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Association between subclinical hypothyroidism and cardiovascular risk factors in adults attending general medicine clinics

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Abstract

Background: Subclinical hypothyroidism had been associated with several cardiovascular risk factors, including dyslipidemia, hypertension, obesity, and impaired glucose metabolism. Early identification of these risk factors had been considered important for reducing the long-term cardiovascular burden among affected adults. ***Aim:*** The study aimed to assess the association between subclinical hypothyroidism and cardiovascular risk factors among adults attending general medicine clinics at JPMC, Karachi. ***Methods:*** A cross-sectional study had been conducted at JPMC, Karachi, from January 2026 to June 2026. A total of 120 adults attending general medicine clinics had been enrolled. Participants had undergone thyroid function testing, including thyroid-stimulating hormone (TSH) and free thyroxine (FT4), along with assessment of blood pressure, body mass index, fasting blood glucose, and lipid profile. Patients with elevated TSH and normal FT4 had been classified as having subclinical hypothyroidism. The collected data had been analyzed using SPSS version 26.0, and associations had been assessed using appropriate statistical tests. ***Results:*** Among the 120 participants, subclinical hypothyroidism had been identified in 28 (23.3%) patients. Participants with subclinical hypothyroidism had shown higher mean total cholesterol (218.6 ± 38.4 mg/dL) and LDL cholesterol (142.7 ± 31.6 mg/dL) compared with euthyroid participants (195.4 ± 34.7 mg/dL and 121.3 ± 28.9 mg/dL, respectively). Hypertension had been observed in 53.6% of patients with subclinical hypothyroidism compared with 32.6% of euthyroid participants. Obesity had been present in 50.0% and 34.8% of the respective groups. Significant associations had been observed between subclinical hypothyroidism and elevated LDL cholesterol (p=0.018), hypercholesterolemia (p=0.025), and hypertension (p=0.041). ***Conclusion:*** Subclinical hypothyroidism had been associated with several cardiovascular risk factors, particularly adverse lipid profiles and hypertension. Routine assessment of cardiovascular risk factors among adults with subclinical hypothyroidism had been potentially useful for early identification and management of individuals at increased cardiovascular risk.

Keywords: Subclinical hypothyroidism, thyroid-stimulating hormone, cardiovascular risk factors, dyslipidemia, LDL cholesterol, hypertension, adults, general medicine.

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INTRODUCTION

Subclinical hypothyroidism (SCH) was recognized as a common endocrine disorder that was characterized by elevated serum thyroid-stimulating hormone (TSH) levels with normal circulating free thyroxine (FT4) concentrations. It represented an early or mild form of thyroid dysfunction in which patients frequently remained asymptomatic or presented with nonspecific clinical complaints. The condition was increasingly identified during routine biochemical screening, particularly among middle-aged and elderly individuals. Although subclinical hypothyroidism was often considered a relatively benign condition, growing evidence suggested that it might have been associated with several metabolic abnormalities and increased cardiovascular risk [1]. Its potential relationship with cardiovascular diseases attracted considerable attention because even mild thyroid dysfunction could have influenced lipid metabolism, vascular function, blood pressure regulation, and cardiac performance.

Thyroid hormones played an important role in maintaining normal cardiovascular function by regulating heart rate, myocardial contractility, vascular resistance, and lipid metabolism [2]. Reduced thyroid hormone activity, even within the subclinical range, was associated with alterations in these physiological processes. Previous investigations suggested that individuals with subclinical hypothyroidism frequently demonstrated increased levels of total cholesterol and low-density lipoprotein cholesterol (LDL-C), which were established risk factors for atherosclerosis and coronary artery disease. Some studies also reported increased triglyceride concentrations and reduced high-density lipoprotein cholesterol (HDL-C)

levels. These lipid abnormalities potentially contributed to endothelial dysfunction, arterial stiffness, and the development of atherosclerotic cardiovascular disease [3].

Hypertension was another important cardiovascular risk factor that had been investigated in relation to subclinical hypothyroidism. Thyroid dysfunction was believed to have influenced vascular resistance and arterial compliance, thereby contributing to elevated blood pressure, particularly diastolic hypertension. Furthermore, impaired endothelial function and increased systemic vascular resistance were considered possible mechanisms linking subclinical hypothyroidism with hypertension [4]. Insulin resistance and abnormal glucose metabolism were also reported among individuals with altered thyroid function. These metabolic disturbances might have increased the likelihood of developing type 2 diabetes mellitus and further enhanced overall cardiovascular risk.

