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Original Research Article

Subclinical Hypothyroidism and Metabolic Syndrome and its Relationship to Cardiovascular Disease among Post Menopausal Women

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ABSRACT

Background
Metabolic syndrome is a leading noncommunicable disease in the modern era of illness. It is more prevalent among postmenopausal women. Hypothyroidism has a positive correlation with the metabolic syndrome. This study focused on postmenopausal women with subclinical hypothyroidism. The study also looked at the prevalence of metabolic syndrome and heart disease in people with subclinical hypothyroidism versus those with normothyrodism.

Methods
This study included 70 postmenopausal women who visited the outpatient department or were admitted to the Department of General Medicine at K.R. Hospital, MMCRI. The trial excluded patients with confirmed cardiovascular disease or documented hypothyroidism. This was a comparative research with two groups: postmenopausal women with subclinical hypothyroidism and normothyroidism.

Results
The study examined 70 cases of postmenopausal women with a mean age of 64.5 years, with the majority falling between the ages of 51 and 70. The average TSH level was 3.34±2.26, with a minimum of 0.08 and a maximum of 10.80. 24 (34.3%) patients exhibited subclinical hypothyroidism. Patients with SCH showed significantly higher levels of HbA1c, total cholesterol, triglycerides, and LDL cholesterol. Individuals with SCH had a significantly larger waist circumference ($p < 0.001$). None of the cardiovascular indicators (systolic and diastolic blood pressures, ECH, and echocardiography) investigated revealed a statistically significant difference between those with euthyroidism and those with SCH.

Conclusion
Subclinical hypothyroidism is common among postmenopausal women, and it is associated with an increased risk of metabolic syndrome. Early detection of this relationship will aid in the prevention of problems.

Keywords: Metabolic Syndrome, Subclinical Hypothyroidism, Postmenopausal.

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INTRODUCTION

Thyroid hormone imbalances are the source of subclinical thyroid dysfunction, an elusive illness with no overt clinical symptoms that is typically discovered after a physical examination. A high serum level of TSH (Thyroid-Stimulating Hormone) combined with normal levels of free thyroxine (FT4) characterizes SCH, a biochemical diagnosis. Thyroid hormones impact the heart in diverse ways, linking SCH to a range of cardiovascular risk factors like dyslipidemia and hypertension. Therefore, minute changes in hormone levels might have a negative impact on the metabolic and cardiovascular systems. Moreover, SCH has been connected to metabolic syndrome (MetS) and insulin resistance.

The term "metabolic syndrome" refers to a group of metabolic conditions that include central obesity, high TGs, low HDL-C, hypertension, and hyperglycemia. Individuals who have metabolic syndrome are more vulnerable to heart problems. The percentages of the population that can be attributed to metabolic syndrome are approximately 6%–7% for mortality from all causes, 12%–17% for cardiovascular disease, and 30%–52% for diabetes.[1-4]

The metabolic syndrome has become more common in recent years. The regulation of glucose and lipid metabolism is significantly influenced by thyroid hormone.Hypothyroidism has been linked to an increased risk of metabolic syndrome, according to recent studies. Women are more likely to have hypothyroidism, especially those who are perimenopausal. Atherosclerosis is closely linked to subclinical hypothyroidism.

Several studies have looked into the connection between MetS and subclinical thyroid dysfunction. Unfortunately, the contradictory outcomes from this research are probably the result of low statistical power. Moreover, little is known about the prevalence of metabolic diseases and subclinical thyroid dysfunction, especially in the postmenopausal population.

AIMS AND OBJECTIVES

To determine as to whether postmenopausal women's metabolic syndrome and subclinical hypothyroidism are related.

MATERIALS & METHODS

This study included 70 postmenopausal women who visited the outpatient department or were admitted to the Department of General Medicine at K.R. Hospital, MMCRI. Patients with confirmed cardiovascular disease or documented hypothyroidism were excluded from the trial. HbA1c, total cholesterol, triglycerides, LDL, and HDL cholesterol levels were all measured. Physical parameters such as waist circumference and blood pressure were recorded. All patients underwent an ECG and an echocardiogram.

