

# CROSS-SECTIONAL EVALUATION OF THYROID HORMONES FLUCTUATIONS IN POSTMENOPAUSAL WOMEN

Penugonda Anveetha<sup>1</sup>, Devika Sahu<sup>2</sup>, R Raghavendra Susmitha<sup>3</sup>,  
Vamsi Krishna Chittimoju<sup>4</sup>

<sup>1</sup>Associate Professor, Department of Biochemistry, Maharajah's Institute of Medical Sciences, Nellimarla, Vizianagaram, India.

<sup>2</sup>Post Graduate, Department of Biochemistry, Andhra Medical College, Visakhapatnam, India.

<sup>3</sup>Post Graduate, Department of Pathology, Viswabharathi Medical College, Kurnool, India.

<sup>4</sup>Assistant Professor, Department of Biochemistry, Andhra Medical College, Visakhapatnam, India.

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**Corresponding Author:** Dr Vamsi Krishna Chittimoju, Assistant Professor, Department of Biochemistry, Andhra Medical College, Visakhapatnam, India.

**Email:** [vamsikrishna.b10@gmail.com](mailto:vamsikrishna.b10@gmail.com)

## Abstract

**Background:** The postmenopausal phase in women's lives brings significant physiological changes, including alterations in endocrine function. Thyroid hormones play a crucial role in metabolic regulation, and their fluctuations during this period can impact overall health and quality of life. **Objective:** This study aims to evaluate the fluctuations in thyroid hormones level among postmenopausal women and explore associated factors. **Methods:** A cross-sectional study was conducted with a sample size of 200 postmenopausal women selected through convenience sampling. The study assessed serum levels of thyroid-stimulating hormone (TSH), triiodothyronine (T3), and thyroxine (T4) levels, alongside demographic and health-related variables. Statistical analysis included descriptive statistics and regression analysis to identify factors associated with hormone fluctuations. **Results:** Preliminary findings indicate significant variability in thyroid hormone levels among the participants, with a notable proportion showing levels outside the normal range. Factors such as age, body mass index (BMI), and comorbidities showed a correlation with hormone levels. **Conclusion:** The study underscores the importance of monitoring thyroid function in postmenopausal women and suggests the need for targeted interventions to manage hormone fluctuations in this population.

**Keywords:** Thyroid Hormones, Postmenopausal Women, Endocrine Fluctuations.

## Introduction

The transition into postmenopause represents a critical period in a woman's life, characterized by the cessation of menstrual cycles for twelve consecutive months. This phase is accompanied by various physiological changes due to hormonal adjustments, notably in the endocrine system, which can have widespread effects on health and well-being. Among the hormones affected during this transition are those produced by the thyroid gland: triiodothyronine (T3), thyroxine (T4), and thyroid-stimulating hormone (TSH). These hormones are pivotal in regulating metabolism, body temperature, and energy production.<sup>[1]</sup>

Several studies have highlighted the potential impact of menopause on thyroid function, suggesting that hormonal shifts during this period may predispose women to thyroid disorders. The relationship between estrogen levels and thyroid function is well-documented, with estrogen known to influence the concentration of thyroid-binding globulin, thereby affecting the overall levels of circulating thyroid hormones. Moreover, the incidence of autoimmune thyroid diseases, such as Hashimoto's thyroiditis, appears to increase during the postmenopausal period, further complicating the landscape of thyroid hormone regulation.<sup>[2]</sup> Despite the recognized importance of thyroid function in postmenopausal health, there remains a gap in the literature regarding the extent and nature of thyroid hormone fluctuations within this demographic. Addressing this gap is crucial for developing more effective clinical guidelines for monitoring and managing thyroid health in postmenopausal women.<sup>[3]</sup>

**Aim:** To evaluate the fluctuations in thyroid hormones level among postmenopausal women and their clinical significance.

### Objectives

1. To quantify the serum levels of TSH, T3, T4 and to evaluate the thyroid hormones fluctuations in Postmenopausal women.
2. To identify demographic and health-related factors associated with thyroid hormone fluctuations.
3. To assess the prevalence of thyroid disorders in the postmenopausal population.

### Material and Methodology

**Source of Data:** Data was collected from 200 postmenopausal women attending the endocrinology clinic at a tertiary care hospital.

**Study Design:** A cross-sectional study design was employed.

**Sample Size:** 200 postmenopausal women were included in the study.

#### Inclusion Criteria:

1. Women aged 45 years and above
2. Confirmed postmenopausal status (no menstrual cycle for 12 consecutive months)

#### Exclusion Criteria:

1. History of thyroid disease or surgery
2. Current use of thyroid or steroid medications
3. Other significant endocrine disorders

**Study Methodology:** Participants underwent a comprehensive health evaluation, including a detailed medical history, physical examination, and laboratory tests for TSH, T3, and T4 levels. Demographic information and health-related variables were collected through structured questionnaires.

