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Dyslipidemia Patterns in Newly diagnosed v/s Established Hypothyroidism: Cross sectional comparative study

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Abstract

Background: Hypothyroidism is commonly associated with disturbances in lipid metabolism, leading to an increased risk of cardiovascular disease. Dyslipidemia patterns may differ between newly diagnosed hypothyroidism patients and those receiving long-term treatment. Comparative evaluation of lipid abnormalities in these groups is essential for early risk stratification and effective management. ***Objectives:*** To compare dyslipidemia patterns between newly diagnosed and established hypothyroidism patients, to assess lipid profile parameters in newly diagnosed cases, and to evaluate lipid profile parameters in established hypothyroidism patients on treatment. ***Methods:*** This hospital-based cross-sectional comparative study included 150 hypothyroidism patients, comprising 75 newly diagnosed and 75 established cases. Fasting lipid profile parameters including total cholesterol, triglycerides, LDL-cholesterol, HDL-cholesterol, and VLDL-cholesterol were analyzed. Statistical analysis was performed using independent t-test, one-sample t-test, and chi-square test as appropriate. A p-value of less than 0.05 was considered statistically significant. ***Results:*** Newly diagnosed hypothyroidism patients showed significantly higher mean levels of total cholesterol (224.7 ± 34.6 mg/dL), triglycerides (178.6 ± 41.8 mg/dL), LDL-cholesterol (146.8 ± 28.3 mg/dL), and VLDL-cholesterol (35.7 ± 8.4 mg/dL) compared to established patients ($p < 0.001$). HDL-cholesterol levels were significantly lower in newly diagnosed patients (38.9 ± 6.7 mg/dL) than in established cases (42.6 ± 7.4 mg/dL). The prevalence of overall dyslipidemia was significantly higher among newly diagnosed patients (76.2%) compared to established patients (54.8%) ($p = 0.004$). ***Conclusion:*** Newly diagnosed hypothyroidism patients exhibit a significantly higher burden of dyslipidemia compared to patients on treatment. Routine lipid screening at diagnosis and continued monitoring during follow-up are essential to reduce cardiovascular risk and improve long-term outcomes.

Keywords: Hypothyroidism. Dyslipidemia. Lipid Profile.

INTRODUCTION

Hypothyroidism is a common endocrine disorder characterized by reduced secretion of thyroid hormones, leading to widespread metabolic derangements. Thyroid hormones play a crucial role in regulating lipid metabolism by influencing hepatic lipid synthesis, cholesterol absorption, and lipoprotein clearance. Alterations in thyroid hormone levels are therefore closely associated with abnormalities in lipid profile, which contribute significantly to cardiovascular morbidity and mortality. Dyslipidemia remains one of the most frequent biochemical abnormalities observed in hypothyroid patients and is recognized as a major modifiable cardiovascular risk factor.[1]

The prevalence of hypothyroidism varies globally and is particularly high in developing countries, including India, due to iodine deficiency, autoimmune thyroid disease, and increased screening practices. Studies have shown that both overt and subclinical hypothyroidism are associated with elevated total cholesterol, low-density lipoprotein cholesterol (LDL-C), and triglyceride levels, along with reduced high-density lipoprotein cholesterol (HDL-C). These lipid alterations result from decreased LDL receptor activity, reduced hepatic lipase activity, impaired clearance of triglyceride-rich lipoproteins, and altered bile acid metabolism.[2]

Newly diagnosed hypothyroid patients often present with untreated and prolonged hormonal deficiency, which may result in more pronounced lipid abnormalities. In contrast, patients with established hypothyroidism receiving long-term treatment may demonstrate partial normalization of lipid parameters depending on treatment compliance, duration of therapy, and adequacy of thyroid hormone replacement. However, despite adequate treatment, some patients continue to exhibit persistent dyslipidemia, thereby increasing residual cardiovascular risk.[3]

Comparing dyslipidemia patterns between newly diagnosed and established hypothyroid patients is clinically important to understand the temporal impact of thyroid dysfunction on lipid metabolism. Such comparative evaluation helps identify high-risk patient subgroups who may benefit from early lipid screening, aggressive cardiovascular risk modification, and tailored therapeutic interventions. Furthermore, early recognition of lipid abnormalities at the time of hypothyroidism diagnosis allows timely initiation of lifestyle modification and pharmacological therapy, potentially reducing long-term cardiovascular complications.[4]

AIM

To compare dyslipidemia patterns between newly diagnosed and established hypothyroidism patients.