The current study combined qualitative and quantitative data. Quantitative data was summarized using mean and standard deviation, while qualitative data was given as frequency and percentages. An independent t-test was used to compare the mean values of two independent groups, and the chi-square test was used to analyze the relationship between two binary variables at a 95% level of significance.A scatter plot was used to investigate the association between two quantitative variables.

Statistical Analysis

The data was analyzed using SPSS 20 for statistical analysis and Microsoft Excel was used for graphical depiction of data.

RESULTS

The study examined 70 cases of postmenopausal women with a mean age of 64.5 years, with the majority falling between the ages of 51 and 70. The average TSH level was 3.34±2.26,

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with a minimum of 0.08 and a maximum of 10.80. 24 (34.3%) patients exhibited subclinical hypothyroidism.

As indicated in Table 1 and Figures 1-6, patients with SCH had significantly higher levels of HbA1c, total cholesterol, triglycerides, and LDL cholesterol. Individuals with SCH had a significantly larger waist circumference (p<0.001).

Parameters		SCH (-)	SCH (+)	P-Value	OR (95% CI)
Age (in years)	<55	7(15.2%)	8 (33.3%)	0.080	0.359 (0.111-1.156
	>55	39 (84.8%)	16(66.7%)		
Waist Circumference	<80	25(54.3%)	0 (0%)	<0.001	2.143 (1.5-2.92)
	>80	21(45.7%)	24(100%)		
HbA1c	<7	40 (87%)	9 (37.5%)	<0.001	11.11 (3.3-36.5
	>7	6 (13%)	15 (62.5%)		
Total Cholesterol	<200	42 (91.3%)	6 (25.0%)	<.001	31.5 (7.9-125.6)
	>200	4(8.7%)	18 (75%)		
Triglycerides	<150	33 (71.1%)	7(29.2%)	0.001	6.16 (2.074-18.32)
	>152	13(28.3%)	17 (70.8%)		
LDL	<100	42 (91.3%)	5 (20.8%)	<0.001	39.9 (9.6-165.4)
	>100	4 (8.7%)	19(79.2%)		
HDL	<50	42 (91.3%)	24 (100%)	0.137	0.636 (0.530-0.764)
	>50	4 (8.7%)	0 (0%)		

Table 1: Multivariable Analysis for SCH in Patients with Metabolic Syndrome

HbA1c and Subclinical Hypothyroidism

Patients with subclinical hypothyroidism had higher HbA1c levels compared to the normothyroid group, with a significant p-value of <.001.