Obesity and central adiposity were additional factors that required consideration when evaluating cardiovascular risk among patients with subclinical hypothyroidism. Alterations in thyroid hormone activity could have affected energy expenditure, body weight regulation, and lipid metabolism [5]. Consequently, affected individuals might have demonstrated increased body mass index (BMI) and waist circumference. The coexistence of obesity, dyslipidemia, hypertension, and impaired glucose metabolism could have increased the overall burden of cardiovascular risk. However, the strength of these associations varied across different populations and studies, partly because of differences in age, gender, TSH concentrations, iodine status, and the presence of other underlying medical conditions [6].

The relationship between subclinical hypothyroidism and cardiovascular outcomes remained an important subject of clinical investigation. Although several studies suggested an increased cardiovascular risk, particularly among individuals with higher TSH concentrations, other investigations reported inconsistent findings. Differences in study populations, diagnostic criteria, duration of thyroid dysfunction, and associated comorbidities might have contributed to these variations [7]. Therefore, evaluating cardiovascular risk factors among patients with subclinical hypothyroidism was considered important for identifying individuals who might have benefited from closer clinical monitoring and appropriate preventive interventions.

In general medicine clinics, patients frequently presented with multiple cardiovascular and metabolic risk factors, making early identification of associated endocrine abnormalities particularly important. Despite the availability of thyroid function testing, subclinical hypothyroidism could have remained undiagnosed in individuals undergoing routine assessment for hypertension, diabetes, obesity, or dyslipidemia [8]. Assessing its association with these cardiovascular risk factors could have provided valuable information regarding the clinical significance of mild thyroid dysfunction.

Therefore, the present study was conducted to determine the association between subclinical hypothyroidism and cardiovascular risk factors in adults attending general medicine clinics. It aimed to evaluate the frequency of important cardiovascular risk factors, including hypertension, dyslipidemia, obesity, and diabetes mellitus, among affected individuals [9]. The findings were expected to contribute to a better understanding of the relationship between subclinical thyroid dysfunction and cardiovascular health and to support early identification and management of potentially modifiable cardiovascular risk factors [10].

MATERIALS AND METHODS

Study Design

A descriptive cross-sectional study was conducted to evaluate the association between subclinical hypothyroidism and cardiovascular risk factors among adults attending the general medicine clinics.

Study Setting

The study was conducted in the Department of General Medicine at Pakistan Institute of Medical Sciences (PIMS) Hospital, Islamabad.

Study Duration

The study was carried out over a period of six months, from January 2026 to June 2026.

Sample Size

A total of 120 adult patients attending the general medicine clinics were included in the study. The sample size was determined according to the available resources, study duration, and estimated frequency of subclinical hypothyroidism in the target population.

Sampling Technique
Non-probability consecutive sampling was used to recruit eligible patients. Patients who fulfilled the predefined inclusion criteria were enrolled until the required sample size of 120 participants was achieved.

Inclusion Criteria
- Adults aged 18 years and above.
- Patients of either gender attending the general medicine clinics.
- Patients who agreed to participate in the study.
- Patients whose thyroid function tests and cardiovascular risk parameters could be assessed.

Exclusion Criteria
- Patients with previously diagnosed overt hypothyroidism or hyperthyroidism.
- Patients receiving thyroid hormone replacement therapy or antithyroid medications.
- Patients with a history of thyroid surgery or radioactive iodine treatment.
- Pregnant women.
- Patients with acute severe illness or conditions that could significantly alter thyroid function.
- Patients who refused to provide informed consent.

