 levels).
3. Attending the tertiary care hospital during the study period.
4. Not on lipid-lowering medications at the time of enrollment.
5. Willing to provide written informed consent.

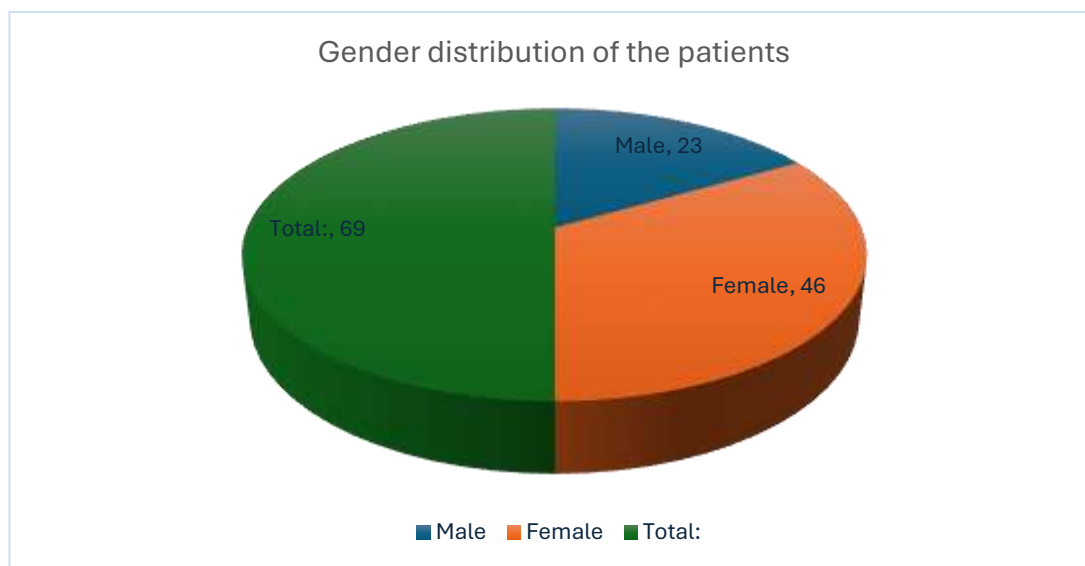
Exclusion criteria:

1. History of cardiovascular disease (e.g., coronary artery disease, stroke).
2. Pregnant or lactating women.
3. Chronic kidney disease or liver dysfunction.
4. Unwilling or unable to give informed consent.
5. Current use of medications affecting lipid metabolism (e.g., statins, steroids, oral contraceptives).

Result:**Table 1:** represent Gender distribution of the patients

Gender of the patients	Number of the patients	Percentage in (%)	P value
Male	23	33	0.012* Statistically significant
Female	46	67	
Total:	69	100%	

total 69 patients, 23 (33%) were male and 46 (67%) were female. The difference in gender distribution is statistically significant, with a p-value of 0.012, indicating that the proportion of female patients is significantly higher than that of male patients ($p < 0.05$).

**Figure 1:** diagrammatical represent Gender distribution of the patients**Table 2:** represents BMI Distribution of Patients

BMI Category (kg/m ²)	Number of Patients	Percentage (%)	P-value
Underweight (<18.5)	5	7%	0.038* Statistically significant
Normal (18.5–24.9)	28	41%	
Overweight (25.0–29.9)	24	35%	
Obese (≥ 30.0)	12	17%	
Total	69	100%	

The data presents the distribution of Body Mass Index (BMI) among 69 patients, showing that 7% were underweight, 41% had a normal BMI, 35% were overweight, and 17% were obese. The statistical analysis yielded a p-value of 0.038, which is less than the conventional threshold of 0.05, indicating that the observed differences in BMI distribution among the patients are statistically significant.

Table 2: table represents age distribution of the patients.

Age Group (years)	Number of Patients	Percentage (%)	p value
18–30	15	22	0.293
31–40	20	29	0.438
41–50	18	26	0.031*
51–60	16	23	0.090
Total	69	100%	0.041*

The distribution of patients across the age groups 18–30, 31–40, 41–50, and 51–60 shows some variation. The majority of patients are in the 31–40 age group (29%), followed by 41–50 (26%), 51–60 (23%), and 18–30 (22%).

The p-values for the 18–30 (0.293), 31–40 (0.438), and 51–60 (0.090) age groups are greater than 0.05, indicating that the number of patients in these groups does not significantly differ from what would be expected under a uniform distribution.

However, the 41–50 age group has a p-value of 0.031, which is less than 0.05, indicating a statistically significant difference in the number of patients in this group compared to a uniform distribution.

