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Evaluation of Thyroid Status in Postmenopausal Women

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Abstract: ***Background:*** Thyroid dysfunction is common among postmenopausal women, presenting diagnostic challenges due to symptoms that overlap with menopausal and age-related conditions. Unrecognized thyroid dysfunction can increase risks for cardiovascular disease, bone fractures, cognitive decline, depression, and mortality. This study aimed to evaluate thyroid status in postmenopausal women, addressing a critical gap in understanding its prevalence and impact. ***Methods:*** This cross-sectional study was conducted over one year (June 2022 to May 2023) at the Department of Gynaecology and Obstetrics, Dhaka Medical College Hospital (DMCH). A total of 100 postmenopausal women were enrolled after obtaining informed consent. Each participant underwent detailed history-taking, clinical examination, and relevant laboratory investigations. Data were recorded in case forms and analyzed using SPSS version 26. ***Results:*** The mean age of participants was 56.08 ± 7.39 years, with most (75%) aged 45-60 years. The mean BMI was 25.60 ± 4.65 kg/m². The mean FT3 was 3.58 ± 2.29 pmol/L, FT4 was 8.29 ± 7.31 pmol/L, and TSH was 5.36 ± 4.53 mIU/L. Anti-TPO antibody was positive in 22% and anti-TG antibody in 38% of participants. Thyroid status assessment showed 54% of participants were euthyroid, 43% were hypothyroid, and 3% were hyperthyroid. Among the 46 women with thyroid dysfunction, subclinical hypothyroidism was the most common (87%), followed by primary hypothyroidism (6.5%), primary hyperthyroidism (4.3%), and subclinical hyperthyroidism (2.2%). ***Conclusion:*** Subclinical hypothyroidism is the predominant thyroid abnormality in postmenopausal women.

Keywords: Thyroid dysfunction, Postmenopausal women, Subclinical hypothyroidism, Thyroid antibodies, TSH, FT3, FT4.

Original Research Article

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Article at a glance:

Study Purpose: *To evaluate thyroid function in postmenopausal women through assessment of serum FT3, FT4, and TSH levels and identify patterns and types of thyroid dysfunction in this population.*

Key findings: *The study revealed that 54% of postmenopausal women were euthyroid, 43% hypothyroid, and 3% hyperthyroid, with subclinical hypothyroidism being the most common dysfunction (87%).*

Newer findings: *The study provides updated prevalence data and patterns of thyroid dysfunction specifically in postmenopausal women*

Abbreviations: *FT3: Free Triiodothyronine, FT4: Free Thyroxine, TSH: Thyroid Stimulating Hormone, BMI: Body Mass Index, Anti-TPO: Anti-Thyroid Peroxidase, Anti-TG: Anti-Thyroglobulin.*

INTRODUCTION

Menopause is a universal transition experienced by all women, marking the end of ovarian follicular activity and resulting in a significant decrease in estrogen production. Typically occurring between the ages of 45 and 55, this transition is associated with various physiological changes that collectively form the postmenopausal syndrome. Symptoms, primarily linked to estrogen deficiency, include hot flashes, vulvovaginal atrophy, and sexual dysfunction, significantly impacting quality of life.[1, 2] The decline

in ovarian hormones also leads to increased follicle-stimulating hormone (FSH) and luteinizing hormone (LH) levels, as the feedback inhibition of estrogen, progesterone, and inhibin diminishes. Although ovarian estrogen production declines, androgen production continues in the ovarian theca cells and adrenal glands, partially converting to estrogen through peripheral aromatization.[3]

With these hormonal changes, the prevalence of thyroid disorders such as hypothyroidism, thyroid autoimmunity, and nodular goiter rises among postmenopausal women, often overlapping with menopause-related symptoms and complicating diagnosis. Globally, approximately 15 million women enter menopause each year, with 70-80% experiencing vasomotor symptoms, influenced by factors such as smoking, diet, BMI, and reproductive history.[4] Thyroid dysfunction in this population can mimic menopausal symptoms, potentially leading to underdiagnosis or mismanagement. Moreover, hormonal adjustments during menopause, especially in the hypothalamic-pituitary axis, contribute to thyroid imbalance. Studies report that hypothyroidism is more prevalent in postmenopausal women compared to their premenopausal counterparts.[5] Age-related increases in serum TSH further suggest diminished pituitary sensitivity to T4 in older populations.[6] Hypothyroidism not only contributes to cardiovascular and metabolic risks but also affects cognitive function, mood, and overall mortality.[7] Hyperthyroidism, although less common, is associated with heightened risks of ischemic heart disease and atrial fibrillation, particularly in the elderly.[8] As women now spend approximately one-third of their lives post-menopause, understanding thyroid dysfunction's impact during this stage is essential to improving physical and mental health. Hormonal imbalances associated with menopause may exacerbate thyroid-related symptoms, influencing cardiovascular health, bone density, cognitive function, and overall quality of life. Assessing thyroid function through TSH, FT4, and FT3 measurements helps clinicians detect thyroid disorders that could mimic or intensify menopausal symptoms. Conducting this study at Dhaka Medical College Hospital, a prominent tertiary care center, highlights the importance of routine thyroid screening and focused management for postmenopausal women.

