Frequency of Thyroid Dysfunction in Metabolic Syndrome Patients at a Tertiary Care Hospital

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ABSTRACT

Background: The metabolic pathways of metabolic syndrome are similar to those of thyroid dysfunction, and thyroid hormone abnormalities have been increasingly reported in patients with metabolic syndrome.

Objective: To find out how often thyroid dysfunction occurs in metabolic syndrome patients who come to a tertiary care hospital.

Materials and Methods: The study was a cross-sectional study carried out at the Medicine Department, Aziz Fatimah Medical and Dental College Faisalabad, Pakistan, during six months from November 2025 to April 2026. 200 patients who met the ATP III criteria for metabolic syndrome were recruited using a non-probability consecutive sampling technique. The SPSS version 25 software was used for data analysis.

Results: Of the 36.0% of patients with metabolic syndrome, 22.5% had subclinical hypothyroidism, 9.0% had overt hypothyroidism, and 4.5% had hyperthyroidism; the remaining 64.0% had euthyroidism.

Conclusion: Thyroid dysfunction, especially subclinical hypothyroidism, is prevalent among patients with metabolic syndrome and is highly related to a poorer lipid profile and higher metabolic syndrome component score.

Keywords: Thyroid Dysfunction, Metabolic Syndrome, Subclinical Hypothyroidism, TSH, Tertiary Care Hospital

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INTRODUCTION

Thyroid function and metabolic syndrome have gained more clinical interest due to common pathways between them, including insulin resistance, lipid metabolism, and adiposity. Lakhani et al. performed a cross-sectional study to ascertain the prevalence of subclinical hypothyroidism in patients with metabolic syndrome in a tertiary care hospital and observed a significant number of patients having previously undiagnosed subclinical thyroid dysfunction (1). In a tertiary care center, Aravindan and Lakshmanan compared the prevalence of metabolic syndrome in hypothyroid and euthyroid individuals and found that there was a significantly higher prevalence of metabolic syndrome in hypothyroid patients than in euthyroid patients (2). In a cross-sectional study, Asuti et al. studied the prevalence of thyroid dysfunction in patients with type II diabetes mellitus in a tertiary care hospital and observed that thyroid dysfunction was present in this metabolically overlapping group, more commonly in the form of subclinical hypothyroidism (3).

The same associations have been found in various tertiary care centers. Kandel et al. did a cross-sectional descriptive study to assess the prevalence of thyroid dysfunction among type II diabetes mellitus patients in a tertiary care center and found that there was a significant prevalence of undiagnosed thyroid dysfunction in type II diabetes mellitus patients (4). In a retrospective study conducted by Pavalaveelzi et al., the prevalence and association of thyroid dysfunction with diabetes mellitus were studied at a tertiary care hospital, and a significant association was observed between glycemic status and thyroid abnormality (5). In the Indian population, Abha et al. carried out a prospective cross-sectional study to evaluate the correlation between thyroid function and lipid profile among patients with metabolic syndrome and observed that there was a parallel shift in the lipid profile

in becoming more atherogenic with worsening thyroid function (6).

Direct examination of the interaction between thyroid hormones and metabolic and glycemic parameters has also been investigated. In a cross-sectional study of the hormonal and glycemic parameters, Sarker et al. identified significant relationships between thyroid dysfunction and metabolic dysregulation in the study population (7). Kumar and Jha performed a study on thyroid dysfunction among patients with type 2 diabetes in a tertiary care hospital and also found a significant number of thyroid abnormalities in patients with type 2 diabetes (8). Shekhar, in a cross-sectional study of thyroid disorder in DM type 2 patients in a tertiary care hospital, found similar results as per the overall literature on the association of dysglycemia with thyroid disorder (9).

Differences in population and region have also been reported. In a tribal population of eastern India, Behera and Sen analyzed the prevalence of thyroid dysfunction in type 2 diabetes mellitus patients in a tertiary center and found prevalence rates similar to other studies in the region, but with a different socio-demographic background (10). Monni et al. studied the prevalence and risk factors for hypothyroidism among individuals with metabolic syndrome in a tertiary care center and found that a few clinical and demographic risk factors were significantly associated with hypothyroidism in metabolic syndrome (11). In a cross-sectional study at a tertiary care hospital, Raj et al. investigated the prevalence of thyroid abnormalities in chronic kidney disease patients and found that thyroid dysfunction was seen in a wide variety of chronic metabolic and systemic diseases other than metabolic syndrome alone (12).