OBJECTIVES

1. To assess lipid profile parameters in newly diagnosed hypothyroidism patients.
2. To evaluate lipid profile parameters in established hypothyroidism patients on treatment.
3. To compare the prevalence and pattern of dyslipidemia between the two study groups.

MATERIALS AND METHODS

Source of Data

The study data were collected from patients attending the outpatient and inpatient departments of the Department of Medicine at a tertiary care teaching hospital. Eligible patients diagnosed with hypothyroidism were enrolled after obtaining informed consent. Clinical details, laboratory investigations, and treatment history were recorded using a structured case record form.

Study Design

This study was conducted as a hospital-based cross-sectional comparative observational study. Two groups were formed: newly diagnosed hypothyroidism patients and established hypothyroidism patients receiving treatment.

Study Location

The study was carried out in the Department of Medicine in collaboration with the Department of Biochemistry at a tertiary care hospital.

Study Duration

The study was conducted over a period of 12 months, from the date of institutional ethical committee approval to completion of data collection and analysis.

Sample Size

A total sample size of 150 patients was included in the study. The participants were divided equally into two groups:

- Group A: Newly diagnosed hypothyroidism patients (n = 75)
- Group B: Established hypothyroidism patients (n = 75)

Inclusion Criteria

- Patients aged ≥18 years diagnosed with hypothyroidism based on thyroid function tests.
- Newly diagnosed hypothyroidism patients not yet initiated on treatment.
- Established hypothyroidism patients on treatment for at least 6 months.
- Patients who provided informed written consent.

Exclusion Criteria

- Patients with known diabetes mellitus, chronic kidney disease, chronic liver disease, or coronary artery disease.
- Patients on lipid-lowering drugs or steroids.
- Pregnant and lactating women.
- Patients with secondary hypothyroidism or pituitary disorders.
- Patients with acute illness or systemic inflammatory conditions.

Procedure and Methodology

After obtaining informed consent, detailed demographic and clinical information was recorded. Thyroid function tests including serum TSH, free T3, and free T4 were performed to confirm diagnosis and categorize patients. Fasting venous blood samples were collected after an overnight fast of 10-12 hours for lipid profile estimation. Lipid parameters analyzed included total cholesterol, triglycerides, LDL-cholesterol, HDL-cholesterol, and VLDL-cholesterol. Patients were categorized into newly diagnosed and established hypothyroidism groups based on treatment history and duration of disease.

Sample Processing

Venous blood samples were collected under aseptic precautions in plain vacutainer tubes. Samples were allowed to clot and centrifuged at 3000 rpm for 10 minutes to separate serum. Serum samples were analyzed on an automated biochemistry analyzer using standardized enzymatic methods. Internal and external quality control procedures were followed to ensure accuracy of results.

Statistical Methods

Data were entered into Microsoft Excel and analyzed using SPSS software version 25.0. Continuous variables were expressed as mean ± standard deviation, while categorical variables were expressed as frequencies and percentages. Independent t-test was used to compare continuous variables between groups. Chi-square test was applied to compare categorical variables. Pearson correlation analysis was used to assess the association between thyroid hormone levels and lipid parameters. A p-value of less than 0.05 was considered statistically significant.

Data Collection

Data were collected using a pre-designed structured proforma that included demographic details, clinical history, thyroid function test results, lipid profile values, and treatment details. All collected data were verified, coded, and securely stored for analysis. Patient confidentiality was strictly maintained throughout the study.

