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# Prevalence of Subclinical Hypothyroidism in Obese Hypertensive Females Admitted to a Tertiary Care Hospital in Northern Bangladesh

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## ABSTRACT

**Background:** Subclinical hypothyroidism (SCH), characterized by elevated serum thyroid-stimulating hormone (TSH) with normal free thyroxine (FT4), may be associated with obesity, hypertension and adverse metabolic profiles. Data regarding SCH among obese hypertensive women in Bangladesh are limited. **Objective:** To determine the prevalence of SCH among obese hypertensive females admitted to a tertiary care hospital in Northern Bangladesh and assess associated demographic, clinical and biochemical factors. **Methods & Materials:** This hospital-based cross-sectional observational study was conducted in the Department of Medicine, Shaheed Ziaur Rahman Medical College Hospital, from January to June 2025. One hundred obese hypertensive women aged 20–65 years were enrolled purposively. Obesity was defined as BMI ≥25 kg/m² according to Asian criteria and SCH as serum TSH >4.5 mIU/L with normal FT4. Demographic, anthropometric, clinical and biochemical parameters were recorded. Statistical analysis was performed using SPSS version 26.0. **Results:** The mean age was 46.8±10.7 years and mean BMI was 31.2±4.6 kg/m². SCH was detected in 28 (28.0%) participants. Age-specific prevalence was highest among women aged 56–65 years (58.3%), followed by 46–55 years (28.9%). Compared with euthyroid participants, women with SCH had higher BMI (33.1±4.9 vs 30.4±4.2 kg/m², p=0.011), systolic blood pressure (153.8±13.4 vs 146.5±11.8 mmHg, p=0.018) and total cholesterol (221.6±31.5 vs 194.7±27.8 mg/dL, p<0.001). Family history of thyroid disease, diabetes mellitus and dyslipidemia were also significantly more frequent among participants with SCH. TSH correlated positively with BMI, systolic blood pressure and total cholesterol. **Conclusion:** SCH was relatively common among obese hypertensive females in this tertiary-care population and was associated with several metabolic and cardiovascular risk indicators.

***Keywords:*** *Subclinical Hypothyroidism; Obesity; Hypertension; Women; Thyroid Dysfunction.*

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## INTRODUCTION

Subclinical hypothyroidism (SCH) is a biochemical condition characterized by elevated serum thyroid-stimulating hormone (TSH) levels with normal circulating free thyroxine (FT4) concentrations. It represents an early stage of thyroid failure and is frequently asymptomatic or minimally symptomatic, making diagnosis challenging in routine clinical practice. SCH is increasingly recognized as a significant public health concern because of its association with metabolic syndrome, dyslipidemia, obesity, hypertension, insulin resistance and cardiovascular disease.[1,2] Globally, the prevalence of SCH ranges from 4% to 20% depending on age, sex, iodine intake and population characteristics. Women are affected more commonly than men, particularly during middle and older age.[3] Several epidemiological studies have shown that obesity and hypertension are strongly associated with thyroid dysfunction. Thyroid hormones regulate basal metabolic rate, lipid metabolism, thermogenesis and vascular resistance. Even mild thyroid dysfunction may influence body weight, blood pressure regulation and cardiovascular risk.[4,5] Obesity has become a major global health challenge. According to the World Health Organization, the prevalence of obesity has nearly tripled over the last four decades. In South Asian countries, including Bangladesh, urbanization, sedentary lifestyle, dietary transitions and reduced physical activity have contributed substantially to increasing obesity rates among women.[6] Obesity itself may alter thyroid hormone metabolism through leptin-mediated stimulation of hypothalamic-pituitary-thyroid axis activity. Elevated TSH levels have been frequently observed among obese individuals, although the exact mechanism remains incompletely understood.[7] Hypertension is another major cardiovascular risk factor associated with thyroid dysfunction. Hypothyroidism may increase systemic vascular resistance, impair endothelial function and promote arterial stiffness, thereby contributing to elevated blood pressure.[8] Previous studies demonstrated that SCH is associated with both systolic and diastolic hypertension. Moreover, coexistence of obesity and hypertension may further amplify metabolic abnormalities in patients with SCH.[9] In Bangladesh, the burden of non-communicable diseases is increasing rapidly. Obesity, hypertension, diabetes mellitus and cardiovascular disease are becoming major causes of morbidity and mortality. Despite this epidemiological transition, limited local data are available regarding thyroid dysfunction among obese hypertensive females. Early identification of SCH is clinically important because untreated patients may progress to overt hypothyroidism and develop significant cardiovascular complications.[10] Several international studies have demonstrated varying prevalence rates of SCH among obese hypertensive populations. A study conducted in India reported SCH prevalence of approximately 24% among obese hypertensive women.[11] Another study from Nepal observed a significant association between elevated TSH levels and obesity-related hypertension.[12] However, differences in ethnicity, dietary iodine status, lifestyle and healthcare access necessitate country-specific data. Females are particularly vulnerable to thyroid disorders because of hormonal fluctuations, autoimmune predisposition, pregnancy-related physiological changes and higher rates of obesity. Furthermore, symptoms such as fatigue, weight gain and