More recent work has shed light on demographic and population-specific links. Kisova et al. investigated the effect of age and sex on the strength of the association between thyroid dysfunction and MS in hospitalized patients, and confirmed the modifying effect of age and sex (13). Giri et al. carried out a descriptive cross-sectional study to assess the burden of metabolic syndrome in polycystic ovarian syndrome (PCOS) patients attending a tertiary care hospital and observed that the burden of metabolic syndrome among these patients was high, and they shared some endocrine and metabolic features with thyroid dysfunction (14). Sharma et al. investigated the prevalence of autoimmune thyroid markers in subclinical thyroid disorders in a tertiary care center in Nepal through a hospital-based cross-sectional study and found that autoimmune markers were found to be positive in many of the patients with subclinical thyroid dysfunction (15).

Last but not least, Jimoh et al. performed a hospital-based study to investigate the spectrum of thyroid function tests in type 2 diabetic patients at a health facility in a rural area of southwest Nigeria and found a high prevalence of thyroid dysfunction in a resource-limited rural environment (16). Chiu et al. did a cross-sectional study on the characteristics and prevalence of metabolic syndrome among adult Filipinos who have hypothyroidism and found that the prevalence of metabolic syndrome was significantly higher among hypothyroid patients than among nonhypothyroid patients (17). In further support of systemic metabolic relevance of thyroid dysfunction, Krishna et al. looked for a correlation between TSH and LFT values in North Karnataka patients admitted to a tertiary care hospital and correlated thyroid status with hepatic biochemical parameters, which showed significant correlation (18). There is significant clinical importance in unrecognized thyroid dysfunction in this high-risk population, which is why the present study was designed to assess the prevalence of thyroid dysfunction in patients with metabolic syndrome attending a tertiary care center.

Objective

To determine the frequency of thyroid dysfunction among patients with metabolic syndrome presenting to a tertiary care hospital.

MATERIALS AND METHODS

Study Design: Cross-sectional study.

Setting: Medicine Department, Aziz Fatimah Medical and Dental College Faisalabad, Pakistan.

Study Duration: Six months, from November 2025 to April 2026.

Sample Size: A sample size of 200 patients was determined by OpenEpi for the prevalence of thyroid dysfunction, estimated to be about 30% in patients with metabolic syndrome (Lakhani et al.), with a 95% CI and a margin of error of 6.5%.

Inclusion Criteria: Patients were adults (25–65 years old) of both sexes who met ATP III criteria for metabolic syndrome (at least 3 of: abdominal obesity, elevated triglycerides, low HDL-cholesterol, raised blood pressure, and raised fasting glucose).

Exclusion Criteria: Patients who were pregnant, had a history of thyroid illness, were prescribed thyroid medication, experienced chronic renal disease, having chronic liver failure, or were receiving other drugs that could affect thyroid function, including lithium along with amiodarone, were not included.

Methods: Demographic, anthropometric, and clinical parameters were recorded in all enrolled patients using a structured proforma, including waist circumference, blood pressure, components of metabolic syndrome, and after informed consent. Blood was collected after an 8-hour overnight fast for the assessment of fasting blood glucose, fasting lipid profile, serum TSH, and free T4 through standard laboratory methods. The thyroid status was determined as euthyroid (normal TSH and free T4 level), subclinical hypothyroidism (elevated TSH and normal free T4 level), overt hypothyroidism (high TSH and low free T4 level), or hyperthyroidism (low TSH and high free T4 level), based on the normal laboratory reference ranges. The data were analyzed using SPSS 25.

RESULTS

200 patients with metabolic syndrome were studied. Participants' mean age was 48.9 ± 9.6 years, and there was a slight predominance of females (58.5%).

