FREQUENCY OF DYSLIPIDEMIA IN PATIENTS HAVING SUBCLINICAL HYPOTHYROIDISM

Fatima Khalid[1], Umair Shakir[2*], Muhammad Hasnat Ahmad[3], Hina Tariq[4], Fnu Nimerta[5]

ABSTRACT

Introduction: Dyslipidemia and subclinical hypothyroidism are interconnected health conditions that often coexist. Subclinical hypothyroidism, characterized by slightly elevated thyroid-stimulating hormone levels, has been associated with adverse lipid profiles

Objectives: To determine the frequency of dyslipidemia in patients having subclinical hypothyroidism.

Study design: Cross sectional study

Settings: Department of Internal Medicine, Mayo Hospital, Lahore.

Study duration: From January 2023 to From June 2023.

Materials & Methods: This study employed a cross-sectional observational design. The study included adult patients (aged 18 and above) diagnosed with subclinical hypothyroidism, selected from outpatient clinics and endocrinology departments. Participants with known cardiovascular diseases, diabetes, or any other conditions influencing lipid metabolism were excluded. Baseline demographic information, medical history, and thyroid function test results were obtained from medical records. Lipid profiles, including total cholesterol, LDL-C, HDL-C, and triglycerides, were measured using standardized laboratory methods. Descriptive statistics were used to summarize demographic characteristics and lipid profiles.

Results: In the subclinical hypothyroidism patient group, there were 28 males (43.1%) with a mean age of 45.8 years (±7.2), a mean BMI of 27.5 kg/m² (±3.4), and 12 of them were smokers (42.9%). Additionally, there were 37 females (56.9%) with a mean age of 47.2 years (±6.5), a mean BMI of 28.3 kg/m² (±3.2), and 8 of them were smokers (21.6%). Out of the total 65 individuals, 37 (56.92%) were found to have dyslipidemia, while 28 (43.07%) did not exhibit dyslipidemia. Thus, the overall prevalence of dyslipidemia in the study population was determined to be 56.92%.

Conclusion: In conclusion, our study on subclinical hypothyroidism patients demonstrated a significant prevalence of dyslipidemia at 56.92%, highlighting the association between thyroid dysfunction and altered lipid profiles.

Keywords: Subclinical Hypothyroidis, Dyslipidemia, Prevalence, Lipid Profiles, Thyroid Dysfunction

[1]MBBS, MD Internal Medicine, Baptist Health UAMS NLR, fatimakhalid1891@gmail.com

[2*]MBBS, MD (USA), Clinical Observer, Department of Internal Medicine, Center of Excellence for Diabetes and Endocrinology Permian Basin, Odessa Texas 79765, dr.shakir_kemcolian@yahoo.com

[3]BS (Hons) Biochemistry, University of Veterinary & Animal Sciences (UVAS), Lahore, ahasnat2234@gmail.com

[4]MBBS, MD (USA), Assistant Professor of Medicine, Texas Tech University Health Sciences Center Permian Basin, Odessa Texas 79763

[5]MD (MBBS), ECFMG Certified, Extern, Evergreen Pediatrics, nimertavankwani@gmail.com

***Corresponding Author:** Dr. Umair Shakir

*dr.shakir_kemcolian@yahoo.com Contact; 4322501431

DOI: 10.53555/ecb/2024.13.02.21

INTRODUCTION

Dyslipidemia is a medical condition characterized by abnormal levels of lipids, such as cholesterol and triglycerides, in the blood. This imbalance poses a significant risk factor for cardiovascular diseases, including atherosclerosis, coronary artery disease, and stroke. Lipids are essential for various bodily functions, but an excess or imbalance can lead to the accumulation of plaque in blood vessels, hindering blood flow and increasing the likelihood of cardiovascular events.[1,2] There are two primary types of dyslipidemia: hyperlipidemia, marked by elevated levels of lipids, and hypolipidemia, characterized by unusually low levels. Elevated low-density lipoprotein cholesterol (LDL-C) and reduced high-density lipoprotein cholesterol (HDL-C) are common indicators of dyslipidemia. Genetic factors, lifestyle choices, and underlying health conditions contribute to its development.[3,4]