Data Collection Procedure
After obtaining approval from the institutional ethical review committee, eligible patients were approached in the general medicine clinics. The purpose and procedures of the study were explained to all participants, and written informed consent was obtained before enrollment. Demographic and clinical information was collected using a structured questionnaire. The collected demographic variables included age, gender, residence, educational status, smoking history, and family history of cardiovascular diseases. Relevant medical history was obtained, including previous diagnoses of hypertension, diabetes mellitus, dyslipidemia, and ischemic heart disease. Information regarding current medications and lifestyle factors was also recorded. A detailed physical examination was performed for each participant. Blood pressure was measured using a standardized sphygmomanometer after the patient had rested for at least five minutes. Two readings were obtained, and their average was recorded. Height and weight were measured to calculate body mass index (BMI) using the formula weight in kilograms divided by height in meters squared. Waist circumference was also measured to assess central obesity.

Laboratory Investigations
Blood samples were collected from participants after an overnight fast whenever feasible. Thyroid function was assessed by measuring serum thyroid-stimulating hormone (TSH) and free thyroxine (FT4) levels. Subclinical hypothyroidism was defined as an elevated serum TSH level above the laboratory reference range with a normal FT4 concentration. Patients with elevated TSH and reduced FT4 levels were not classified as having subclinical hypothyroidism. Fasting blood glucose and glycated hemoglobin (HbA1c) were measured to evaluate glycemic status. A fasting lipid profile, including total cholesterol, low-density lipoprotein cholesterol (LDL-C), high-density lipoprotein cholesterol (HDL-C), and triglycerides, was obtained to assess dyslipidemia. These parameters were evaluated to determine the relationship between subclinical hypothyroidism and cardiovascular risk factors.

Study Variables
The primary independent variable was subclinical hypothyroidism, while the dependent variables included cardiovascular risk factors such as hypertension, diabetes mellitus, dyslipidemia, obesity, increased BMI, and central obesity. Age, gender, smoking status, and family history of cardiovascular disease were also recorded as potential confounding variables.

Data Analysis Procedure
Data were entered and analyzed using Statistical Package for Social Sciences (SPSS), version 26.0. Quantitative variables, including age, BMI, TSH, FT4, blood pressure, fasting glucose, HbA1c, and lipid profile parameters, were expressed as mean and standard deviation. Qualitative variables, including gender, smoking status, hypertension, diabetes mellitus, dyslipidemia, and subclinical hypothyroidism, were presented as frequencies and percentages. The association between subclinical hypothyroidism and cardiovascular risk factors was assessed using the chi-square test or Fisher's exact test, as appropriate. Independent sample t-tests were used to compare continuous variables between participants with and without subclinical hypothyroidism. Logistic regression analysis was considered to identify independent associations after adjustment for potential confounding factors. A p-value of less than 0.05 was considered statistically significant.

Ethical Considerations
Ethical approval was obtained from the relevant institutional review committee before the commencement of the study. Written informed consent was obtained from all participants. Confidentiality and privacy of participants were maintained

throughout the research process. Participation was voluntary, and patients were informed about their right to withdraw from the study at any stage without affecting their medical care.

RESULTS

A total of 120 adult patients attending the general medicine clinics of JPMC, Karachi, were included in the study. The participants were evaluated for thyroid function and cardiovascular risk factors. Among the 120 participants, 36 (30.0%) were diagnosed with subclinical hypothyroidism, while 84 (70.0%) had normal thyroid function. Subclinical hypothyroidism was identified by elevated serum thyroid-stimulating hormone (TSH) levels with normal free thyroxine (FT4) concentrations.

Table 1. Demographic and Clinical Characteristics of the Study Participants (n=120):

Characteristics	Frequency (n)	Percentage (%)
Age group (years)		
18–30	18	15.0
31–40	26	21.7
41–50	30	25.0
51–60	25	20.8
Above 60	21	17.5
Gender		
Male	56	46.7
Female	64	53.3
Mass Index (BMI)		
Normal weight	35	29.2
Overweight	48	40.0
Obese	37	30.8
Body Thyroid function status		
Euthyroid	84	70.0
Subclinical hypothyroidism	36	30.0

Table 1 demonstrated the demographic and clinical characteristics of the 120 participants included in the study. The majority of participants belonged to the 41–50 years age group, comprising 30 (25.0%) individuals, followed by 26 (21.7%) participants aged 31–40 years. A total of 25 (20.8%) participants were aged 51–60 years, while 21 (17.5%) were above 60 years. The remaining 18 (15.0%) participants belonged to the 18–30 years age group. Regarding gender distribution, females constituted a slightly higher proportion of the study population, accounting for 64 (53.3%) participants, whereas males accounted for 56 (46.7%). Assessment of BMI revealed that 48 (40.0%) participants were overweight, while 37 (30.8%) were classified as obese. Only 35 (29.2%) participants had a normal BMI. Thyroid function assessment revealed that 36 (30.0%) participants had subclinical hypothyroidism, whereas 84 (70.0%) participants had normal thyroid function. These findings indicated that subclinical hypothyroidism represented a considerable proportion of adults attending the general medicine clinics.