Table 1

Baseline Demographic and Clinical Characteristics (n = 200)

Variable	Frequency (%) / Mean ± SD
Age (years)	48.9 ± 9.6
Female	117 (58.5%)
Male	83 (41.5%)
Waist Circumference (cm)	101.4 ± 8.7
BMI (kg/m²)	28.6 ± 3.9
Number of MetS Components (mean)	3.6 ± 0.7

Over one third of the patients had thyroid abnormality, most frequently subclinical hypothyroidism.

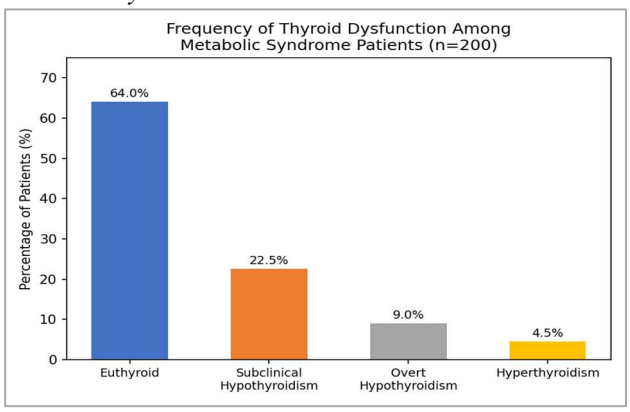
Table 2

Frequency of Thyroid Dysfunction Among Metabolic Syndrome Patients (n = 200)

Thyroid Status	Frequency	Percentage
Euthyroid	128	64.0%
Subclinical Hypothyroidism	45	22.5%
Overt Hypothyroidism	18	9.0%
Hyperthyroidism	9	4.5%

Graph (Bar Chart)

Frequency of Thyroid Dysfunction Categories Among Metabolic Syndrome Patients



The graphic demonstrates that about two-thirds of patients with metabolic syndrome were euthyroid, and subclinical hypothyroidism was the most prevalent thyroid dysfunction seen. The lipid profile was much more atherogenic in patients with thyroid dysfunction than in euthyroid patients.

Table 3

Comparison of Lipid Profile Between Euthyroid and Thyroid Dysfunction Groups

Variable	Euthyroid (n=128)	Thyroid Dysfunction (n=72)
Total Cholesterol (mg/dL)	189.4 ± 28.1	212.6 ± 31.5
LDL-Cholesterol (mg/dL)	116.7 ± 22.4	134.9 ± 25.8
Triglycerides (mg/dL)	168.3 ± 40.2	196.8 ± 45.6
HDL-Cholesterol (mg/dL)	41.2 ± 6.5	38.6 ± 6.1

$p<0.05$ for all comparisons (independent t-test).

Table 4

Association of Thyroid Dysfunction with Number of Metabolic Syndrome Components

Number of MetS Components	Thyroid Dysfunction n (%)	Euthyroid n (%)
3 Components (n=74)	18 (24.3%)	56 (75.7%)
4 Components (n=84)	32 (38.1%)	52 (61.9%)
5 Components (n=42)	22 (52.4%)	20 (47.6%)

Overall p-value = 0.002 (chi-square test for trend).

DISCUSSION

Thyroid dysfunction was present in 36.0% of the patients, with subclinical hypothyroidism being the most common (22.5%), and a more atherogenic lipid profile and a higher number of metabolic syndrome components were significantly associated with thyroid dysfunction. Our results are consistent with the results of previous research that has investigated this relationship. Lakhani et al. also reported a significant number of patients with metabolic syndrome with previously undiagnosed subclinical hypothyroidism in a cross-sectional study (1), with the same percentage of 22.5% subclinical hypothyroidism found in our study. Consistent with our findings, Aravindan and Lakshmanan reported a significantly higher prevalence of metabolic syndrome among hypothyroid patients than in euthyroid patients (2), and Asuti et al. found that subclinical hypothyroidism was a common thyroid abnormality among patients with type II diabetes mellitus (3), a metabolically overlapping population.

The same trends have been reported in other tertiary care centers. This is in line with the other studies that found a significant association between glycemic status and thyroid abnormality in a retrospective tertiary care study (5) and a notable burden of undiagnosed thyroid dysfunction among patients with type II diabetes mellitus at a tertiary care center (4). In a prospective cross-sectional study, Abha et al. showed worsening thyroid function was associated with a more atherogenic lipid profile in patients with metabolic syndrome (6), which is in keeping with our Table 3 results that showed significantly higher levels of total cholesterol, LDL-cholesterol, and triglycerides in patients with thyroid dysfunction.

