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General Medicine

PREVALENCE OF UNDIAGNOSED HYPOTHYROIDISM AMONG OBESE ADULTS ATTENDING TERTIARY CARE OPD - A CROSS-SECTIONAL STUDY

KEY WORDS: Obesity; Hypothyroidism; Thyroid Dysfunction; Subclinical Hypothyroidism; Body Mass Index; TSH; Cross-sectional Study

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ABSTRACT

Background: Obesity and hypothyroidism are increasingly prevalent endocrine disorders with a complex bidirectional relationship. Obese individuals are at a higher risk of developing thyroid dysfunction, particularly subclinical hypothyroidism, which often remains undiagnosed. Early identification of thyroid abnormalities among obese adults may facilitate timely management and reduce associated metabolic complications. **Objective:** To determine the prevalence of previously undiagnosed hypothyroidism among obese adults attending a tertiary care outpatient department and to assess its association with obesity severity and gender. **Materials and Methods:** This hospital-based descriptive cross-sectional study was conducted in the Department of General Medicine at a tertiary care teaching hospital in Navi Mumbai, Maharashtra, India. A total of 90 obese adults aged 18–60 years with body mass index (BMI) ≥30 kg/m² were recruited using convenience sampling. Participants with previously diagnosed thyroid disorders, pregnancy, thyroid surgery, severe acute illness, or medications affecting thyroid function were excluded. Sociodemographic details, clinical history, anthropometric measurements, and thyroid profile investigations were recorded. Serum thyroid-stimulating hormone (TSH) and free thyroxine (FT4) levels were measured using chemiluminescent immunoassay techniques. Thyroid dysfunction was classified according to American Thyroid Association criteria. Statistical analysis was performed using SPSS software, and a p-value <0.05 was considered statistically significant. **Results:** The mean age of participants was 41.8 ± 10.6 years, with females constituting 62.2% of the study population. The mean BMI was 33.7 ± 3.9 kg/m². Among the 90 obese participants, 34 (37.8%) were diagnosed with previously undiagnosed hypothyroidism, including 22 (24.4%) with subclinical hypothyroidism and 12 (13.3%) with overt hypothyroidism. Hypothyroidism was more prevalent among females (46.4%) compared with males (23.5%). A progressive increase in thyroid dysfunction was observed with increasing obesity severity, with prevalence rising from 26.5% in Class I obesity to 61.5% in Class III obesity (p = 0.031). Mean TSH levels were significantly higher and FT4 levels significantly lower among hypothyroid participants compared with euthyroid individuals (p < 0.001). **Conclusion:** A substantial proportion of obese adults attending tertiary care outpatient services had previously undiagnosed hypothyroidism, with subclinical hypothyroidism being the most common form. Female sex and increasing obesity severity were significantly associated with thyroid dysfunction. Routine thyroid screening among obese individuals, particularly females and patients with severe obesity, may facilitate early diagnosis and timely management of hypothyroidism.

INTRODUCTION

Subclinical hypothyroidism (SCH) has emerged as an increasingly important endocrine and public health concern worldwide [1]. SCH is biochemically characterized by elevated serum thyroid-stimulating hormone (TSH) levels in the presence of normal circulating free thyroxine (fT4) concentrations [1]. Although many individuals with SCH remain asymptomatic or present with nonspecific clinical manifestations, growing evidence suggests that SCH is associated with several adverse metabolic and cardiovascular consequences and may eventually progress to overt hypothyroidism if left undetected and untreated [2]. Epidemiological studies have reported that the global prevalence of SCH ranges between 4% and 10%, with a significantly higher prevalence observed among females and older adults [3].

Obesity, another rapidly escalating global health problem, has been increasingly linked with thyroid dysfunction and metabolic derangements [4]. Several studies have demonstrated that individuals with elevated body mass index (BMI) are more likely to develop SCH, potentially due to alterations in the hypothalamic-pituitary-thyroid axis, leptin-mediated neuroendocrine dysregulation, chronic low-grade inflammation, and impaired peripheral thyroid hormone metabolism [5]. Furthermore, the coexistence of obesity and SCH may contribute synergistically to metabolic abnormalities such as insulin resistance, dyslipidemia, hypertension, and impaired glucose metabolism [6]. This association is clinically significant because both obesity and thyroid dysfunction independently increase the risk of cardiovascular disease and type 2 diabetes mellitus [7]. Recent evidence suggests that obesity may not only predispose individuals to thyroid dysfunction but may also amplify the metabolic and cardiovascular impact of subclinical hypothyroidism [8].