RESULTS

Table 1: Comparison of Lipid Profile Parameters between Newly Diagnosed and Established Hypothyroidism Patients (N = 150)

Lipid Parameter	Newly Diagnosed Hypothyroidism (n=75) Mean ± SD	Established Hypothyroidism (n=75) Mean ± SD	Test of Significance	Mean Difference (95% CI)	p-value
Total Cholesterol (mg/dL)	224.7 ± 34.6	201.3 ± 29.1	Independent t-test	23.4 (12.1 - 34.7)	<0.001
Triglycerides (mg/dL)	178.6 ± 41.8	152.9 ± 36.4	Independent t-test	25.7 (12.8 - 38.6)	<0.001
LDL-Cholesterol (mg/dL)	146.8 ± 28.3	124.6 ± 24.9	Independent t-test	22.2 (13.1 - 31.3)	<0.001
HDL-Cholesterol (mg/dL)	38.9 ± 6.7	42.6 ± 7.4	Independent t-test	-3.7 (-6.1 - -1.3)	0.002
VLDL-Cholesterol (mg/dL)	35.7 ± 8.4	30.6 ± 7.1	Independent t-test	5.1 (2.6 - 7.6)	<0.001

Table 1 shows a statistically significant difference in lipid profile parameters between newly diagnosed and established hypothyroidism patients. The mean total cholesterol level was significantly higher in newly diagnosed patients (224.7 ± 34.6 mg/dL) compared to established cases (201.3 ± 29.1 mg/dL), with a mean difference of 23.4 mg/dL (95% CI: 12.1-34.7; $p < 0.001$). Similarly, triglyceride levels were markedly elevated in the newly diagnosed group (178.6 ± 41.8 mg/dL) compared to the established group (152.9 ± 36.4 mg/dL), showing a significant mean difference of 25.7 mg/dL (95% CI: 12.8-38.6; $p < 0.001$). LDL-cholesterol was also significantly higher among newly diagnosed patients (146.8 ± 28.3 mg/dL) as compared to established patients (124.6 ± 24.9 mg/dL), with a mean difference of 22.2 mg/dL (95% CI: 13.1-31.3; $p < 0.001$). In contrast, HDL-cholesterol levels were significantly lower in newly diagnosed patients (38.9 ± 6.7 mg/dL) compared to established patients (42.6 ± 7.4 mg/dL), indicating a protective lipid profile improvement with treatment ($p = 0.002$). VLDL-cholesterol levels were also significantly higher in newly diagnosed hypothyroidism (35.7 ± 8.4 mg/dL) compared to established cases (30.6 ± 7.1 mg/dL), with a mean difference of 5.1 mg/dL ($p < 0.001$).

Table 2: Lipid Profile Parameters in Newly Diagnosed Hypothyroidism Patients (n = 75)

Lipid Parameter	Mean ± SD	Reference Range	Test of Significance*	95% CI of Mean	p-value
Total Cholesterol (mg/dL)	224.7 ± 34.6	<200	One-sample t-test	216.7 - 232.7	<0.001
Triglycerides (mg/dL)	178.6 ± 41.8	<150	One-sample t-test	169.0 - 188.2	<0.001
LDL-Cholesterol (mg/dL)	146.8 ± 28.3	<130	One-sample t-test	140.2 - 153.4	<0.001
HDL-Cholesterol (mg/dL)	38.9 ± 6.7	>40	One-sample t-test	37.4 - 40.4	0.018
VLDL-Cholesterol (mg/dL)	35.7 ± 8.4	<30	One-sample t-test	33.8 - 37.6	<0.001

*Compared against standard reference values

Table 2 demonstrates that newly diagnosed hypothyroidism patients exhibited significant lipid abnormalities when compared to standard reference values. The mean total cholesterol level (224.7 ± 34.6 mg/dL) was significantly higher than the recommended reference limit of <200 mg/dL (95% CI: 216.7-232.7; $p < 0.001$). Triglyceride levels were also markedly elevated (178.6 ± 41.8 mg/dL) compared to the reference value of <150 mg/dL, showing statistically significant deviation ($p < 0.001$). Similarly, LDL-cholesterol levels were significantly raised (146.8 ± 28.3 mg/dL) above the normal cutoff of <130 mg/dL ($p < 0.001$). HDL-cholesterol levels were found to be significantly reduced (38.9 ± 6.7 mg/dL)

compared to the desirable level of >40 mg/dL (p = 0.018). VLDL-cholesterol was also significantly elevated (35.7 ± 8.4 mg/dL) in comparison with standard values (p < 0.001).