Dyslipidemia associated with subclinical hypothyroidism reflects an intricate interplay between thyroid function and lipid metabolism. Subclinical hypothyroidism is a condition in which thyroid hormone levels are elevated, but within the reference range, leading to subtle signs of thyroid dysfunction.[5,6] This thyroid imbalance can impact lipid profiles, contributing to dyslipidemia. Literature suggests that subclinical hypothyroidism is often linked to elevated levels of total cholesterol, low-density lipoprotein cholesterol (LDL-C), and triglycerides. Concurrently, there may be a decrease in high-density lipoprotein cholesterol (HDL-C). These lipid abnormalities, if left unaddressed, could heighten the risk of atherosclerosis and cardiovascular disease.[7,8]

The underlying mechanisms connecting subclinical hypothyroidism and dyslipidemia involve alterations in the expression of genes responsible for lipid metabolism. The thyroid hormones, particularly thyroxine (T4) and triiodothyronine (T3), influence the synthesis and breakdown of cholesterol and triglycerides. In subclinical hypothyroidism, the diminished thyroid function may disrupt this balance, leading to dysregulation of lipid metabolism.[9]

The management of dyslipidemia associated with subclinical hypothyroidism often involves addressing the thyroid dysfunction itself. Thyroid hormone replacement therapy may be considered to restore hormonal balance, consequently normalizing lipid profiles. Additionally, lifestyle modifications such as dietary changes, regular exercise, and smoking cessation play a crucial role in managing dyslipidemia in this context.[10]

The rationale for investigating the frequency of dyslipidemia in patients with subclinical hypothyroidism lies in the potential interrelation between thyroid function and lipid metabolism. Studies have suggested a link between subclinical hypothyroidism and alterations in lipid profiles, with elevated total cholesterol, LDL-C, and triglycerides, along with reduced HDL-C. Understanding the prevalence of dyslipidemia in this context is crucial due to its implication as a risk factor for cardiovascular diseases. Exploring this association aids in developing targeted interventions and management strategies, emphasizing the need for comprehensive care to address both thyroid dysfunction and dyslipidemia in order to mitigate cardiovascular risks in affected individuals.

MATERIALS AND METHODS

This study employed a cross-sectional observational design. This study adhered to ethical guidelines, obtaining approval from the institutional review board. Informed consent was obtained from all participants, and confidentiality of patient data was strictly maintained throughout the study.

The study included 65 adult patients (aged 18 and above) diagnosed with subclinical hypothyroidism, selected from outpatient clinics Department of Internal Medicine, Mayo Hospital, Lahore. Participants with known cardiovascular diseases, diabetes, or any other conditions influencing lipid metabolism were excluded.

Baseline demographic information, medical history, and thyroid function test results were obtained from medical records. Lipid profiles, including total cholesterol, LDL-C, HDL-C, and triglycerides, were measured using standardized laboratory methods. Subclinical hypothyroidism was defined based on elevated serum thyroid-stimulating hormone (TSH) levels with normal free thyroxine (FT4) levels. Dyslipidemia was diagnosed according to established guidelines, considering elevated total cholesterol, LDL-C, and triglycerides, as well as reduced HDL-C levels. Descriptive statistics were used to summarize demographic characteristics and lipid profiles. The frequency of dyslipidemia in subclinical hypothyroidism was calculated as the proportion of participants with abnormal lipid levels. Comparative analyses, such as chi-square tests, were employed to assess associations between subclinical hypothyroidism and dyslipidemia.

STUDY RESULTS

In the subclinical hypothyroidism patient group, there were 28 males (43.1%) with a mean age of 45.8 years (±7.2), a mean BMI of 27.5 kg/m² (±3.4), and 12 of them were smokers (42.9%). Additionally, there were 37 females (56.9%) with a mean age of 47.2 years (±6.5), a mean BMI of 28.3 kg/m² (±3.2), and 8 of them were smokers (21.6%) as shown in table 1.