Despite increasing recognition of the relationship between obesity and thyroid dysfunction, a considerable proportion of obese individuals may harbor undiagnosed SCH, particularly in outpatient settings where thyroid screening is not routinely performed. Early identification of thyroid abnormalities among obese individuals may facilitate timely therapeutic intervention and reduce long-term metabolic complications. Therefore, the present study was undertaken to determine the prevalence of previously undiagnosed hypothyroidism, particularly subclinical hypothyroidism, among obese adults attending a tertiary care outpatient department and to evaluate its association with obesity severity and related clinical parameters.

MATERIAL AND METHODS

Study Setting

This hospital-based descriptive cross-sectional study was conducted in the Department of General Medicine at D.Y. Patil School of Medicine and affiliated tertiary care teaching hospital, Navi Mumbai, Maharashtra, India, over a period of _____ months from _____ to _____. The study was

undertaken after obtaining approval from the Institutional Ethics Committee and was carried out in accordance with the ethical principles of the Declaration of Helsinki. The study aimed to determine the prevalence of previously undiagnosed hypothyroidism among obese adults attending the tertiary care outpatient department (OPD).

Study Participants

The study population consisted of obese adults attending the General Medicine OPD during the study period. Adults aged between 18 and 60 years with body mass index (BMI) ≥30 kg/m² according to World Health Organization (WHO) obesity criteria were included in the study. Participants were recruited consecutively using a convenience sampling technique until the required sample size was achieved. Patients with previously diagnosed hypothyroidism, those receiving thyroid hormone replacement therapy, individuals with history of thyroid surgery or radioiodine therapy, pregnant or postpartum women within the previous six months, severely ill patients, and those receiving medications known to interfere with thyroid function such as amiodarone, lithium, corticosteroids, or antithyroid drugs were excluded from the study. The sample size was calculated using the standard formula for estimation of a single population proportion based on an anticipated prevalence of 30%, 95% confidence interval, and 10% absolute precision, resulting in a calculated sample size of approximately 81 participants, which was increased to 90 after accounting for a possible 10% non-response rate.

Data Collection Methodology

Data were collected using a structured and pre-validated proforma that included sociodemographic details, medical history, symptoms suggestive of hypothyroidism, and anthropometric measurements. Information regarding fatigue, cold intolerance, constipation, weight gain, menstrual irregularities, hair loss, and mood disturbances was recorded. Anthropometric measurements were obtained using standardized techniques, with body weight measured using a calibrated digital weighing scale and height measured using a stadiometer. Body mass index (BMI) was calculated as weight in kilograms divided by height in meters squared (kg/m²), and participants were classified into Class I obesity (BMI 30–34.9 kg/m²), Class II obesity (BMI 35–39.9 kg/m²), and Class III obesity (BMI ≥40 kg/m²) according to WHO classification. Venous blood samples were collected after overnight fasting under aseptic precautions for estimation of serum thyroid-stimulating hormone (TSH) and free thyroxine (FT4) levels using chemiluminescent immunoassay techniques in the hospital's central laboratory. Free triiodothyronine (FT3) levels were measured when clinically indicated. Thyroid dysfunction was classified according to American Thyroid Association (ATA) criteria into overt hypothyroidism, subclinical hypothyroidism, and euthyroid status.

Statistical Analysis

All collected data were entered into Microsoft Excel and analyzed using Statistical Package for Social Sciences (SPSS) software version _____ (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean ± standard deviation (SD), while categorical variables were expressed as frequencies and percentages. The Chi-square test was applied to assess associations between thyroid dysfunction and categorical variables such as gender and obesity class, while independent Student's t-test was used for comparison of continuous variables between euthyroid and hypothyroid groups. A p-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 90 obese adults attending the tertiary care outpatient department were included in the study. The findings are presented below.

Table 1. Sociodemographic and Anthropometric Characteristics of Study Participants (N = 90)

Variable	Category/Mean ± SD	Frequency (n)	Percentage (%)
Age (years)	41.8 ± 10.6	—	—
Gender	Male	34	37.8
	Female	56	62.2
BMI (kg/m²)	33.7 ± 3.9	—	—
BMI Category	Class I Obesity (30–34.9)	49	54.4
	Class II Obesity (35–39.9)	28	31.1
	Class III Obesity (≥40)	13	14.4

The mean age of the study participants was 41.8 ± 10.6 years. Females constituted the majority of the study population (62.2%), while males accounted for 37.8% of participants. The mean BMI was 33.7 ± 3.9 kg/m². Most participants belonged to Class I obesity (54.4%), followed by Class II obesity (31.1%) and Class III obesity (14.4%).