The direct effects of thyroid hormones on glycemic and hormonal parameters have also been investigated. A cross-sectional study by Sarker et al. revealed a significant relationship of thyroid dysfunction with metabolic dysregulation (7); Kumar and Jha also reported a high prevalence of thyroid abnormalities in patients with type 2 diabetes from a tertiary care hospital (8). Shekhar's cross-sectional study of thyroid disorder in T2D patients showed that patients had thyroid disorder, findings similar to the general literature, which established a link between dysglycemia and thyroid disorder (9), supporting the metabolic pathway hypothesis for our diabetes and thyroid findings.

Our findings can be generalized with additional context from population-specific studies. In a tribal

community of eastern India, which has different sociodemographic characteristics from the other studies, the prevalence of thyroid dysfunction was found to be broadly similar to other studies, indicating the association between thyroid dysfunction and metabolic derangement to be fairly consistent across various populations (10). Several clinical and demographic covariates were found to be significantly associated with hypothyroidism in metabolic syndrome patients by Monni et al. (11), providing some explanation for the observed variability within our own group of patients with thyroid dysfunction, and the finding of prevalent thyroid abnormalities in patients with chronic kidney disease by Raj et al. (12) highlights that thyroid dysfunction is a common occurrence in chronic metabolic and systemic disease, not just metabolic syndrome alone.

Modifiers of this association have been described as demographical. In the hospitalization setting, some of the variation in the prevalence of thyroid dysfunction may be attributed to the interaction between age and sex, with the association with metabolic syndrome, as found by Kisova et al. (13), which we did not specifically stratify in our analysis. The high prevalence of metabolic syndrome in patients with polycystic ovarian syndrome (14) and frequently positive autoimmune markers in patients with subclinical thyroid dysfunction (15) highlight the strong relationship between metabolic and endocrine dysfunction. Autoimmune markers were not specifically evaluated in our study, but the high prevalence of subclinical hypothyroidism may suggest that some of these patients have autoimmune thyroiditis as a cause of their thyroid dysfunction.

In a study of hypothyroid Filipino patients, Chiu et al. also reported a significantly higher prevalence of metabolic syndrome compared with the general population (17), which further supports the bidirectional relationship between thyroid and metabolic syndrome that was seen in our study, and the finding of significant association between TSH and liver function test values by Krishna et al. (18) indicates that systemic metabolic effects of thyroid dysfunction seen in our study may also be present in other liver function tests that were not directly assessed in the present analysis. Additional longitudinal, multi-center studies, including additional autoimmune thyroid markers, are recommended to further characterize the direction and mechanism of the association between thyroid dysfunction and metabolic syndrome.

CONCLUSION

Patients having metabolic syndrome frequently have thyroid dysfunction, especially subclinical hypothyroidism, which is strongly linked to an increased number of metabolic syndrome elements and a higher atherogenic lipid profile. In individuals with metabolic syndrome, especially those with a greater number of metabolic abnormalities, it may be appropriate to perform routine thyroid function testing to help identify and treat thyroid dysfunction early in this high-risk group.