OBJECTIVES

To evaluate thyroid function in postmenopausal women by assessing serum FT3, FT4, and TSH levels and identifying the patterns and types of thyroid dysfunction.

METHODS

Study Design

This study employed a descriptive cross-sectional observational design conducted in the Department of Obstetrics & Gynaecology at Dhaka Medical College Hospital (DMCH) over a one-year period from June 2022 to May 2023. The target population consisted of postmenopausal women meeting specified inclusion and exclusion criteria, with participants selected through purposive convenient sampling.

Selection Criteria

Inclusion Criteria: Natural postmenopausal women.

Exclusion Criteria: Women undergoing drug or hormone therapy (e.g., Amiodarone, Lithium, Glucocorticoids) or those with endocrinological diseases (e.g., Cushing's disease, hypopituitarism, hyperparathyroidism).

Study Variables

Demographic Variables: Age, BMI, age of menarche, menstrual cycle history, and contraceptive use.

Investigation Variables: Serum levels of FT3 (pmol/L), FT4 (pmol/L), TSH (mIU/L), Anti-TPO antibody, and Anti-TG antibody.

Outcome Variables: Thyroid function status (categorized as euthyroid, hypothyroid, and hyperthyroid).

Data Collection Procedure

This cross-sectional observational study was conducted with postmenopausal women attending the DMCH Obstetrics & Gynecology Department. Initial assessments were performed by an attending doctor, followed by further evaluation by the principal investigator. Ethical approval was obtained from the Ethical Review Committee of Dhaka Medical College, and informed consent was

obtained from all participants after explaining the risks and benefits of the study. Each participant underwent a comprehensive history and clinical examination along with relevant laboratory tests, including serum T3, T4, and TSH measurements conducted at the Department of Nuclear Medicine at DMCH. All clinical and laboratory findings were recorded, and data were organized into case records for subsequent analysis.

Data Collection Tools

The tools used for data collection in this study included several key components designed to ensure comprehensive data capture and alignment with study objectives. A checklist was prepared for each case to guide data collection systematically and maintain consistency across participants. Informed written consent forms were provided in both Bangla and English, ensuring that participants fully understood the study's purpose, risks, and benefits. An interview schedule was developed in Bengali, containing questions that directly aligned with the study objectives, allowing for clear and relevant data collection. Additionally, a structured questionnaire was used to gather demographic and clinical data, facilitating a thorough understanding of each participant's background and health status.

Data Processing and Analysis

Data was entered into a password-protected Microsoft Access database and subsequently analyzed using SPSS version 26 (IBM Corp., Armonk, NY). Data verification for completeness, accuracy, and consistency was conducted before analysis. Socio-demographic characteristics, clinical history, and laboratory findings were presented using frequencies and percentages for qualitative variables and mean ± standard deviation for quantitative variables. One-way ANOVA was applied to compare continuous variables across groups, with statistical significance set at $p<0.05$.

Ethical Considerations

This study protocol was first submitted to the ethical review committee and the research review committee at Dhaka Medical College Hospital (DMCH) for initial approval. Upon obtaining clearance, the protocol was then forwarded to the Bangladesh Sheikh Mujib Medical University (BSMMU) for final approval. Upon arrival at the hospital, patients who met the inclusion criteria were carefully evaluated by the researcher. Each patient received a detailed explanation of the study objectives, procedures, potential risks, and benefits, which were communicated in the local language using a printed handout for clarity. Following this, written informed consent was obtained from each participant, ensuring they fully understood the information provided. Participants were assured of the confidentiality of their data, informed that there was no financial compensation involved, and reminded of their right to withdraw from the study at any point without impacting their treatment. Finally, it was clearly communicated that the study involved no invasive procedures, reinforcing the non-invasive and observational nature of the research.