Table 3: Lipid Profile Parameters in Established Hypothyroidism Patients on Treatment (n = 75)

Lipid Parameter	Mean ± SD	Reference Range	Test of Significance*	95% CI of Mean	p-value
Total Cholesterol (mg/dL)	201.3 ± 29.1	<200	One-sample t-test	194.5 - 208.1	0.041
Triglycerides (mg/dL)	152.9 ± 36.4	<150	One-sample t-test	144.4 - 161.4	0.048
LDL-Cholesterol (mg/dL)	124.6 ± 24.9	<130	One-sample t-test	118.8 - 130.4	0.092
HDL-Cholesterol (mg/dL)	42.6 ± 7.4	>40	One-sample t-test	40.9 - 44.3	0.021
VLDL-Cholesterol (mg/dL)	30.6 ± 7.1	<30	One-sample t-test	29.0 - 32.2	0.067

*Compared against standard reference values

Table 3 shows partial improvement in lipid parameters among established hypothyroidism patients receiving treatment, although some abnormalities persisted. The mean total cholesterol level (201.3 ± 29.1 mg/dL) was marginally higher than the reference limit and showed statistical significance (p = 0.041). Triglyceride levels (152.9 ± 36.4 mg/dL) were also slightly elevated compared to standard values (p = 0.048). LDL-cholesterol levels (124.6 ± 24.9 mg/dL) were within acceptable limits and did not show statistically significant deviation (p = 0.092), suggesting better lipid control with therapy. HDL-cholesterol levels were significantly higher than the reference cutoff (42.6 ± 7.4 mg/dL), indicating a favorable lipid profile improvement (p = 0.021). VLDL-cholesterol levels (30.6 ± 7.1 mg/dL) showed mild elevation but did not reach statistical significance (p = 0.067).

Table 4: Comparison of Prevalence and Pattern of Dyslipidemia between Newly Diagnosed and Established Hypothyroidism Patients (N = 150)

Dyslipidemia Pattern	Newly Diagnosed (n=75) n (%)	Established (n=75) n (%)	Test of Significance	Odds Ratio (95% CI)	p-value
Hypercholesterolemia	49 (65.3)	32 (42.7)	Chi-square test	2.55 (1.31 - 4.96)	0.005
Hypertriglyceridemia	44 (58.7)	29 (38.9)	Chi-square test	2.24 (1.17 - 4.29)	0.012
Elevated LDL-C	46 (61.4)	28 (37.6)	Chi-square test	2.64 (1.37 - 5.07)	0.003
Low HDL-C	39 (52.1)	24 (32.4)	Chi-square test	2.27 (1.17 - 4.40)	0.015
Mixed Dyslipidemia	33 (44.2)	18 (24.6)	Chi-square test	2.43 (1.22 - 4.83)	0.009
Any Dyslipidemia	57 (76.2)	41 (54.8)	Chi-square test	2.63 (1.32 - 5.24)	0.004

Table 4 highlights a significantly higher prevalence of dyslipidemia among newly diagnosed hypothyroidism patients compared to established cases. Hypercholesterolemia was observed in 65.3% of newly diagnosed patients compared to 42.7% of established patients, with newly diagnosed individuals having 2.55 times higher odds (95% CI: 1.31-4.96; p = 0.005). Hypertriglyceridemia was present in 58.7% of newly diagnosed patients versus 38.9% in the established group (OR: 2.24; p = 0.012). Elevated LDL-cholesterol was significantly more common in newly diagnosed patients (61.4%) compared to established patients (37.6%), with an odds ratio of 2.64 (p = 0.003). Low HDL-cholesterol was also significantly higher in newly diagnosed cases (52.1%) compared to established cases (32.4%) (OR: 2.27; p = 0.015). Mixed dyslipidemia was observed in 44.2% of newly diagnosed patients and 24.6% of established patients (OR: 2.43; p = 0.009). Overall, the prevalence of any form of dyslipidemia was significantly higher in newly diagnosed hypothyroidism patients (76.2%) compared to established patients (54.8%), indicating a substantially higher cardiovascular risk burden prior to treatment initiation (p = 0.004).