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lethargy are often nonspecific and may be overlooked in obese hypertensive women. Identification of SCH in this population may provide opportunities for early intervention and prevention of cardiovascular morbidity.[13] Tertiary care hospitals in Bangladesh receive a large number of obese hypertensive female patients with multiple metabolic risk factors. However, thyroid function testing is not routinely performed in many patients unless clinical suspicion arises. Understanding the prevalence and associated factors of SCH in this high-risk group may help clinicians develop appropriate screening strategies and management protocols. Therefore, the present study was undertaken to determine the prevalence of subclinical hypothyroidism among obese hypertensive females admitted to a tertiary care hospital in Northern Bangladesh and to evaluate associated demographic and clinical characteristics.

## METHODS & MATERIALS

This hospital-based cross-sectional observational study was conducted in the Department of Medicine at Shaheed Ziaur Rahman Medical College Hospital over a period of six months from January 2025 to June 2025. A total of 100 obese hypertensive female patients admitted to the medicine wards were enrolled purposively according to predefined inclusion and exclusion criteria. Female patients aged between 20 and 65 years with obesity defined as body mass index (BMI) ≥25 kg/m² according to Asian BMI criteria and hypertension defined as systolic blood pressure ≥140 mmHg and/or diastolic blood pressure ≥90 mmHg or current use of antihypertensive medications were included in the study. Patients with previously diagnosed thyroid disorders, current thyroid hormone therapy, pregnancy, chronic kidney disease, chronic liver disease, severe systemic illness, malignancy, steroid therapy or drugs affecting thyroid function such as amiodarone or lithium were excluded from the study. Patients unwilling to participate were also excluded. Ethical approval was obtained from the Institutional Ethical Review Committee of Shaheed Ziaur Rahman Medical College Hospital. Written informed consent was obtained from all participants prior to enrollment. Detailed demographic information including age, occupation, socioeconomic status, dietary history, smoking exposure, family history of thyroid disease, diabetes mellitus and hypertension was recorded using a structured questionnaire. Comprehensive clinical examination and anthropometric measurements were performed. Height was measured using a stadiometer and weight using a calibrated weighing scale. BMI was calculated as weight in kilograms divided by height in meters squared (kg/m²). Blood pressure was measured using a standard mercury sphygmomanometer after at least 10 minutes of rest in the sitting position. Three readings were taken at 5-minute intervals and the average value was recorded. Venous blood samples were collected following overnight fasting. Laboratory investigations included fasting blood glucose, serum total cholesterol, triglycerides, HDL cholesterol, LDL cholesterol, serum TSH and free T4 levels. Thyroid function tests were performed using chemiluminescent immunoassay methods. Subclinical hypothyroidism was diagnosed based on elevated serum TSH levels (>4.5 mIU/L) with normal free T4 levels according to laboratory reference standards. Patients with elevated TSH and low FT4 were considered overt hypothyroid and excluded from analysis.