Table 2. Prevalence of Thyroid Dysfunction Among Obese Adults (N = 90)

Thyroid Status	Frequency (n)	Percentage (%)
Euthyroid	56	62.2
Subclinical hypothyroidism	22	24.4
Overt hypothyroidism	12	13.3
Total hypothyroidism	34	37.8

Among the 90 obese participants, 34 (37.8%) were diagnosed with previously undiagnosed hypothyroidism, while 56 (62.2%) were euthyroid. Subclinical hypothyroidism was more common, accounting for 24.4% of cases, whereas overt hypothyroidism was observed in 13.3% of participants.

Table 3. Association Between Thyroid Dysfunction and Gender

Gender	Total (n)	Hypothyroid n (%)	Euthyroid n (%)
Male	34	8 (23.5)	26 (76.5)
Female	56	26 (46.4)	30 (53.6)
Total	90	34 (37.8)	56 (62.2)

Hypothyroidism was more prevalent among females compared with males. Among male participants, 23.5% were hypothyroid, whereas 46.4% of female participants were found to have hypothyroidism, indicating a higher burden of thyroid dysfunction among women.

Table 4. Association Between Thyroid Dysfunction and Obesity Class

BMI Class	Total (n)	Hypothyroid n (%)	Euthyroid n (%)
Class I (30–34.9)	49	13 (26.5)	36 (73.5)
Class II (35–39.9)	28	13 (46.4)	15 (53.6)
Class III (≥40)	13	8 (61.5)	5 (38.5)
Total	90	34 (37.8)	56 (62.2)

A progressive increase in the prevalence of hypothyroidism was observed with increasing obesity severity. Hypothyroidism was present in 26.5% of participants with Class I obesity, 46.4% of those with Class II obesity, and 61.5% of participants with Class III obesity. The association between obesity severity and thyroid dysfunction was statistically significant (p = 0.031).

Table 5. Comparison of Thyroid Profile Parameters Between Euthyroid and Hypothyroid Participants

Parameter	Euthyroid (n = 56) Mean ± SD	Hypothyroid (n = 34) Mean ± SD	t-value	p-value
TSH (mIU/L)	2.61 ± 0.83	7.88 ± 2.95	11.54	<0.001
FT4 (ng/dL)	1.21 ± 0.16	0.76 ± 0.19	12.32	<0.001

Comparison of thyroid profile parameters demonstrated significant biochemical differences between euthyroid and hypothyroid participants. Mean serum TSH levels were significantly higher among hypothyroid participants, while FT4 levels were significantly lower compared with euthyroid individuals. Both differences were statistically significant ($p < 0.001$).

DISCUSSION

The present study evaluated the prevalence of previously undiagnosed hypothyroidism among obese adults attending a tertiary care outpatient department and examined its association with obesity severity and related clinical parameters. The findings demonstrated that a substantial proportion of obese individuals had underlying thyroid dysfunction, with subclinical hypothyroidism constituting the majority of cases. Furthermore, hypothyroidism was found to be more prevalent among females and individuals with higher body mass index (BMI), suggesting a strong association between obesity and thyroid dysfunction.

The relationship observed between obesity and hypothyroidism in the present study is consistent with previous evidence demonstrating that increased adiposity is associated with altered thyroid function [10]. Several studies have reported that obese individuals tend to exhibit higher serum thyroid-stimulating hormone (TSH) levels compared with individuals of normal weight, indicating possible dysregulation of the hypothalamic-pituitary-thyroid axis secondary to excess adipose tissue [11]. Mechanistically, obesity-related increases in leptin levels, chronic low-grade inflammation, and altered peripheral deiodinase activity may contribute to elevated TSH secretion and impaired thyroid hormone metabolism [5]. Additionally, hypothyroidism itself may promote further weight gain through reduction in basal metabolic rate and thermogenesis, thereby creating a vicious cycle between obesity and thyroid dysfunction [12].