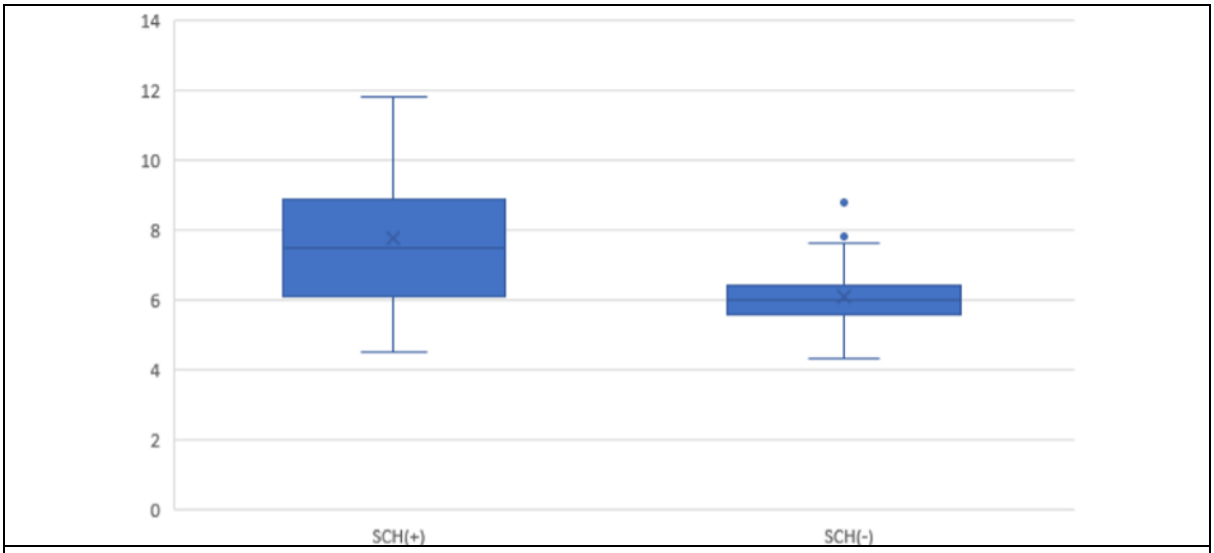

Figure 1: Mean HbA1c According to SCH

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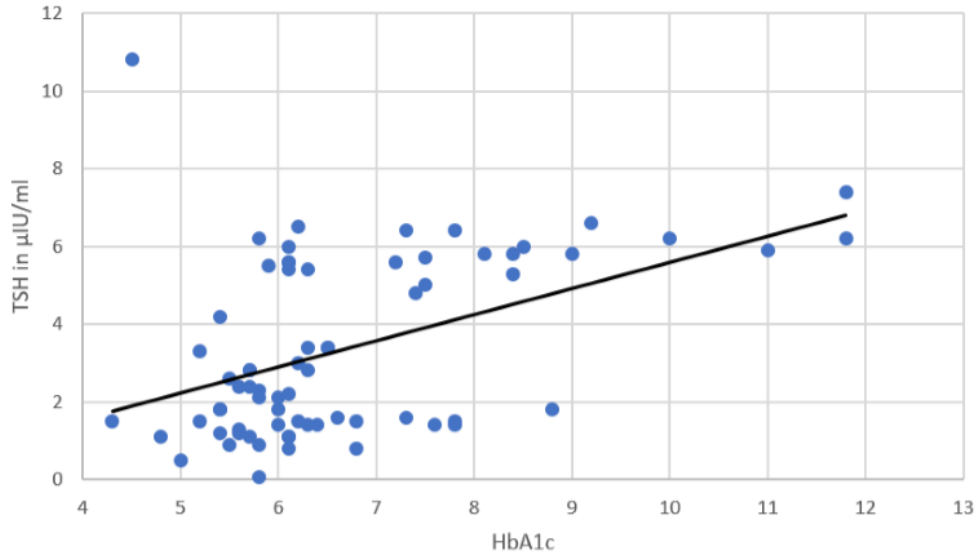

Figure 2: TSH vs. HbA1c

Triglycerides and Subclinical Hypothyroidism

Patients in the subclinical hypothyroidism group had greater values of triglycerides than the normothyroid group, with a significant p-value.