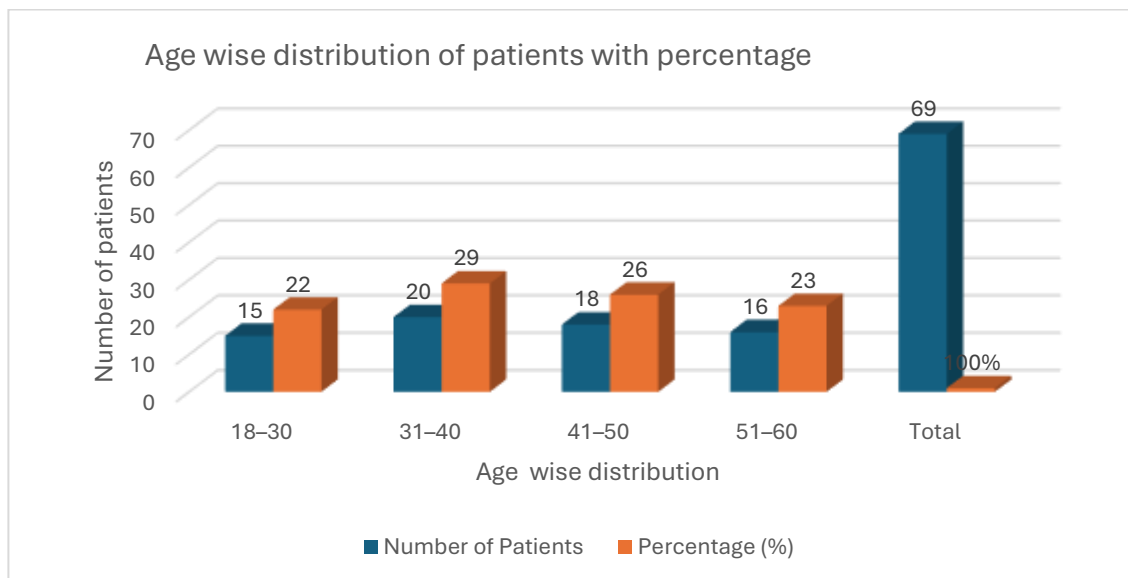


Figure 2: graphical represents age distribution of the patients.

Lipid Parameter	Hypothyroid Group (Mean \pm SD)	Control Group (Mean \pm SD)	p-value
Total Cholesterol (mg/dL)	220.5 \pm 35.2	180.3 \pm 30.1	0.001*
LDL-C (mg/dL)	140.6 \pm 28.4	110.7 \pm 25.6	0.002*
HDL-C (mg/dL)	42.1 \pm 6.3	50.2 \pm 7.1	0.015*
Triglycerides (mg/dL)	160.8 \pm 45.7	120.4 \pm 40.2	0.004*

The lipid profile comparison between hypothyroid patients and controls showed significant differences. The hypothyroid group had higher total cholesterol (220.5 \pm 35.2 mg/dL vs. 180.3 \pm 30.1 mg/dL, $p = 0.001$), LDL-C (140.6 \pm 28.4 mg/dL vs. 110.7 \pm 25.6 mg/dL, $p = 0.002$), and triglycerides (160.8 \pm 45.7 mg/dL vs. 120.4 \pm 40.2 mg/dL, $p = 0.004$). In contrast, HDL-C was significantly lower in the hypothyroid group (42.1 \pm 6.3 mg/dL) compared to controls (50.2 \pm 7.1 mg/dL, $p = 0.015$). These findings suggest that hypothyroidism is associated with a dyslipidemic profile, which may increase the risk of cardiovascular disease.

Discussion: This study confirms that hypothyroidism significantly disrupts lipid metabolism, leading to higher total cholesterol, LDL-C, and triglycerides, and lower HDL-C compared to controls.⁹ These changes increase cardiovascular risk. Differences in BMI and age also highlight metabolic effects of hypothyroidism. Early detection and treatment of lipid abnormalities are important to prevent cardiovascular complications.¹⁰

Conclusion: Conclusion

Hypothyroidism is associated with significant lipid abnormalities, including increased total cholesterol, LDL-C, and triglycerides, along with decreased HDL-C levels. These dyslipidemic

changes contribute to a higher risk of cardiovascular disease in affected patients. Regular screening and timely management of lipid profiles in hypothyroid patients are crucial to reduce cardiovascular morbidity and improve overall outcomes.

Limitations:

- Single-center study may not reflect broader population.
- Cross-sectional design prevents establishing causality.
- Possible variability in laboratory testing not addressed.
- Small sample size limits generalizability.

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