REFERENCES

1. Lakhani G, Patel P, Patel TC, Patel PP. A Cross-Sectional Study on the Prevalence of Subclinical Hypothyroidism in Metabolic Syndrome Patients at a Tertiary Care Hospital. Cureus. 2024 Aug 26;16(8).
2. Aravindan J, Lakshmanan K. Association between hypothyroidism and metabolic syndrome in a tertiary care hospital. Romanian Journal of Diabetes Nutrition and Metabolic Diseases. 2024 Sep 30;31(3):280-5.
3. Asuti S, Purad S, Hosamani P. Pattern of thyroid dysfunction in type II diabetes mellitus patients in a tertiary care center: a cross-sectional study. J Med Sci Health. 2023 May;9(2):204-10.
4. Kandel L, Shakya YL, Yadav M, Shah NA, Gupta S. Prevalence of thyroid dysfunction among patients with type II diabetes mellitus in tertiary care center: a cross-sectional descriptive study. JNMA: Journal of the Nepal Medical Association. 2024 Oct 31;62(278):691.
5. Pavalaveelzi CM, Velu K, Yuvaraj SS, Velu K. Prevalence and Association of Thyroid Dysfunction With Diabetes Mellitus in a Tertiary Care Hospital: A Retrospective Study. Cureus. 2025 Feb 28;17(2).
6. Abha P, Keshari JR, Sinha SR, Nishant K, Kumari R, Prakash P, ABHA P, Sinha Sr SR. Association of thyroid function with lipid profile in patients with metabolic syndrome: A prospective cross-sectional study in the Indian population. Cureus. 2023 Sep 5;15(9).
7. Sarker PK, Sultana N, Islam H, Bashir MS, Ali MS. Thyroid dysfunction and metabolic dysregulation: a cross-sectional study of hormonal and glycemic parameters. Mol Mech Res. 2025;3(2):10227.
8. Kumar P, Jha UC. STUDY ON THYROID DYSFUNCTION IN PATIENTS WITH TYPE 2 DIABETES IN A TERTIARY CARE HOSPITAL. Int J Acad Med Pharm. 2024;6(3):647-9.
9. Shekhar RA. A cross-sectional study of thyroid disorder in patients with type 2 diabetes mellitus in a Tertiary Care Hospital. Asian J Pharm Clin Res. 2022;15(8):46-50.
10. Behera BP, Sen RK. A study on the prevalence of thyroid dysfunction in patients with type 2 diabetes mellitus in a tertiary centre in a tribal population of eastern India. Int J Pharm Pharm Sci. 2023;15(6):29-34.
11. Monni AF, Islam A, Ghosh P, ISLAM M, Sobhan R, Pathan F. Proportion and covariates of hypothyroidism among patients with metabolic syndrome attending in tertiary care hospital. SAUDI JOURNAL OF MEDICINE Учредители: SASPR Edu International Pvt. Ltd. 2024;9(9):397-404.
12. Raj R, Kumar V, Bhushan D, Biswas R, Ojha VS, KUMAR DV. The prevalence of thyroid abnormalities in patients with chronic kidney disease: a cross-sectional study at a tertiary care hospital. Cureus. 2023 Aug 7;15(8).

13. Kisova SZ, Orbetzova MM, Argirov KR. Thyroid dysfunction and metabolic syndrome: age-and sex-related associations in hospitalized patients. Folia Medica. 2025 Oct 30;67(5):e159172.
14. Giri A, Joshi A, Shrestha S, Chaudhary A. Metabolic syndrome among patients with polycystic ovarian syndrome presenting to a tertiary care hospital: a descriptive cross-sectional study. JNMA: Journal of the Nepal Medical Association. 2022 Feb 28;60(246):137.
15. Sharma VK, Niraula A, Tuladhar ET, Bhattarai A, Raut M, Dubey RK, Baidya S, Parajuli N. Autoimmune thyroid status in subclinical thyroid disorders in patients attending a tertiary care center in Nepal: a hospital-based cross-sectional study. BMC Endocrine Disorders. 2023 Oct 11;23(1):221.
16. Jimoh AK, Ghazali MS, Ogundeji OA, Adeleke BA, Ajani OG, Gabriel-Alayode EO, Popoola GO, Adediran OS. Spectrum of thyroid function test among type 2 diabetic patients attending a rural health facility, southwest Nigeria: A hospital-based study. SAGE Open Medicine. 2022 May;10:20503121221097625.
17. Chiu HH, Villanueva III E, Larrazabal Jr R, Arcellana AE, Jimeno C. Characteristics and prevalence of metabolic syndrome among adult filipinos with hypothyroidism: a cross-sectional study. Journal of the ASEAN Federation of Endocrine Societies. 2024 Feb 8;39(1):53.
18. Krishna SM, Hegde SV, Chellathurai M, Mohandas NJ, Guruswamy S, Pandit S, Afra A, Shetty S, Siripuram C. Correlation between thyroid-stimulating hormone (TSH) and liver function test values in North Karnataka patients admitted to a tertiary care hospital. Cureus. 2024 Apr 25;16(4):e59004.