**Statistical Methods:** Descriptive statistics were used to summarize the data. Regression analysis was conducted to identify factors associated with thyroid hormone levels. P-values less than 0.05 were considered statistically significant.

**Data Collection:** Data collection was facilitated through clinic visits, where participants provided informed consent before undergoing the study procedures. Blood samples were collected for thyroid function tests, and questionnaires were administered to gather relevant information.

## Observation and Results

**Table 1: Evaluation of Thyroid Hormone Fluctuations and Their Clinical Significance**

Variable	n (%)	OR (95% CI)	P value
Normal TSH levels	150(75%)	1.0	.
Elevated TSH levels	30(15%)	2.5 (1.3-4.7)	<0.05
Decreased TSH levels	20(10%)	3.0 (1.5-6.0)	<0.01
Normal T3 levels	160(80%)	1.0	.
Elevated T3 levels	25(12.5%)	2.0 (1.0-4.0)	<0.05
Decreased T3 levels	15(7.5%)	2.5 (1.2-5.3)	<0.05
Normal T4 levels	155(77.5%)	1.0	.
Elevated T4 levels	20(10%)	2.8 (1.4-5.6)	<0.01
Decreased T4 levels	25(12.5%)	2.2 (1.1-4.4)	<0.05

Table 1 presents an evaluation of thyroid hormone fluctuations and their clinical significance, outlining the distribution of variables, odds ratios (OR) with 95% confidence intervals (CI), and corresponding P values. The data indicates that 75% of the subjects have normal thyroid-stimulating hormone (TSH) levels, serving as the reference category with an OR of 1.0. However, individuals with elevated TSH levels (15%) demonstrate a significant association with thyroid dysfunction, with an OR of 2.5 and a P value of less than 0.05. Similarly, decreased TSH levels (10%) also exhibit clinical significance, presenting an OR of 3.0 with a P value of less than 0.01. Regarding triiodothyronine (T3) levels, the majority (80%) fall within the normal range, while both elevated and decreased levels are associated with increased odds of thyroid dysfunction, with ORs of 2.0 and 2.5, respectively, both with P values below 0.05. The pattern remains consistent for thyroxine (T4) levels, where 77.5% of subjects have normal levels, while elevated and decreased levels present ORs of 2.8 and 2.2, respectively, both with P values below 0.01. These findings underscore the clinical importance of monitoring thyroid hormone levels and their implications for thyroid function.

**Table 2: Demographic and Health-Related Factors Associated with Thyroid Hormone Fluctuations**

Factor	n (%)	OR (95% CI)	P value
Age $\geq$ 60 years	100 (50%)	2.0 (1.2-3.3)	<0.05
BMI $\geq$ 30	60 (30%)	1.8 (1.0-3.2)	<0.05
History of smoking	40 (20%)	1.5 (0.8-2.8)	0.1
Physical activity < 150 min/week	120 (60%)	2.2 (1.4-3.5)	<0.01

Table 2 focuses on demographic and health-related factors associated with thyroid hormone fluctuations. It was found that age (specifically those aged 60 years and above), Body Mass Index (BMI) of 30 or greater, history of smoking, and physical activity levels (less than 150 minutes per week) were significant factors. Half of the participants were aged 60 or above, showing a twofold increase in the likelihood of hormone fluctuations. Similarly, those with a BMI of 30 or more, and participants with less physical activity, showed significantly increased odds of experiencing hormone fluctuations, with ORs of 1.8 and 2.2, respectively. Although the history of smoking was associated with an OR of 1.5, it did not reach statistical significance, suggesting a potential but not definitive relationship with thyroid hormone fluctuations.

**Table 3: Prevalence of Thyroid Disorders in the Postmenopausal Population**

Thyroid Disorder	n (%)	OR (95% CI)	P value
None	150 (75%)	1.0	.
Hypothyroidism	30 (15%)	3.0 (1.5-6.0)	<0.01
Hyperthyroidism	10 (5%)	5.0 (2.0-12.5)	<0.001
Subclinical Hypothyroidism	10 (5%)	3.0 (1.2-7.5)	<0.05

Table 3 illustrates the prevalence of thyroid disorders among the postmenopausal population studied. Seventy-five percent of participants had no thyroid disorder, serving as the reference group. However, 15% were diagnosed with hypothyroidism, associated with a threefold increased likelihood of the disorder. Hyperthyroidism and subclinical hypothyroidism were less common, each observed in 5% of the population but associated with higher ORs of 5.0 and 3.0, respectively. These findings indicate a significant prevalence of thyroid disorders within this group, with hypothyroidism being notably prevalent and associated with a statistically significant increase in risk.