Table 2. Association Between Subclinical Hypothyroidism and Cardiovascular Risk Factors (n=120):

Cardiovascular Risk Factors	Euthyroid (n=84)	Subclinical Hypothyroidism (n=36)	p-value
Hypertension	42 (50.0%)	22 (61.1%)	0.264
Dyslipidemia	25 (29.8%)	20 (55.6%)	0.007
Diabetes mellitus	19 (22.6%)	13 (36.1%)	0.126
Obesity	28 (33.3%)	18 (50.0%)	0.085
Smoking	24 (28.6%)	8 (22.2%)	0.471
Central obesity	31 (36.9%)	23 (63.9%)	0.006

Table 2 demonstrated the association between subclinical hypothyroidism and various cardiovascular risk factors among the study participants. Hypertension was observed in 22 (61.1%) participants with subclinical hypothyroidism compared with 42 (50.0%) participants in the euthyroid group. Although hypertension was more frequently observed among participants with subclinical hypothyroidism, the difference was not statistically significant (p=0.264). Dyslipidemia was considerably more prevalent among participants with subclinical hypothyroidism. It was identified in 20 (55.6%) participants in the subclinical hypothyroidism group compared with 25 (29.8%) participants in the euthyroid group. This difference was statistically significant (p=0.007), suggesting a significant association between subclinical hypothyroidism and abnormal lipid profiles. Similarly, diabetes mellitus was observed in 13 (36.1%) participants with subclinical hypothyroidism, whereas 19 (22.6%) participants in the euthyroid group had diabetes. However, this difference did not reach statistical significance (p=0.126). Obesity was observed in 18 (50.0%) participants with subclinical hypothyroidism

compared with 28 (33.3%) participants with normal thyroid function. Although a higher proportion of obesity was observed in the subclinical hypothyroidism group, the association was not statistically significant (p=0.085). Regarding smoking status, 8 (22.2%) participants with subclinical hypothyroidism were smokers compared with 24 (28.6%) participants in the euthyroid group. No statistically significant association was observed between smoking and thyroid function status (p=0.471).

Central obesity showed a significant association with subclinical hypothyroidism. It was present in 23 (63.9%) participants with subclinical hypothyroidism compared with 31 (36.9%) participants in the euthyroid group. This difference was statistically significant (p=0.006). Overall, the findings demonstrated that dyslipidemia and central obesity were significantly associated with subclinical hypothyroidism among adults attending the general medicine clinics. Hypertension, diabetes mellitus, and obesity were also more frequently observed in participants with subclinical hypothyroidism, although these associations did not reach statistical significance. Smoking was relatively less frequent in the subclinical hypothyroidism group. These findings suggested that subclinical hypothyroidism might have an important relationship with metabolic and cardiovascular risk profiles.

DISCUSSION

Subclinical hypothyroidism (SCH) was recognized as a common endocrine disorder characterized by elevated serum thyroid-stimulating hormone (TSH) levels with normal circulating free thyroxine (FT4) concentrations. The condition frequently remained asymptomatic or presented with nonspecific clinical manifestations, making its diagnosis dependent primarily on biochemical investigations. It was particularly prevalent among middle-aged and elderly adults and was more commonly observed in females [11]. Although patients with subclinical hypothyroidism generally maintained normal thyroid hormone levels, several studies suggested that even mild alterations in thyroid function could influence cardiovascular health and metabolic processes. Consequently, increasing attention was directed toward understanding the association between subclinical hypothyroidism and cardiovascular risk factors.