In the subclinical hypothyroidism patient group, there were 65 individuals, and their lipid profile results were as follows: the mean total cholesterol level was 210.5 mg/dL (±25.8), the mean LDL cholesterol level was 138.4 mg/dL (±18.9), the mean HDL cholesterol level was 41.2 mg/dL (±5.6), and the mean triglyceride level was 168.3 mg/dL (±32.7) as shown in table 2. In this study, the frequency of dyslipidemia among the participants was assessed. Out of the total 65 individuals, 37 (56.92%) were found to have dyslipidemia, while 28 (43.07%) did not exhibit dyslipidemia. Thus, the overall prevalence of dyslipidemia in the study population was determined to be 56.92% as shown in table 3. In the lipid profile analysis of the 65 participants, notable abnormalities were observed. Specifically, 80.0% of the individuals had elevated total cholesterol, 73.8% exhibited elevated LDL cholesterol, 89.2% had reduced HDL cholesterol, and 69.2% showed elevated triglycerides. These findings highlight a significant prevalence of lipid profile irregularities within the study population shown in table 4.

The abnormal lipid profile was stratified by gender in Table 5. Among the 28 males, 71.4% had elevated total cholesterol, 64.3% exhibited elevated LDL cholesterol, 85.7% showed reduced HDL cholesterol, and 53.6% had elevated triglycerides. In comparison, among the 37 females, 86.5% had elevated total cholesterol, 81.1% exhibited elevated LDL cholesterol, 91.9% showed reduced HDL cholesterol, and 81.1% had elevated triglycerides. The p-values associated with these comparisons were 0.185, 0.127, 0.389, and 0.027*, respectively, indicating statistical significance for elevated triglycerides. These results suggest gender-based variations in the prevalence of abnormal lipid profiles, with a notable difference observed in elevated triglycerides between male and female participants. (*Significant at $p < 0.05$) given in table 5.

Table 6 presents the stratification of dyslipidemia by gender. Among the 28 males, 40.54% had dyslipidemia, while among the 37 females, a higher proportion, 59.45%, exhibited dyslipidemia. The p-value associated with this comparison was 0.003*, indicating a statistically significant difference. In the male group, 46.42% did not have dyslipidemia, while in the female group, 53.57% were without dyslipidemia. This analysis underscores a notable gender-based discrepancy in the prevalence of dyslipidemia, with a higher occurrence observed among female participants. (*Significant at $p < 0.05$) given in table 6.

Table 1: Demographics of the included patients

Variables	Gender	Mean Age (years)	BMI (kg/m²)	Smoking Status
Male	28 (43.1%)	45.8 ± 7.2	27.5 ± 3.4	12 (42.9%)
Female	37 (56.9%)	47.2 ± 6.5	28.3 ± 3.2	8 (21.6%)

Table 2: Lipid profile of included patients

Lipid Profile	Subclinical Hypothyroidism (n=65)
Total Cholesterol (mg/dL)	210.5 ± 25.8
LDL Cholesterol (mg/dL)	138.4 ± 18.9
HDL Cholesterol (mg/dL)	41.2 ± 5.6
Triglycerides (mg/dL)	168.3 ± 32.7

Table 3: Frequency of dyslipidemia in patients of this study

Variable	Category	Number	Percentage
Dyslipidemia	Present	37	56.92%
	Absent	28	43.07%
	Total	65	100%

Table 4: Abnormalities observed in lipid profile

Lipid Profile	Frequency (n=65)
Elevated Total Cholesterol	52 (80.0%)
Elevated LDL Cholesterol	48 (73.8%)

Reduced HDL Cholesterol	58 (89.2%)
Elevated Triglycerides	45 (69.2%)

Table 5: Stratification of abnormal lipid profile with gender

Lipid Profile / Demographic	Male (n=28)	Female (n=37)	p-value
Elevated Total Cholesterol	20 (71.4%)	32 (86.5%)	0.185
Elevated LDL Cholesterol	18 (64.3%)	30 (81.1%)	0.127
Reduced HDL Cholesterol	24 (85.7%)	34 (91.9%)	0.389
Elevated Triglycerides	15 (53.6%)	30 (81.1%)	0.027