RESULTS

This cross-sectional observational study was conducted at the Department of Obstetrics and Gynaecology, Dhaka Medical College Hospital (DMCH), Dhaka, Bangladesh, to evaluate thyroid function in post-menopausal women. A total of 100 post-menopausal women were included in the study following careful history taking, clinical examination, and relevant investigations, following the inclusion and exclusion criteria. The participants had a mean age of 56.08 ± 7.39 years, with ages ranging from 48 to 81 years. The majority of participants (75%) were in the 45–60-year age group, followed by those in the 61-70-year age group (15%), and 8% in the 71–80-year age group. A small proportion (2%) of participants were aged over 80 years. (Figure-1)

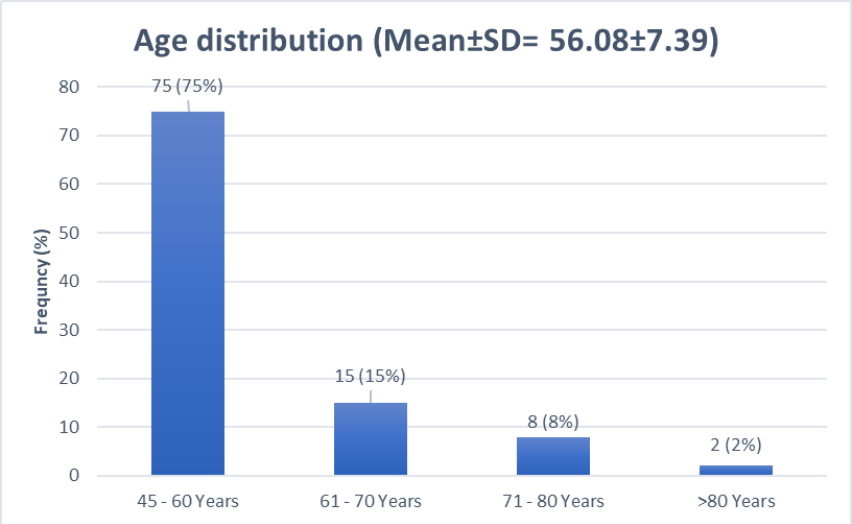

Figure 1: Age Distribution of the Study Participants (N = 100)

The mean BMI of the postmenopausal women in the study was 25.6 ± 4.65 kg/m². The majority of participants (46%) had a BMI within the range of 18.5–24.9 kg/m², followed by those with a BMI of 25–29.9 kg/m² (33%), 30–39.9 kg/m² (17%), and less than 18.5 kg/m² (3%). Only 1% of the participants had a BMI greater than 40 kg/m². (Figure-2)

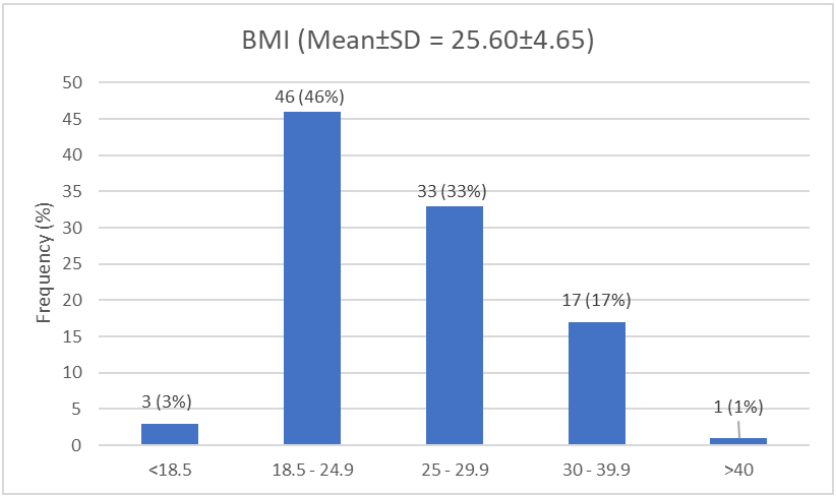

Figure 2: BMI of the Study Participants (N = 100)

The mean age of menarche in the study participants was 13.43 ± 1.07 years, while the mean age of menopause was 46.71 ± 1.89 years. The majority of participants (57%) reported having regular menstrual cycles, and 23% had a history of using contraceptives during their reproductive years. Additionally, 58% of the participants experienced menopause for a duration of 5 years. (Table 1)

Table 1: Menstrual History of the Study Participants During Their Reproductive Life (N=100)

Variable	Frequency	Percentage (%)
Age of Menarche (Years) (Mean)	13.43±1.07	
History of menstrual cycle		
Regular	57	57
Irregular	43	43
History of contraceptive	46.71±1.89	

Use		
Age of menopause (Years)		
<5 Years	42	42
>5 Years	58	58

Table 2 presents the thyroid status of the study participants (n=100). The majority of participants were euthyroid, accounting for 54% of the sample (95% CI: 44-64%), followed by those with hypothyroidism (43%, 95% CI: 33-52%), and a small proportion with hyperthyroidism (3%, 95% CI: 0-7%).