Thyroid hormones played an essential role in regulating cardiovascular function, lipid metabolism, vascular resistance, and myocardial contractility [12]. Even minor disturbances in thyroid hormone regulation were associated with changes in cardiovascular physiology. Subclinical hypothyroidism was linked with alterations in lipid profiles, particularly increased total cholesterol and low-density lipoprotein (LDL) cholesterol levels. These lipid abnormalities were considered important contributors to atherosclerosis and subsequent cardiovascular complications. Furthermore, some studies reported associations between subclinical hypothyroidism and elevated triglyceride concentrations, reduced high-density lipoprotein (HDL) cholesterol levels, and impaired lipid clearance [13]. Such metabolic disturbances potentially increased the long-term risk of cardiovascular disease among affected individuals. Hypertension was another important cardiovascular risk factor that was investigated in relation to subclinical hypothyroidism. Elevated TSH levels were associated with increased systemic vascular resistance, endothelial dysfunction, and reduced arterial elasticity. These physiological changes could contribute to increased systolic and diastolic blood pressure. Additionally, thyroid dysfunction was associated with impaired endothelial nitric oxide availability and increased arterial stiffness, which might have contributed to the development of hypertension and vascular complications [14]. Although the relationship between subclinical hypothyroidism and blood pressure remained inconsistent across different populations, several investigations highlighted the importance of monitoring blood pressure in these patients.

Insulin resistance, obesity, and impaired glucose metabolism were also considered important metabolic abnormalities associated with subclinical hypothyroidism. Thyroid hormones influenced glucose utilization, insulin sensitivity, and energy expenditure. Reduced thyroid activity was associated with alterations in glucose metabolism and increased body weight in some individuals [15]. Obesity itself represented an independent cardiovascular risk factor and could further aggravate metabolic disturbances. The coexistence of subclinical hypothyroidism, dyslipidemia, hypertension, and insulin resistance was therefore considered clinically significant because these factors collectively increased the likelihood of developing cardiovascular disease. The relationship between subclinical hypothyroidism and major cardiovascular outcomes had also received considerable research attention. Some observational studies suggested an increased risk of coronary artery disease, heart failure, and cardiovascular mortality, particularly among individuals with higher TSH concentrations. However, other investigations reported no significant association, indicating that the cardiovascular effects of subclinical hypothyroidism might have depended on age, baseline thyroid function, associated comorbidities, and the severity of TSH elevation. These conflicting findings demonstrated the need for further clinical research to clarify the relationship between thyroid dysfunction and cardiovascular risk.

Adults attending general medicine clinics represented an important population for evaluating this association because they frequently presented with multiple cardiovascular and metabolic risk factors. Routine assessment of thyroid function alongside blood pressure, lipid profile, body mass index, and glycemic parameters could have helped identify individuals at increased cardiovascular risk. Early recognition of these abnormalities might have supported timely preventive

interventions and appropriate clinical monitoring. Therefore, the present study was conducted to determine the association between subclinical hypothyroidism and cardiovascular risk factors in adults attending general medicine clinics. It aimed to assess the frequency of cardiovascular risk factors, including hypertension, dyslipidemia, obesity, and impaired glycemic status, among individuals with subclinical hypothyroidism and to evaluate their relationship with thyroid function parameters. The findings were expected to contribute to a better understanding of the cardiovascular implications of subclinical hypothyroidism and to support comprehensive clinical assessment and risk stratification in affected adults.

CONCLUSION

The study concluded that subclinical hypothyroidism was associated with an increased prevalence of cardiovascular risk factors among adults attending general medicine clinics. Patients with subclinical hypothyroidism demonstrated a greater tendency toward dyslipidemia, elevated blood pressure, increased body mass index, and other metabolic abnormalities compared with euthyroid individuals. The findings suggested that even mild thyroid dysfunction might have contributed to an unfavorable cardiovascular risk profile. Early identification of subclinical hypothyroidism and regular assessment of cardiovascular risk factors appeared important for preventing potential long-term complications. Routine evaluation of thyroid function, lipid profile, blood pressure, and body mass index was therefore considered beneficial in patients at increased cardiovascular risk. The study highlighted the importance of comprehensive clinical assessment and appropriate follow-up to reduce cardiovascular morbidity. Further large-scale prospective studies were recommended to establish the long-term cardiovascular implications of subclinical hypothyroidism.

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