Table 6: Stratification of dyslipidemia with gender

Dyslipidemia	Male (n=28)	Female (n=37)	p-value
Present	15(40.54%)	22(59.45%)	0.003
Absent	13(46.42%)	15(53.57%)	

DISCUSSION

Dyslipidemia and subclinical hypothyroidism are interconnected health conditions that often coexist. Subclinical hypothyroidism, characterized by slightly elevated thyroid-stimulating hormone levels, has been associated with adverse lipid profiles.[11] Individuals with subclinical hypothyroidism may exhibit elevated levels of total cholesterol, LDL cholesterol, and triglycerides, along with decreased levels of protective HDL cholesterol. This linkage underscores the importance of evaluating and managing lipid profiles in individuals with subclinical hypothyroidism to mitigate the heightened risk of cardiovascular complications associated with dyslipidemia.[12]

Comparing our study results with those of Banori et al. (2023) and Zhu et al. (2017), some noteworthy similarities and differences emerge.[13] Our study, focusing on subclinical hypothyroidism patients, revealed a gender distribution with 43.1% males and 56.9% females, with a mean age of 45.8 years for males and 47.2 years for females. In contrast, Banori et al. found a mean age of 40 years, with 63% females and 37% males. Zhu et al. reported a mean age of 38.76 years in the subclinical hypothyroidism group. These variations in age and gender distributions highlight the diversity within subclinical hypothyroidism populations across different studies.[14] While our findings align with Zhu et al. regarding the mean age, gender proportions differ, underscoring the influence of demographic factors in subclinical hypothyroidism studies. Further research is warranted to explore these variations and their potential implications for subclinical hypothyroidism management.[13,14]

Our study on subclinical hypothyroidism patients revealed a dyslipidemia prevalence of 56.92%. Comparing this with other relevant studies, Basharat et al. (2012) reported a similar prevalence of dyslipidemia at 59.1% in the general population, suggesting consistency in findings across different populations. Banori et al. (2023) found a higher frequency of dyslipidemia (70%) in subclinical hypothyroidism patients, indicating potential variations in prevalence among different study cohorts.[13,15]

In alignment with our study, Al Sayed et al. (2016) reported a dyslipidemia frequency of 67% in subclinical hypothyroidism patients, reinforcing the association between thyroid dysfunction and altered lipid profiles.[16] The study by Regmi et al. in Nepal further substantiates this association, highlighting hypercholesterolemia in 48.4% and hypertriglyceridemia in 32.3% of hypothyroid patients.[17] Moreover, our findings align with the Japanese study that revealed higher rates of dyslipidemia in hypothyroid females above 55 years, indicating age and gender disparities in dyslipidemia prevalence. Zeb et al. (2016) and MacCarthy et al. (2015) reported similar dyslipidemia prevalence rates of 70% and 63%, respectively, emphasizing the consistency of results across different geographic locations.[18,19] In comparison, a study by Daxsana et al. (2013) in clinical hypothyroidism reported a slightly higher prevalence of 65.06%, suggesting a consistent association between dyslipidemia and varying stages of thyroid dysfunction.[20]

The overall comparison underscores the global relevance of the association between subclinical hypothyroidism and dyslipidemia. The variations observed among studies could be attributed to demographic differences, regional factors, or variations in the definition and diagnostic criteria for dyslipidemia. Nonetheless, the collective evidence supports the importance of vigilant monitoring and management of dyslipidemia in individuals with subclinical hypothyroidism to address potential cardiovascular risks.

Potential limitations include the cross-sectional design, limiting causal inferences, and the exclusion of certain comorbidities, which might

affect generalizability. However, the study design was chosen to provide a snapshot of the frequency of dyslipidemia in patients with subclinical hypothyroidism

CONCLUSION

In conclusion, our study on subclinical hypothyroidism patients demonstrated a significant prevalence of dyslipidemia at 56.92%, highlighting the association between thyroid dysfunction and altered lipid profiles. These findings underscore the imperative for vigilant monitoring and targeted management of dyslipidemia in individuals with subclinical hypothyroidism to address potential cardiovascular risks.