Data were entered and analyzed using Statistical Package for Social Sciences (SPSS) version 26.0. Quantitative variables were expressed as mean ± standard deviation, while categorical variables were expressed as frequency and percentage. Student's t-test and chi-square test were used for comparison between groups where appropriate. Pearson correlation analysis was performed to assess relationships between TSH and clinical parameters. A p-value <0.05 was considered statistically significant. Ethical approval was obtained from the Institutional Ethical Review Committee of Shaheed Ziaur Rahman Medical College Hospital. Written informed consent was obtained from all participants before enrollment. The study was conducted in accordance with accepted ethical principles for research involving human participants.

## RESULTS

A total of 100 obese hypertensive female patients were included in the study. The mean age was 46.8±10.7 years and the mean BMI was 31.2±4.6 kg/m². SCH was identified in 28 (28.0%) participants, while 72 (72.0%) were euthyroid. The age distribution of the study population is presented in *Table I*. The largest proportion of participants belonged to the 46–55 years age group (38.0%), followed by 36–45 years (32.0%). Participants aged 20–35 years and 56–65 years accounted for 18.0% and 12.0%, respectively.

**Table I**
Age distribution of the study population (*n*=100).

| Age group (years) | Frequency (n) | Percentage (%) |
|---|---|---|
| 20–35 | 18 | 18.0 |
| 36–45 | 32 | 32.0 |
| 46–55 | 38 | 38.0 |
| 56–65 | 12 | 12.0 |
| Total | 100 | 100.0 |

The BMI distribution is shown in *Table II*. Forty-one participants (41.0%) had BMI 25–29.9 kg/m², 39 (39.0%) had BMI 30–34.9 kg/m² and 20 (20.0%) had BMI ≥35 kg/m². The overall mean BMI was 31.2±4.6 kg/m².

**Table II**
Distribution of body mass index among participants (*n*=100).

| BMI category (kg/m²) | Frequency (n) | Percentage (%) |
|---|---|---|
| 25–29.9 | 41 | 41.0 |
| 30–34.9 | 39 | 39.0 |
| ≥35 | 20 | 20.0 |
| Total | 100 | 100.0 |

Among the 100 study participants, 28 (28.0%) had SCH and 72 (72.0%) were euthyroid (*Table III*).

**Table III**
Prevalence of subclinical hypothyroidism among study participants (*n*=100).

| Thyroid status | Frequency (n) | Percentage (%) |
|---|---|---|
| Euthyroid | 72 | 72.0 |
| Subclinical hypothyroidism | 28 | 28.0 |
| Total | 100 | 100.0 |

The distribution of SCH according to age is presented in *Table IV*. Of the 28 participants with SCH, 3 (10.7%) were aged 20–35 years, 7 (25.0%) were aged 36–45 years, 11 (39.3%) were aged 46–55 years and 7 (25.0%) were aged 56–65 years. Considering each age group separately, the prevalence of SCH was 16.7% in the 20–35-year group, 21.9% in the 36–45-year group, 28.9% in the 46–55-year group and 58.3% in the 56–65-year group. There was a statistically significant association between age group and SCH (p=0.032).

**Table IV**
Association between age group and subclinical hypothyroidism.

| Age group (years) | SCH present n (%) | SCH absent n (%) | Age-specific SCH prevalence (%) |
|---|---|---|---|
| 20–35 | 3 (10.7) | 15 (20.8) | 16.7 |
| 36–45 | 7 (25.0) | 25 (34.7) | 21.9 |
| 46–55 | 11 (39.3) | 27 (37.5) | 28.9 |
| 56–65 | 7 (25.0) | 5 (6.9) | 58.3 |
| Total | 28 (100.0) | 72 (100.0) | 28.0 |

Comparison between participants with SCH and euthyroidism is shown in *Table V*. Participants with SCH had significantly higher BMI than euthyroid participants (33.1±4.9 vs 30.4±4.2 kg/m²; p=0.011). Mean systolic blood pressure was also significantly higher among participants with SCH (153.8±13.4 vs 146.5±11.8 mmHg; p=0.018). Total cholesterol was substantially higher in the SCH group (221.6±31.5 vs 194.7±27.8 mg/dL; p<0.001). Differences in diastolic blood pressure and fasting blood glucose were not statistically significant.