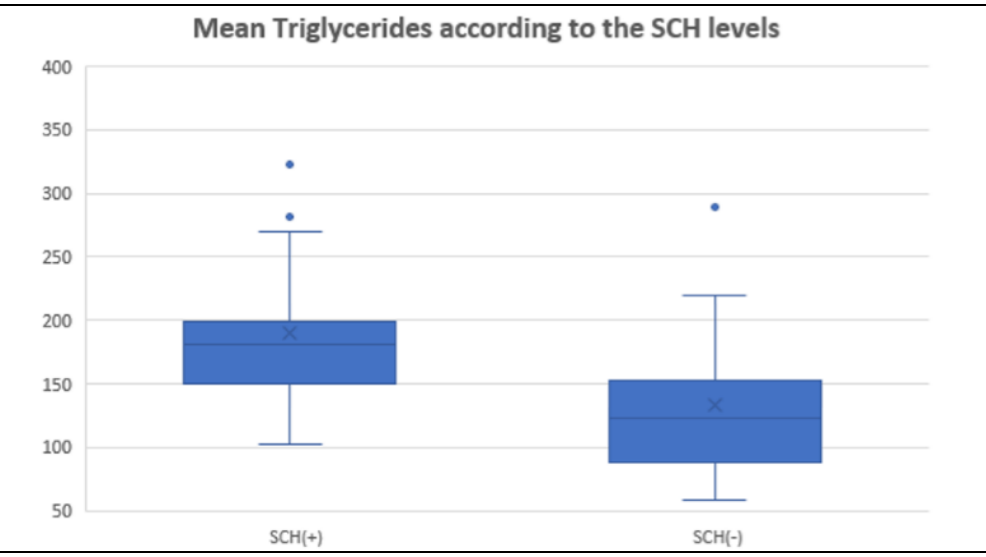

Figure 3: Mean Triglycerides According to the SCH Levels

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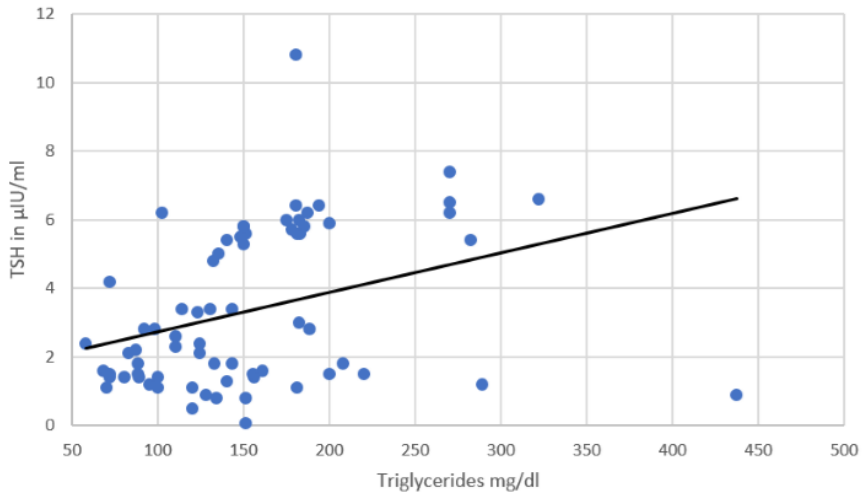

Figure 4: TSH vs. Triglycerides

LDL Levels with TSH.

The study found that LDL levels were greater in the subclinical hypothyroidism group than in the other group.

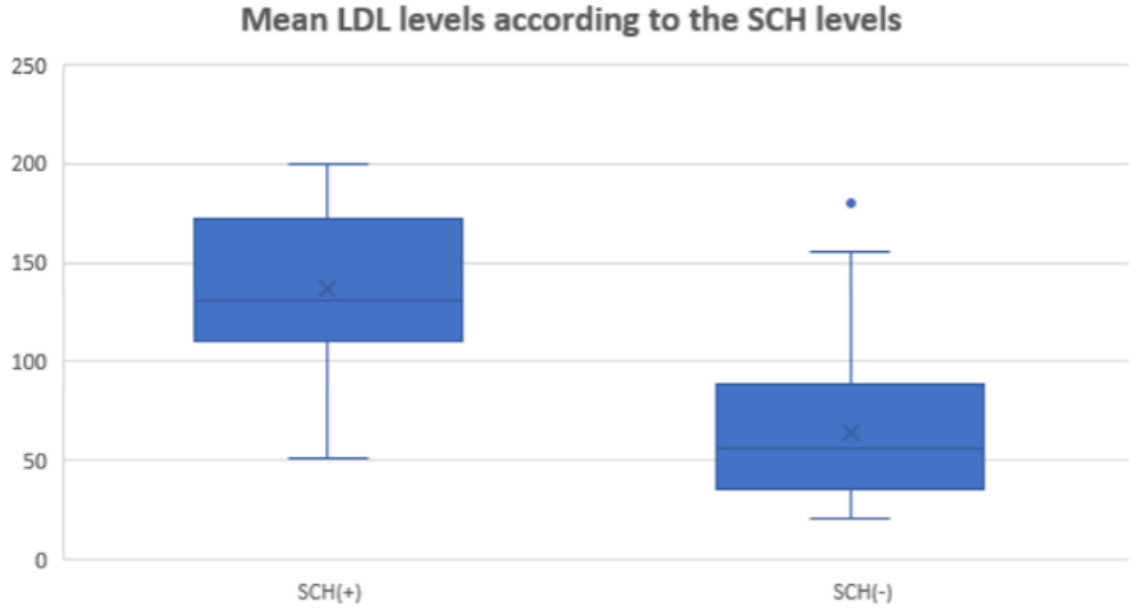

Figure 5: Mean LDL Levels According to the SCH Levels

Total Cholesterol Levels and TSH.