Table 2: Thyroid Status of the Study Participants (N=100)

Thyroid status	Frequency (N)	Percentage (%)	95%CI
Euthyroid	54	54	44-64
Hypothyroid	43	43	33-52
Hyperthyroid	3	3	0-7

Table 3 illustrates the distribution of age and BMI across different thyroid status categories (n=100). Regarding age, the majority of euthyroid participants (72.2%) were in the 45–60-year age group, followed by 14.8% in the 61–70-year age group and 9.3% in the 71–80-year age group. In contrast, the hypothyroid group had a higher proportion (83.7%) in the 45–60-year age range, with smaller percentages in the older age groups (11.6% in 61–70 years, 4.7% in 71–80 years). Hyperthyroid participants were predominantly in the 71–80-year age group, with one participant (33.3%) from this category, while none were in the 45–60-year age group. The difference in age distribution across thyroid status categories was statistically significant (p = 0.040). In terms of BMI, a higher proportion of euthyroid participants (85.2%) had a BMI in the range of 18.5–24.9, while 14.8% had a BMI of 25–29.9. Among hypothyroid participants, 58.1% had a BMI within the normal range (18.5–24.9), and 39.5% were overweight (BMI 25–29.9). All participants with hyperthyroidism had a BMI less than 18.5 (100%). The difference in BMI distribution between the groups was highly significant (p < 0.001).

Table 3: Age And BMI in Different Thyroid Status (N=100)

Variable	Euthyroid N=54 (%)	Hypothyroid N=43 (%)	Hyperthyroid N=3 (%)	*p-value
Age (Years)				
45 – 60	39 (72.2)	36 (83.7)	0 (0)	
61 – 70	08 (14.8)	05 (11.6)	02 (0)	0.040
71 – 80	05 (09.3)	02 (04.7)	01 (33.3)	
> 80	02 (03.7)	0 (0)	0 (0)	
BMI				
< 18.5	0 (0)	0 (0)	3 (100)	
18.5 – 24.9	46 (85.2)	25 (58.1)	0 (0)	
25 – 29.9	08 (14.8)	17 (39.5)	0 (0)	< 0.001
≥ 40	0 (0)	1 (2.3)	0 (0)	

Table 4 presents the distribution of thyroid dysfunction among the 100 participants. Of the 46 participants with thyroid dysfunction, the majority (87%) had subclinical hypothyroidism, followed by 6.5% with primary hypothyroidism. A smaller proportion, 4.3%, were diagnosed with primary hyperthyroidism, while 2.2% had subclinical hyperthyroidism.

Table 4: Thyroid Dysfunction of the Study Participants (N=46)

Variable	Frequency (N)	Percentage (%)
Primary hypothyroidism	3	6.5
Subclinical hypothyroidism	40	87
Primary hyperthyroidism	2	4.3
Subclinical hyperthyroidism	1	2.2

Table 5 presents the prevalence of thyroid autoantibodies among the study participants (n=100). Anti-TPO antibodies were positive in 22% of participants, while 78% had negative results. Anti-TG antibodies were positive in 38% of the participants, with the remaining 62% showing negative results.

Table-5: Thyroid Autoantibody of the Study Participants (N=100)

Autoantibody	Frequency (N)	Percentage(%)
Anti TPO antibody		
Positive	22	22.0
Negative	78	78.0
Anti TG Antibody		
Positive	38	38.0
Negative	62	62.0

Table 6 presents the distribution of thyroid autoantibodies across different thyroid status groups (n=100). Regarding Anti-TPO antibodies, a significant difference was observed across thyroid status categories ($p < 0.001$). In the euthyroid group, only 3.7% had a positive Anti-TPO antibody, whereas 44.19% of hypothyroid participants and 33.33% of hyperthyroid participants tested positive for Anti-TPO antibodies. Conversely, the majority of euthyroid participants (96.3%) had negative Anti-TPO results, compared to 55.81% in the hypothyroid group and 66.66% in the hyperthyroid group. For Anti-TG antibodies, a significant difference was also noted ($p = 0.004$). Among euthyroid participants, 22.2% tested positive for Anti-TG antibodies, while 53.5% of hypothyroid participants and 66.66% of hyperthyroid participants showed positive results. The majority of euthyroid participants (77.8%) had negative Anti-TG antibodies, compared to 46.5% in the hypothyroid group and 33.33% in the hyperthyroid group. Anti TPO antibody and Anti TG antibody had significants association with thyroid status (p value <0.05).