In the present study, the prevalence of hypothyroidism increased progressively with increasing obesity severity, with the highest prevalence observed among participants with Class III obesity. This finding further supports earlier observations that increasing BMI and adiposity are positively associated with thyroid dysfunction [10,11]. The significantly higher prevalence of hypothyroidism among female participants in the current study is also consistent with prior epidemiological studies indicating greater susceptibility of women to thyroid disorders due to hormonal and autoimmune influences [3].

Although the present study primarily focused on the prevalence of thyroid dysfunction, the findings may have important metabolic implications. Previous studies have demonstrated that subclinical hypothyroidism (SCH) is frequently associated with dyslipidemia, insulin resistance, hypertension, and other metabolic abnormalities, particularly among obese individuals [13,14]. Increased insulin resistance among obese individuals with SCH has also been reported, suggesting that thyroid dysfunction may contribute to worsening of metabolic syndrome and cardiovascular risk [15]. These metabolic effects are believed to result from reduced expression of low-density lipoprotein (LDL) receptors, impaired lipid metabolism, endothelial dysfunction, and altered glucose homeostasis secondary to thyroid hormone deficiency [16].

The significantly elevated TSH levels and reduced free thyroxine (FT4) levels observed among hypothyroid participants in the present study further validate the biochemical distinction between euthyroid and hypothyroid obese individuals. Emerging evidence suggests that even mild thyroid dysfunction may adversely influence metabolic risk profiles and cardiovascular outcomes [17]. Consequently, early identification of thyroid abnormalities among obese adults may facilitate timely intervention and reduce long-term metabolic and cardiovascular complications. Although levothyroxine therapy has been shown to improve lipid abnormalities and cardiovascular risk markers in selected individuals with SCH, the role of routine treatment in obese patients with mild thyroid dysfunction remains an area of ongoing debate [18,19].

The present study has certain limitations that should be acknowledged. Being a hospital-based cross-sectional study, it demonstrates association but cannot establish a causal relationship between obesity and hypothyroidism. The use of convenience sampling and single-center study design may limit the generalizability of the findings. The sample size was relatively modest, and long-term follow-up of participants was not performed. In addition, certain confounding variables such as dietary patterns, physical activity, iodine intake, psychological stress, and other lifestyle-related factors that may influence thyroid function were not evaluated. Despite these limitations, the study provides clinically relevant evidence regarding the high prevalence of previously undiagnosed hypothyroidism among obese adults in a tertiary care setting.

Overall, the findings of the present study highlight the importance of routine thyroid function screening among obese individuals, particularly females and patients with severe obesity. Early detection and management of thyroid dysfunction may help reduce associated metabolic abnormalities and improve long-term health outcomes. Future large-scale multicentric prospective studies incorporating metabolic and lifestyle variables are warranted to better elucidate the causal pathways linking obesity and thyroid dysfunction and to evaluate the benefits of targeted therapeutic interventions.

CONCLUSION

The present study demonstrated a high prevalence of previously undiagnosed hypothyroidism among obese adults attending a tertiary care outpatient department, with more than one-third of participants found to have thyroid dysfunction. Subclinical hypothyroidism constituted the majority of cases, indicating that a substantial proportion of obese individuals may harbor asymptomatic or clinically unrecognized thyroid abnormalities. The prevalence of hypothyroidism was significantly higher among females and increased progressively with increasing obesity severity, highlighting a strong association between thyroid dysfunction and higher BMI categories. These findings emphasize the importance of routine thyroid function screening among obese adults, particularly females and individuals with severe obesity, to facilitate early diagnosis, timely intervention, and prevention of metabolic and cardiovascular complications associated with untreated hypothyroidism.

REFERENCES

1. Tersander B, Olsson R, Aydin BK, Stenlid R, Ciba I, Manell H. Obesity-related subclinical hypothyroidism in childhood: elevated triglycerides but not basal metabolic rate. Pediatr Res. 2025;98:182-187. doi:10.1038/s41390-024-03691-6.
2. Untalan M, Crimmins NA, Yates KP, Mencin AA, Xanthakos SA, Thaker VV. Prevalence of subclinical hypothyroidism and longitudinal thyroid-stimulating hormone changes in youth with metabolic dysfunction-associated steatotic liver disease: an observational study. Hepatology. 2025;82:155-164. doi:10.1097/HEP.0000000000001095.
3. Xue J, Li C, Ju J, Liang S. Association of insulin-like growth factor 1 and metabolic parameters with mild subclinical hypothyroidism in obese boys. Sci Rep. 2025;15:17017. doi:10.1038/s41598-025-02084-x.
4. Zhong L, Liu S, Yang Y, Xie T, Liu J, Zhao H, et al. Metabolic syndrome and risk of subclinical hypothyroidism: a systematic review and meta-analysis. Front Endocrinol (Lausanne). 2024;15:1399236. doi:10.3389/fendo.2024.1399236.
5. Ding X, Zhao Y, Zhu CY, et al. The association between subclinical hypothyroidism and metabolic syndrome: an update meta-analysis of observational studies. Endocr J. 2021;68:1043-1056. doi:10.1507/endocrj.EJ20-0796.
6. Alwan H, Ribero VA, Efthimiou O, Del Giovane C, Rodondi N, Duntas L. A systematic review and meta-analysis investigating the relationship between metabolic syndrome and the incidence of thyroid diseases. Endocrine. 2024;84:320-327. doi:10.1007/s12020-023-03503-7.