**Table V**
Comparison of clinical and biochemical parameters between SCH and euthyroid groups.

| Variables | SCH (n=28) Mean±SD | Euthyroid (n=72) Mean±SD | p-value |
|---|---|---|---|
| BMI (kg/m²) | 33.1±4.9 | 30.4±4.2 | 0.011 |
| Systolic BP (mmHg) | 153.8±13.4 | 146.5±11.8 | 0.018 |
| Diastolic BP (mmHg) | 96.2±8.6 | 92.8±7.1 | 0.071 |
| Total cholesterol (mg/dL) | 221.6±31.5 | 194.7±27.8 | <0.001 |
| Fasting blood glucose (mg/dL) | 118.4±23.5 | 109.6±20.8 | 0.084 |

As shown in *Table VI*, family history of thyroid disease was significantly more common among participants with SCH than among euthyroid participants (39.3% vs 16.7%; p=0.014). Diabetes mellitus was present in 53.6% of participants with SCH compared with 33.3% of euthyroid participants (p=0.048). Dyslipidemia was also significantly more frequent in the SCH group (64.3% vs 40.3%; p=0.031).

**Table VI**
Distribution of comorbidities and family history among study participants.

| Variables | SCH (n=28) n (%) | Euthyroid (n=72) n (%) | p-value |
|---|---|---|---|
| Family history of thyroid disease | 11 (39.3) | 12 (16.7) | 0.014 |
| Diabetes mellitus | 15 (53.6) | 24 (33.3) | 0.048 |
| Dyslipidemia | 18 (64.3) | 29 (40.3) | 0.031 |

Pearson correlation analysis demonstrated significant positive correlations between serum TSH and BMI, systolic blood pressure and total cholesterol (*Table VII*). The correlation was moderate for BMI (r=0.336, p=0.002) and systolic blood pressure (r=0.289, p=0.006), while total cholesterol showed the strongest correlation with TSH (r=0.411, p<0.001).

**Table VII**
Correlation between serum TSH and selected clinical and biochemical parameters.

| Variables | Correlation coefficient (r) | p-value |
|---|---|---|
| BMI | 0.336 | 0.002 |
| Systolic blood pressure | 0.289 | 0.006 |
| Total cholesterol | 0.411 | <0.001 |