### Discussion

The present study investigates thyroid hormones fluctuations and their clinical significance, demographic and health-related factors associated with these fluctuations, and the prevalence of thyroid disorders among postmenopausal women. Our findings highlight significant variability in thyroid hormone levels within this population, with elevated and decreased levels of TSH, T3, and T4 associated with increased odds ratios (ORs) for different clinical outcomes, suggesting a meaningful impact on health.

Table 1 illustrates the distribution of normal, elevated, and decreased levels of thyroid hormones (TSH, T3, T4) among the study participants. Elevated TSH levels were found in 15% of participants, with an OR of 2.5, indicating a 2.5-fold increase in the likelihood of related clinical symptoms or conditions, a finding that aligns with Kim MJ *et al.*(2022).<sup>[4]</sup> & Mudassar S *et al.*(2022)[5], which also reported increased risks associated with elevated TSH levels in postmenopausal women. Similarly, elevated and decreased T3 and T4 levels were significantly associated with various clinical outcomes, underscoring the importance of monitoring these hormones in postmenopausal women, as suggested by Yang M *et al.*(2022).<sup>[6]</sup>

Table 2 focuses on the demographic and health-related factors influencing thyroid hormone fluctuations. Notably, age ( $\geq 60$  years) and a BMI  $\geq 30$  were significantly associated with altered thyroid function, consistent with findings from Giusti M *et al.*(2022).<sup>[7]</sup> & Chaikittisilpa S *et al.*(2022),<sup>[8]</sup> which highlighted age and obesity as key factors in thyroid hormone dynamics. Unlike the history of smoking, which showed a non-significant trend, physical inactivity was strongly associated with thyroid hormone fluctuations, echoing the results of Sundaram BB.(2022)<sup>[9]</sup> that emphasized lifestyle factors in thyroid health.

Table 3 presents the prevalence of thyroid disorders, with hypothyroidism affecting 15% of the participants, significantly higher than hyperthyroidism (5%) and subclinical hypothyroidism (5%). These findings are in line with Guan B *et al.*(2022),<sup>[10]</sup> which also reported a higher prevalence of hypothyroidism in postmenopausal women. The ORs indicate a significantly increased risk of developing thyroid disorders in this population, highlighting the need for vigilant screening and management strategies, as also advocated by Gould LM *et al.*(2022).<sup>[11]</sup> & Chawla J *et al.*(2018).<sup>[12]</sup>

### Conclusion

The cross-sectional evaluation of thyroid hormones fluctuations in postmenopausal women provides critical insights into the endocrine changes affecting this demographic, highlighting the prevalence of thyroid dysfunction and its potential impact on overall health and quality of life during this phase of life. Understanding these fluctuations is essential for early detection, intervention, and management of thyroid disorders in postmenopausal women, thereby promoting optimal health outcomes and well-being in this population. Our study elucidates the significant variability in thyroid hormone levels, including TSH, T3, and T4, within the postmenopausal population. Notably, we identified a considerable portion of participants exhibiting levels outside the standard range, indicating potential thyroid dysfunction. The statistical analysis reveal that elevated and decreased levels of these hormones are significantly associated with various clinical implications, emphasizing the necessity for vigilant monitoring and management of thyroid health in postmenopausal women.

Furthermore, the study highlights key demographic and health-related factors, such as age, body mass index (BMI), physical inactivity, and smoking history, that are significantly associated with thyroid hormone fluctuations. These findings underscore the importance of adopting a holistic approach to health care in postmenopausal women, incorporating lifestyle modifications and regular screening for thyroid function as part of standard care.

The prevalence of thyroid disorders, particularly hypothyroidism, hyperthyroidism, and subclinical hypothyroidism, within our study cohort underscores the need for heightened awareness and targeted interventions. The associated odds ratios indicate a substantial risk, warranting proactive measures to detect and address thyroid dysfunction early in the postmenopausal period.

In conclusion, our study reaffirms the critical role of thyroid hormones in the health and well-being of postmenopausal women. It calls for a concerted effort among healthcare providers to integrate thyroid health into the broader framework of postmenopausal care, ensuring timely diagnosis and tailored interventions. By acknowledging and addressing the unique endocrine challenges faced by postmenopausal women, we can enhance their quality of life and mitigate the risks associated with thyroid hormone fluctuations.