The study found that the subclinical hypothyroidism group had higher total cholesterol readings than the other group.

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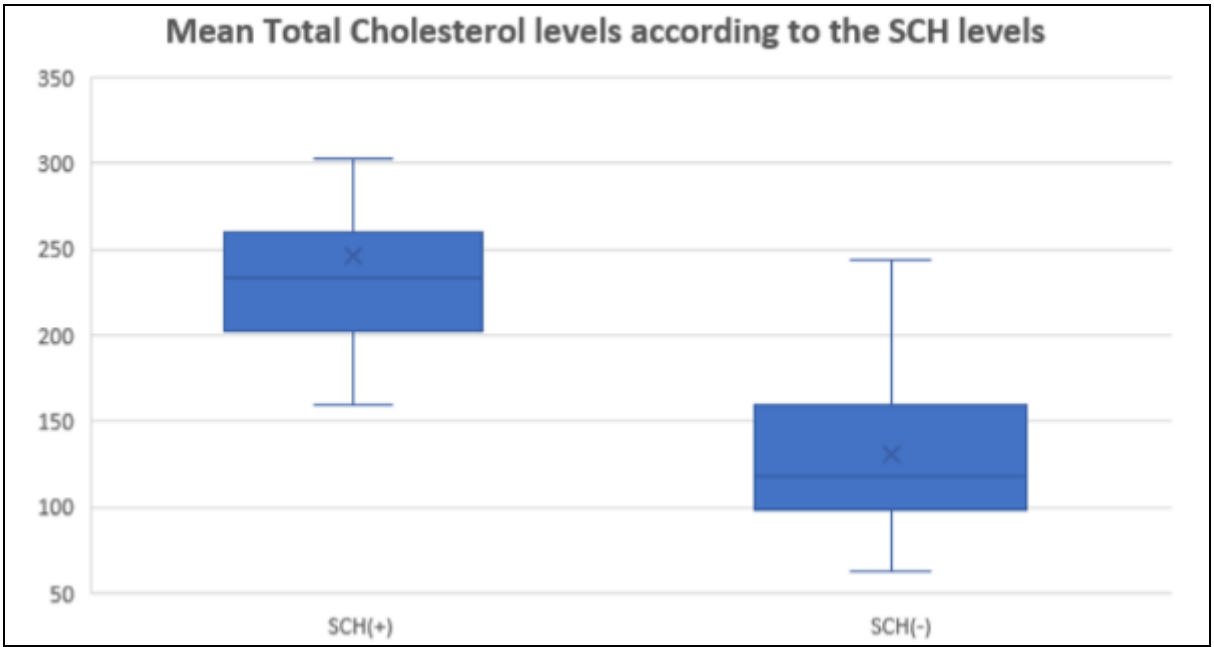

Figure 6: Mean Total Cholesterol Levels According to the SCH Levels

As demonstrated in Table 2, there was no statistically significant difference between euthyroid and SCH patients in terms of cardiovascular measures.

Parameters		SCH (-)	SCH (+)	P-Value	OR (95% CI)
Age (in years)	<55	7(15.2%)	8 (33.3%)	0.080	0.359 (0.111-1.156
	>55	39 (84.8%)	16(66.7%)		
SBP in mmHg	<130	2(4.3%)	1 (4.2%)	0.972	1.045 (0.090-12.150)
	>130	44(95.7%)	23(95.8%)		
DBP in mmHg	<80	6 (13%)	4 (16.7%)	0.681	0.750 (0.190-2.96)
	>80	40 (87%)	20 (83.3%)		
	>200	4(8.7%)	18 (75%)		
ECG	normal	29 (63.0%)	11 (45.8%)	0.167	0.496 (0.182-1.35)
	Abnormal	17 (37.0%)	13 (54.2%)		
ECHO	normal	29 (63%)	10 (41.7%)	0.05	0.419 (0.153-1.14)
	Abnormal	17 (37%)	14 (58.3%)		