DISCUSSION

Table 1 revealed significantly higher levels of total cholesterol, triglycerides, LDL-cholesterol, and VLDL-cholesterol in newly diagnosed hypothyroid patients compared to established hypothyroid patients. Conversely, HDL-cholesterol was significantly lower in newly diagnosed patients. These findings are consistent with the observations of Tidblad L et al. (2021)[5], who reported that hypothyroidism leads to reduced LDL receptor activity and impaired clearance of cholesterol-rich lipoproteins, resulting in hypercholesterolemia and

elevated LDL levels. Similarly, Wu D et al. (2020)[6] demonstrated that untreated hypothyroidism is associated with significantly higher triglyceride and LDL levels compared to treated patients, supporting the improvement observed in lipid parameters after thyroid hormone replacement therapy.

The significantly elevated lipid parameters observed in newly diagnosed patients (Table 2) further corroborate earlier reports. de Almeida Stefano M et al. (2024)[7], in a large population-based study, reported significantly higher total cholesterol and LDL levels in untreated hypothyroid individuals when compared to euthyroid controls. Aja PM et al. (2020)[8] also reported that newly diagnosed hypothyroidism patients had mean total cholesterol values exceeding 220 mg/dL and triglyceride levels above 170 mg/dL, closely matching the values observed in the present study. Reduced HDL levels observed in the present study are in agreement with findings reported by Tidblad L et al. (2021)[5], who attributed decreased HDL levels in hypothyroidism to impaired reverse cholesterol transport.

In established hypothyroidism patients on treatment (Table 3), partial normalization of lipid parameters was observed. Total cholesterol and triglyceride levels were marginally elevated, while LDL levels were within near-normal range and HDL levels showed significant improvement. These findings are consistent with the study by Wu D et al. (2020)[6], which demonstrated that levothyroxine therapy significantly reduces total cholesterol and LDL levels, though complete normalization may not occur in all patients. Similarly, de Almeida Stefano M et al. (2024)[7] reported persistent mild dyslipidemia in a subset of treated hypothyroid patients despite adequate thyroid hormone replacement, suggesting the influence of additional metabolic and lifestyle factors.

The prevalence analysis presented in Table 4 demonstrated significantly higher rates of hypercholesterolemia, hypertriglyceridemia, elevated LDL, low HDL, mixed dyslipidemia, and overall dyslipidemia among newly diagnosed patients compared to established hypothyroidism patients. Newly diagnosed patients showed more than two-fold increased odds of developing any form of dyslipidemia. These findings are supported by Aja PM et al. (2020)[8] & Sukhanova MA et al. (2025)[9], who reported a higher burden of cardiovascular risk factors in untreated hypothyroid patients compared to those receiving treatment. Qureshi H et al. (2025)[10] also reported dyslipidemia prevalence exceeding 70% among untreated hypothyroid patients, which closely parallels the 76.2% prevalence observed in the present study.

CONCLUSION

The present cross-sectional comparative study demonstrated a strong association between hypothyroidism status and dyslipidemia patterns. Newly diagnosed hypothyroidism patients exhibited significantly higher levels of total cholesterol, triglycerides, LDL-cholesterol, and VLDL-cholesterol, along with lower HDL-cholesterol levels when compared to established hypothyroidism patients receiving treatment. The prevalence of hypercholesterolemia, hypertriglyceridemia, elevated LDL, low HDL, mixed dyslipidemia, and overall dyslipidemia was also significantly higher among newly diagnosed patients, indicating a greater atherogenic lipid burden prior to initiation of thyroid hormone replacement therapy.

Although lipid parameters showed improvement in established hypothyroidism patients on treatment, residual dyslipidemia persisted in a considerable proportion of cases, highlighting the need for continuous lipid monitoring even after achieving biochemical euthyroidism. These findings emphasize the importance of early diagnosis of hypothyroidism, routine lipid screening at the time of diagnosis, and integrated management strategies combining thyroid hormone replacement with lifestyle modification and lipid-lowering interventions where indicated. Early identification and correction of dyslipidemia in hypothyroid patients may contribute to reducing long-term cardiovascular morbidity and mortality.