REFERENCES

1. Mushtaq S, Ishaq S, Rashid T. Dyslipidemia in thyroid disorders. Indo American Journal of Pharmaceutical Research, ISSN. 2015(2231-6876).
2. Khazan M, Amouzegar A, Gharibzadeh S, Mehran L, Tohidi M, Azizi F. Prevalence of hypothyroidism in patients with dyslipidemia: Tehran Thyroid Study (TTS). Hormone and Metabolic Research. 2014 Dec;46(13):980-4.
3. Rizos CV, Elisaf MS, Liberopoulos EN. Effects of thyroid dysfunction on lipid profile. The open cardiovascular medicine journal. 2011;5:76.
4. Kumar DV, Mathur DS, Tuteja DR. Effects of thyroid dysfunction on lipid profile. Int J Med Biomed Stud. 2019;3:76-80.
5. Alsalmi WM, Shaglouf LH, Azab AE. Correlation between hypothyroidism, hyperthyroidism, and lipid profile in thyroid dysfunction patients. Clin Med J. 2018;4(2):6-14.
6. Narula K, Dara NK, Meena SL. Dyslipidemia in Thyroid Disorders. Hindu. 2020;86:86-00.
7. Liu H, Peng D. Update on dyslipidemia in hypothyroidism: the mechanism of dyslipidemia in hypothyroidism. Endocrine Connections. 2022 Feb 1;11(2):657-61.
8. Gabriela Brenta M, Fretes O. Dyslipidemias and hypothyroidism. Pediatric Endocrinology Reviews (PER). 2014 Jun;11(4):390-9.
9. Saluja M, Pyarsabadi P, Jelia S, Chittora S, Swami Y, Vimlani H. Study of thyroid dysfunction in metabolic syndrome and association with its components. Current Medicine Research and Practice. 2018 Jan 1;8(1):3-7.
10. Marwaha RK, Tandon N, Garg MK, Kanwar R, Sastry A, Narang A, Arora S, Bhadra K. Dyslipidemia in subclinical hypothyroidism in an Indian population. Clinical biochemistry. 2011 Oct 1;44(14-15):1214-7.
11. Hussain A, Elmahdawi AM, Elzeraidi NE, Nouh F, Algathafi K. The effects of dyslipidemia in subclinical hypothyroidism. Cureus. 2019 Nov 16;11(11).
12. Duntas LH, Brenta G. A renewed focus on the association between thyroid hormones and lipid metabolism. Frontiers in endocrinology. 2018 Sep 3;9:511.
13. Banori A, Arshad M, Zeb S. Frequency of dyslipidemia in patients having subclinical hypothyroidism. Med Forum Monthly. 2018;29(11)64-68.
14. Zhu X, Cheng SY. New insights into regulation of lipid metabolism by thyroid hormone. Curr Opin Endocrinol Diabetes Obes 2017;17(5):408-13
15. Basharat Z, Mumtaz S, Rashid F, Rashid S,vMaliern SA, Diljan A, et al. Prevalence of riskvfactors of ischemic stroke in a local Pakistanivpopulation. High-density lipoproteins, an emerging risk factor. Neuro Sci 2012; 17:357-62.
16. Al Sayed A, Al Ali N, Bo Abbas Y, Alfadhli E. Subclinical hypothyroidism is associated with early insulin resistance in Kuwaiti women. Endocrine J 2006,53.653-7.
17. Regmi A, Shah B, Rai BR, Pandeya A. Serum lipid profile in patients with thyroid disorders in central Nepal. Nepal Med Coll J 2010;12(4):253-6
18. Zeb S, Naz S, Ullah N. Frequency of Dyslipidemia in Patients Having Subclinical Hypothyroidism. Journal of Gandhara Medical and Dental Science. 2016 Sep 1;3(01):22-6.
19. MacCarthy PA,Shah AM.Impaired endothelium-dependent regulation of ventricular relaxation in pressure-overload in cardiac hypertrophy. Circulation 2015;101:1854-61.
20. Saxena A, Kapoor P, Saxena S, Kapoor AK. Effect of levothyroxine therapy on dyslipidemia in hypothyroid patients.Internet Journal of Medical Update.2013;8(2):39-49