Table 2: Multivariable Analysis for SCH in Patients with Cardio-Vascular Diseases

DISCUSSION

Thyroid gland disorders are among the most prevalent illnesses affecting women globally, with diabetes coming in second. Women are more likely than men to have decreased thyroid function, especially postmenopausal women over 50. According to the Framingham Heart Study, hypothyroidism affects more than 12% of women over 60.[1] The two most prevalent endocrine illnesses that show a considerable overlap are thyroid dysfunction and metabolic syndrome; postmenopausal women are more susceptible to osteoporosis and cardiovascular disease. If left untreated, thyroid problems will increase these risks. It might be difficult to diagnose and treat perimenopausal women when it comes to telling the difference between symptoms of thyroid malfunction and menopausal symptoms. According to an Indian study, 25–35% of adults have metabolic syndrome, which is associated with thyroid dysfunction.[2] Over the past few decades, many studies have attempted to highlight the problem statement

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of metabolic syndrome; nevertheless, the majority of them have focused on either the old population or the male population. Research studies continue to underrepresent postmenopausal women. Research on metabolic syndrome in women in this age range is scarce.

Previous studies have primarily shown a correlation between increased serum TSH levels and metabolic syndrome. Serum TSH values within the normal reference range were found to be significantly positively correlated with the prevalence of metabolic syndrome in Korea by Lee Yeo Kyung et al.[3] Bensenor Isabela M et al. found a robust correlation between high TSH and metabolic syndrome after studying 10,935 Brazilian volunteers.[4] Huang C. Y. et al. found that whereas a relatively high serum T3 concentration was highly associated with metabolic syndrome, a relatively low serum T4 concentration did not appear to be associated with metabolic syndrome. Blood TSH levels were found to be unrelated to metabolic syndrome.[5] In postmenopausal women, the presence of overt and subclinical hypothyroidism raises the risk of metabolic syndrome, which includes hypertriglyceridemia (OR = 1.526) and abdominal obesity (OR = 1.711). Women who are perimenopausal produce sex hormones at quite different rates. Impaired ovarian function results in decreased estrogen release, but adrenal cortex-derived androgen secretion is only marginally affected. Men and women have different patterns of lipid buildup that are regulated by sex hormones. Males and postmenopausal women readily store abdominal fat, leading to central obesity, while premenopausal women are more likely to develop peripheral obesity, which is accompanied by edema and adipose development. There is an increased chance of developing type 2 diabetes, cardiovascular disease-related mortality, and abdominal obesity.[6] Women's levels of FSH (Follicle-Stimulating Hormone) increase after menopause. There is a significant correlation between blood TC levels and FSH levels, and hypercholesterolemia is significantly more prevalent in premenopausal women than in perimenopausal women.[7] Twenty-four patients (34.3%) had subclinical hypothyroidism, according to the study. According to Vishwas et al. research,[8] 45% of women had metabolic syndrome, with postmenopausal women having a higher risk than perimenopausal women. With 14% subclinical hypothyroidism, 2% overt hypothyroidism, and 1% hyperthyroidism, there was a 17% prevalence of thyroid dysfunction. Thyroid dysfunction and metabolic syndrome did not significantly correlate; however, the frequency was higher in women with hypothyroidism. According to Latha P et al., 18% of perimenopausal women had hypothyroidism, with 17% having subclinical hypothyroidism and 1% having overt hypothyroidism.[9] Joshi SA et al. found that 12.5% of premenopausal and postmenopausal women had hypothyroidism; 1.5% had overt hypothyroidism and 11% had subclinical hypothyroidism.[10]