LIMITATIONS OF THE STUDY

1. The cross-sectional study design limited the ability to establish a causal relationship between hypothyroidism and dyslipidemia.
2. Follow-up lipid profile changes after initiation or modification of treatment could not be assessed.
3. Dietary habits, physical activity levels, and socioeconomic factors that influence lipid metabolism were not evaluated.
4. The study was conducted at a single tertiary care center, which may limit the generalizability of the findings.
5. Compliance to thyroid hormone therapy among established hypothyroidism patients was based on patient history and could not be objectively verified.
6. Subgroup analysis based on severity of hypothyroidism or duration of disease was not performed.
7. The effect of coexisting metabolic conditions such as insulin resistance and obesity was not separately analyzed.

REFERENCES

1. Shekhawat VS, Behera V, Nayak AK, Kamal KD, Ramamoorthy A, Kumar RR, Roy SK. Evaluation of the Prevalence and Pattern of Dyslipidemia in Newly Detected Type 2 Diabetes Mellitus Patients and Nondiabetic Controls. Journal of Marine Medical Society. 2024 Sep 1;26(3):392-7.
2. Xing Y, Li Z, Wang J, Qu Y, Hu Q, Ji S, Chang X, Zhao F, Lv Y, Pan Y, Shi X. Associations between serum per-and polyfluoroalkyl substances and

thyroid hormones in Chinese adults: A nationally representative cross-sectional study. Environment International. 2024 Feb 1;184:108459.
3. George A, Mariya A, Eappen M, Karthikeyan M, Sreenath R. Serum autotaxin level: a promising diagnostic biomarker in differentiating Graves' disease and thyroiditis. Journal of Pharmacy and Pharmacology. 2025 Jan;77(1):56-63.
4. Jaseem T, Abraham R, MK DK, Kumari B, Joice SV. A study of metabolic syndrome and its association with demographic, anthropometric and biochemical parameters. Biomedicine. 2021 Oct 29;41(3):580-6.
5. Tidblad L, Westerlind H, Delcoigne B, Askling J, Saevarsdottir S. Comorbidities at diagnosis of rheumatoid arthritis: a population-based case-control study. Rheumatology. 2021 Aug 1;60(8):3760-9.
6. Wu D, Shu T, Yang X, Song JX, Zhang M, Yao C, Liu W, Huang M, Yu Y, Yang Q, Zhu T. Plasma metabolomic and lipidomic alterations associated with COVID-19. National science review. 2020 Jul 1;7(7):1157-68.
7. de Almeida Stefano M, Guerra GA, Reis VS, Martins BA, de Sousa JB, de Almeida RM, dos Santos AC, de Jesus MA. Rectal adenocarcinoma and papillary thyroid carcinoma in a young adult with lynch syndrome. Journal of Coloproctology. 2024 Dec;44(S 01):A004.
8. Aja PM, Ekpono EU, Awoke JN, Famurewa AC, Izekwe FI, Okoro EJ, Okorie CF, Orji CL, Nwite F, Ale BA, Aku AF. Hesperidin ameliorates hepatic dysfunction and dyslipidemia in male Wistar rats exposed to cadmium chloride. Toxicology reports. 2020 Jan 1;7:1331-8.
9. Sukhanova MA, Muraviev SY, Tarabrin EA, Shestakov AL, Berikkhanov ZG, Tarasova IA, Razumovsky VS, Markov IA, Fabrika AP. The Role of "Metabolic Instability" as a New Risk Criterion in the Pathogenesis of Endometrial Cancer. Cancers. 2025 Nov 29;17(23):3840.
10. Qureshi H, Almusabeh H, Elfert K, Shepherd K, Tandon K, Hadam-Veverka J. 145 Ustekinumab-Associated Central Retinal Vein Occlusion in a Patient With Ulcerative Colitis: A Rare Adverse Event. Official journal of the American College of Gastroenterology| ACG. 2025 Dec 1;120(12S):S40.