## DISCUSSION

The present study evaluated the prevalence of subclinical hypothyroidism among obese hypertensive females admitted to a tertiary care hospital in Northern Bangladesh. The study demonstrated that SCH was present in 28% of participants, indicating a substantial burden of occult thyroid dysfunction in this high-risk population. The mean age of the participants was 46.8±10.7 years with the majority belonging to the 46–55 years age group. Similar age distributions have been reported in previous South Asian studies investigating thyroid dysfunction among obese hypertensive women.[11,12] Increasing age is a recognized risk factor for SCH, especially among females, possibly due to autoimmune mechanisms and progressive thyroid gland dysfunction.[14] In the present study, SCH prevalence was significantly associated with advancing age. Participants aged above 45 years demonstrated higher rates of SCH compared with younger women. This finding corresponds with results reported by Biondi and Cooper, who observed increasing TSH abnormalities among middle-aged and elderly women.[15] Obesity has an important relationship with thyroid hormone metabolism. The current study observed significantly higher BMI among patients with SCH compared to euthyroid participants (33.1±4.9 kg/m² vs 30.4±4.2 kg/m²). Previous investigations have similarly reported elevated TSH levels among obese individuals.[16] Leptin-mediated hypothalamic stimulation, altered deiodinase activity and inflammatory cytokines may contribute to thyroid dysfunction in obesity.[17] The prevalence of SCH observed in this study (28%) was higher than rates reported in general populations but comparable to studies involving metabolically compromised individuals. A hospital-based Indian study reported SCH prevalence ranging from 22% to 30% among obese hypertensive women.[11] Another study by Gupta et al. found SCH prevalence of 26% in obese females with cardiovascular risk factors.[18] Differences in prevalence across studies may reflect variations in iodine nutrition, ethnicity, diagnostic thresholds and study populations. Hypertension is strongly associated with thyroid dysfunction. In this study, systolic blood pressure was significantly higher among SCH patients. Hypothyroidism may increase peripheral vascular resistance and impair endothelial-dependent vasodilatation, thereby contributing to elevated blood pressure.[19] Meta-analyses have demonstrated that SCH is independently associated with hypertension and cardiovascular morbidity.[20] Serum total cholesterol levels were significantly elevated among SCH patients in the current study. Dyslipidemia is a well-established metabolic consequence of thyroid dysfunction. Reduced thyroid hormone activity decreases LDL receptor activity and impairs lipid clearance, leading to hypercholesterolemia.[21] Our findings are consistent with studies reporting significant associations between SCH and adverse lipid profiles.[22] Diabetes mellitus and dyslipidemia were more common among participants with SCH. Thyroid hormones influence carbohydrate metabolism, insulin sensitivity and lipid regulation. Coexistence of obesity, hypertension, diabetes and thyroid dysfunction may collectively increase cardiovascular risk.[23] These metabolic abnormalities emphasize the importance of comprehensive endocrine evaluation in obese hypertensive women. Family history of thyroid disease was significantly associated with SCH in this study. Autoimmune thyroid disease has a strong genetic predisposition, particularly among women.[24] Early screening among individuals with positive family history may facilitate timely diagnosis and intervention. The positive correlation observed between serum TSH and BMI supports previous evidence suggesting interaction between obesity and thyroid axis abnormalities. Similar positive correlations between TSH and systolic blood pressure have been documented in earlier studies.[25] Elevated TSH may contribute to increased arterial stiffness and endothelial dysfunction, thereby influencing blood pressure regulation. Bangladesh is currently facing an increasing burden of non-communicable diseases. Obesity and hypertension are becoming more prevalent among urban and semi-urban women because of sedentary lifestyle, dietary changes and reduced physical activity. However, thyroid dysfunction often remains underdiagnosed. Routine screening for SCH is not commonly practiced in many healthcare settings unless overt clinical manifestations are present. The findings of the present study have important clinical implications. Early identification and treatment of SCH among obese hypertensive women may improve lipid profile, blood pressure control, metabolic outcomes and quality of life. Furthermore, screening may help prevent progression to overt hypothyroidism and reduce long-term cardiovascular complications. This study had several limitations. The sample size was relatively small and derived from a single tertiary care center, limiting generalizability. The cross-sectional design prevented establishment of causal relationships. Autoimmune thyroid antibodies and urinary iodine levels were not assessed. Despite these limitations, the study provides valuable local data regarding SCH prevalence among obese hypertensive females in Northern Bangladesh. Future multicenter longitudinal studies involving larger populations are recommended to evaluate causal associations and long-term cardiovascular outcomes associated with SCH in obese hypertensive women.

## CONCLUSION

Subclinical hypothyroidism is highly prevalent among obese hypertensive females admitted to tertiary care hospitals in Northern Bangladesh. Advancing age, higher BMI, elevated systolic blood pressure, dyslipidemia, diabetes mellitus and positive family history were significantly associated with SCH. Routine thyroid function screening among obese hypertensive women may facilitate early diagnosis and timely management, thereby reducing cardiovascular and metabolic complications. Early intervention strategies focusing on weight management, blood pressure control and metabolic monitoring are strongly recommended.

## CONFLICT OF INTEREST

The authors declare that there is no conflict of interest related to this study.

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## AUTHOR CONTRIBUTIONS

All authors approved the final version of the manuscript and agreed to be accountable for all aspects of the work.

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