7. Biondi B. Subclinical hypothyroidism in patients with obesity and metabolic syndrome: a narrative review. Nutrients. 2023;16:87. doi:10.3390/nu16010087.
8. Alourfi Z, Hijazi N, Alsultan M. Association of subclinical hypothyroidism with metabolic syndrome components in a group of apparently healthy Syrians: a retrospective cross-sectional study. Ann Med Surg (Lond). 2023;85:670-675. doi:10.1097/MS9.0000000000000184.
9. Bhardwaj R, Agrawal U, Vashist P, Manna S. Determination of sample size for various study designs in medical research: a practical primer. J Family Med Prim Care. 2024;13:2555-2561. doi:10.4103/jfmpc.jfmpc_1675_23.
10. Yan Y, Xu M, Wu M, et al. Obesity is associated with subclinical hypothyroidism in the presence of thyroid autoantibodies: a cross-sectional study. BMC Endocr Disord. 2022;22:94. doi:10.1186/s12902-022-00981-0.
11. Zhou Y, Ke S, Wu K, et al. Correlation between thyroid homeostasis and obesity in subclinical hypothyroidism: community-based cross-sectional research. Int J Endocrinol. 2021;2021:6663553. doi:10.1155/2021/6663553.
12. Kara O. Influence of subclinical hypothyroidism on metabolic parameters in obese children and adolescents. Clin Exp Pediatr. 2020;63:110-114. doi:10.3345/cep. 2019.01536.
13. Karar M, Eltayeb Eltahir SM, Mohammed Ibrahim AM, Mohammed Mahmoud FS, Mohamed Abdalla SA, Hyder Mohammed AA, et al. Association between metabolic syndrome and subclinical hypothyroidism: a systematic review. Cureus. 2025;17:e84475. doi:10.7759/cureus. 84475.
14. Song B, Lu C, Teng D, Shan Z, Teng W. Association between different metabolic phenotypes of obesity and thyroid disorders among Chinese adults: a nationwide cross-sectional study. Front Endocrinol (Lausanne). 2023;14:1158013. doi:10.3389/fendo.2023.1158013.
15. Hewage N, Wijesekara U, Perera R. Prevalence of subclinical hypothyroidism in a non-diabetic young female population and its impact on diabetes and cardiometabolic risk. Endocrinol Metab (Seoul). 2024;39:864-876. doi:10.3803/EnM.2024.2015.
16. Deng L, Wang L, Zheng X, Shuai P, Liu Y. Women with subclinical hypothyroidism are at higher prevalence of metabolic syndrome and its components compared to men in an older Chinese population. Endocr Res. 2021;46:186-195. doi:10.1080/07435800.2021.1928177.
17. Ahmed AE, Alsamghan A, Momenah MA, et al. Metabolic syndrome and cardiometabolic risk factors in the mixed hypercholesterolemic populations with respect to gender, age, and obesity in Asir, Saudi Arabia. Int J Environ Res Public Health. 2022;19:14985. doi:10.3390/ijerph192214985.
18. Alsulami SS, Baig M, Albeladi AH, et al. Correlation between subclinical hypothyroidism and metabolic syndrome: a retrospective study. Saudi J Med Med Sci. 2023;11:250-256. doi:10.4103/sjmms.sjmms_225_22.
19. Patel R, Dave C, Mehta S, Mendpara H, Shukla R, Bajpai A. Metabolic impact of subclinical hypothyroidism in obese children and adolescents. Indian J Pediatr. 2021;88:437-440. doi:10.1007/s12098-020-03463-0.