The average age of the study population was 64.5 years in the current study, compared to 55.14±8.05 years in the MK Vishwas et al. study and 56±4.7 years in the Butmarasri K et al. study.[11] The TSH level ranged from 0.08 to 10.80, with a mean of 3.34±2.26, according to our study. Perimenopausal women in the MK Vishwas et al.[8] study had a mean TSH value of 8.74±4.34 mU/L, which was significantly higher than the results of Latha P. et al. but comparable to the observation of 8.24±1.3 mU/L made by Garg N. et al.[12] The average TSH level in postmenopausal women was 9.31±3.34 mU/L, which was considerably higher than the study of Kamal SV et al. but comparable to that of Garg N et al.[12,13] According to the current study, metabolic syndrome was observed in 45% of women, with a higher prevalence in postmenopausal women (52% vs. 42% in perimenopausal women). A study conducted in Iran[14] on adult women revealed a 44.9% prevalence of metabolic syndrome among premenopausal women, which rose sharply to 57.9% and 64.3% in early menopausal and postmenopausal women, respectively. In China, a study on adult women reported a 23.2% incidence of metabolic syndrome. The MK Vishwas et al. study's

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findings on the metabolic syndrome among hypothyroid postmenopausal women were similar to those of Sieminska L et al. (49%) and Kannan L et al. (51.8%).[15,16]

The current study found that the levels of HbA1c, total cholesterol, triglycerides, and LDL cholesterol were considerably higher in individuals with SCH. The waist circumference was substantially greater in those with SCH ($p < 0.001$). In the Vishwas et al. study, hypothyroidism in postmenopausal women was significantly correlated with younger age, a higher BMI, and higher total cholesterol; whereas, in perimenopausal women, hypothyroidism was highly correlated with higher FBS and PPBS.

According to Deshmukh V et al., the prevalence of hypothyroidism suggests that different degrees of hypothyroidism along the course of the disease could be the cause of metabolic syndrome.[17] Furthermore, Chakradhar M et al. study found a statistically significant association between thyroid dysfunction and higher FBS and a larger waist circumference (p 0.033 and 0.039, respectively). Waist circumference also exhibited a positive link with TSH and a negative correlation with T4.[18] Waist circumference and T4 had a significant relationship (p-value = 0.002), but not with TSH ($p = 0.136$), according to Gyawali P et al.[19] There could be regional variations in iodine consumption, environmental factors, and genetic makeup that contribute to this discrepancy. Because hypothyroidism is more common in those with metabolic syndrome, it may worsen cardiovascular health by increasing blood pressure and cholesterol.

Individuals with thyroid gland dysfunction and metabolic syndrome may have an increased risk of cerebrovascular and cardiovascular events. Therefore, among women with diabetes, a larger waist circumference, and an aberrant lipid profile, early diagnosis of thyroid dysfunction may help prevent cardiovascular events in the long run. Hypothyroidism increases when systolic and diastolic blood pressure, triglycerides, and HDL decrease, according to MK Vishwas et al. however, the relationship was not statistically significant. Our study did not find any statistically significant difference in cardiovascular parameters between SCH and euthyroid patients.

In the present investigation, triglyceride levels were higher in patients with subclinical hypothyroidism than in those with normal thyroid function. In a similar vein, Abd El-Hay GE et al. showed that there was a substantial positive association (p-value = 0.02) between blood triglyceride levels and TSH, and a significant positive correlation (p-value = 0.02) between FBS and T3. Additionally, there was a substantial positive link between blood triglyceride levels and T4 (p-value = 0.02), and a significant negative correlation between waist circumference and T4.[20] TSH was positively correlated with triglycerides, free thyroxine with HDL, blood pressure and FBS, while waist circumference was negatively correlated with FT4, according to Delitala AP et al.[21] Thyroid dysfunction was linked to high waist circumference (99.17%), decreased HDL (87.60%), increased HOMA-IR (Homeostasis Model Assessment-Estimated Insulin Resistance) (86.78%), higher diastolic and systolic blood pressure (59.50%), elevated FBS (58.68%), and elevated triglycerides (33.06%) in the Deshmukh V et al. study. The subclinical and overt hypothyroidism groups had significantly higher blood pressure, lipids, BMI, and waist circumference, according to He J et al.[22]

The study had limitations due to its tiny group size. Additionally, cardiac examination was limited to the ECG and ECHO.

CONCLUSION

Subclinical hypothyroidism is common among postmenopausal women, and it is associated with an increased risk of metabolic syndrome. Early detection of this relationship will aid in the prevention of problems.

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