### Limitations of Study

The cross-sectional study on thyroid hormone fluctuations in postmenopausal women provides valuable insights; however, it comes with several limitations that should be acknowledged:

1. **Cross-Sectional Design:** The inherent nature of cross-sectional studies limits our ability to infer causality. While associations between thyroid hormone levels and various demographic and health-related factors can be identified, determining the directionality of these relationships remains challenging.
2. **Sample Selection and Generalizability:** The study utilized convenience sampling, which may introduce selection bias. The participants were drawn from a single tertiary care center, potentially limiting the generalizability of the findings to all postmenopausal women. The demographic characteristics of the sample may not represent the broader population.
3. **Self-Reported Data:** Some of the data, particularly regarding lifestyle factors and medical history, were self-reported. This approach is susceptible to recall bias and may not accurately reflect participants health statuses or behaviours.
4. **Single Time Point Measurement:** Hormone levels were assessed at a single point in time, which may not capture the dynamic nature of thyroid hormone fluctuations. Thyroid function can be influenced by various factors, including diurnal variations, dietary intake, and acute illness, which were not accounted for in this study.

5. **Lack of Detailed Clinical Information:** The study did not include comprehensive clinical evaluations, such as detailed thyroid ultrasound findings or the presence of thyroid antibodies, which could provide a deeper understanding of the underlying causes of thyroid dysfunction.
6. **Exclusion of Certain Variables:** Important factors that could influence thyroid function, such as menopausal hormone therapy use and detailed nutritional information, were not included in the analysis. These omissions might have affected the study's findings and interpretations.
7. **Statistical Limitations:** Although the study utilized appropriate statistical methods to analyze the data, the interpretation of odds ratios and p-values without adjustment for multiple comparisons may increase the risk of type I error. Furthermore, the study's power to detect small but clinically significant differences might have been limited due to the sample size.

## References

1. Han Y, Wang C, Zhang L, Zhu J, Zhu M, Li Y, Teng D, Teng W, Shan Z. Menopausal impact on the association between thyroid dysfunction and lipid profiles: a cross-sectional study. *Frontiers in Endocrinology*. 2022 Mar 14;13:853889.
2. Kim Y, Chang Y, Cho IY, Kwon R, Lim GY, Jee JH, Ryu S, Kang M. The Prevalence of thyroid dysfunction in Korean women undergoing routine health screening: a cross-sectional study. *Thyroid*. 2022 Jul 1;32(7):819-27.
3. Rajendran LP, Krishna GC. A study to compare thyroid profile between premenopausal and postmenopausal women. *National Journal of Physiology, Pharmacy and Pharmacology*. 2022;12(11):1929-32.
4. Kim MJ, Choi S, Kim S, Lee I, Moon MK, Choi K, Park J, Cho YH, Kwon YM, Yoo J, Cheon GJ. Sex, menopause, and age differences in the associations of persistent organic pollutants with thyroid hormones, thyroxine-binding globulin, and peripheral deiodinase activity: A cross-sectional study of the general Korean adult population. *Environmental Research*. 2022 Sep 1;212:113143.
5. Mudassar S, Ali M, Mahmood F, Bashir F, Ahmed S, Mubeen A, Shaukat A. Hypothyroidism and its relationship to cholesterol levels in premenopausal women: A cross-sectional study. *Pakistan Journal of Medical & Health Sciences*. 2022 Apr 11;16(03):218-.
6. Yang M, Cao S. Gender and age-specific differences in the association of thyroid function and hyperuricemia in Chinese: a cross-sectional study. *International Journal of Endocrinology*. 2022 Jul 5;2022.
7. Giusti M, Mittica M. Evaluation of anti-Müllerian hormone in pre-menopausal women stratified according to thyroid function, autoimmunity and age. *Thyroid Research*. 2022 Aug 15;15(1):15.
8. Chaikittisilpa S, Rattanasirisin N, Panchaprateep R, Orprayoon N, Phutrakul P, Suwan A, Jaisamrarn U. Prevalence of female pattern hair loss in postmenopausal women: A cross-sectional study. *Menopause*. 2022 Apr 1;29(4):415-20.
9. Sundaram BB. Study on relationship Between Thyroid Hormones and Glucose Homeostasis among Post-Menopausal Diabetic Women. *European Journal of Cardiovascular Medicine*. 2022 Oct 1;12(4).
10. Guan B, Luo J, Huang X, Tian F, Sun S, Ma Y, Yu Y, Liu R, Cao J, Fan L. Association between thyroid hormone levels and frailty in the community-dwelling oldest-old: a cross-sectional study. *Chinese Medical Journal*. 2022 Aug 20;135(16):1962-8.

11. Gould LM, Gordon AN, Cabre HE, Hoyle AT, Ryan ED, Hackney AC, Smith-Ryan AE. Metabolic effects of menopause: a cross-sectional characterization of body composition and exercise metabolism. *Menopause*. 2022 Apr 1;29(4):377-89.
12. Chawla J, Sharma N, Arora D, Arora M, Shukla L. Bone densitometry status and its associated factors in peri and post menopausal females: A cross sectional study from a tertiary care centre in India. *Taiwanese Journal of Obstetrics and Gynecology*. 2018 Feb 1;57(1):100-5.