Table-6: Alteration of Thyroid Autoantibody of the Study Participants (N=100)

Autoantibody	Euthyroid N=54 (%)	Hypothyroid N=43 (%)	Hyperthroid N-3 (%)	P value
Anti TPO Antibody				
Positive	02 (3.7)	19(44.19)	01 (33.33)	<0.001
Negative	52 (96.3)	24(55.81)	02 (66.66)	
Anti TG Antibody				
Positive	12(22.2)	23(53.5)	02 (66.66)	0.004
Negative	42(77.8)	20(46.5)	01 (33.33)	

Table 7 presents the results of thyroid function tests among the study participants (n=100). The mean serum TSH level was 5.36 ± 4.53 mIU/L, the mean FT3 level was 3.58 ± 2.29 pmol/L, and the mean FT4 level was 8.29 ± 7.31 pmol/L.

Table 7: Investigation of the Study Participants (N=100)

Variable	Mean	SD
TSH (mIU/L)	5.36	4.53
FT3 (pmol/L)	3.58	2.29
FT4 (pmol/L)	8.29	7.31

Table 8 presents the mean levels of circulating thyroid hormones in relation to thyroid disease status (n=100). In the euthyroid group, the mean TSH level was 2.25 ± 0.91 mIU/L, the mean FT3 level was 4.78 ± 0.58 pmol/L, and the mean FT4 level was 11.47 ± 0.28 pmol/L. In contrast, hypothyroid participants exhibited significantly elevated TSH levels (9.64 ± 3.75 mIU/L) along with markedly reduced FT3 (1.47 ± 0.55 pmol/L) and FT4 levels (2.12 ± 0.96 pmol/L). Hyperthyroid participants had a very low TSH level (0.15 ± 0.14 mIU/L), while FT3 levels were substantially increased (12.10 ± 0.0 pmol/L), and FT4 levels were also significantly elevated (39.60 ± 7.39 pmol/L). These findings highlight the distinct patterns of thyroid hormone levels associated with different thyroid disease statuses.

Table 8: Thyroid Disease Status and Mean Circulating Hormones Level (Mean±SD, N=100)

Variable	Euthyroid (mean±SD)	Hypothyroid (mean±SD)	Hyperthroid (mean±SD)
TSH (mIU/L)	2.25±0.91	9.64±3.75	0.15±0.14
FT3 (pmol/L)	4.78±0.58	1.47±0.55	12.10±0.0
FT4 (pmol/L)	11.47±0.28	2.12±0.96	39.60±7.39

DISCUSSION

Thyroid disorders are among the most prevalent endocrine disorders globally, second only to diabetes.9 Thyroid dysfunction is commonly diagnosed among patients seeking care in primary health centers and predominantly affects females, with the highest incidence observed in postmenopausal and elderly women.[10, 11] The current study was designed to evaluate thyroid function in postmenopausal women. The mean age of the study participants was 56.08 ± 7.39 years, with a range from 45 to 81 years. Most participants (75%) were in the 45–60-year age group, followed by those in the 61–70-year (15%) and 71-80-year (8%) age groups. A small percentage (2%) were over 80 years of age. These findings are consistent with a, where the mean age of postmenopausal women was 57.9 years, with a range from 49 to 82 years.[12] In contrast, another study reported a mean age of 51.71 ± 4.9 years, which is somewhat lower than the current study's findings.[13] In another study it is observed observed a mean age of 49.93 ± 5.37 years for the thyroid dysfunction group, which is not in close agreement with the present study, likely due to variations in the study populations.[14] The mean BMI of the postmenopausal women was 25.6 ± 4.65 kg/m², with a range from 18 to 40 kg/m². The majority of participants (46%) had a BMI between 18.5 and 24.9 kg/m², followed by 33% in the 25–29.9 kg/m² range, 17% in the 30–39.9 kg/m² range, 3% with a BMI less than 18.5 kg/m², and 1% with a BMI greater than 40 kg/m². These findings are similar to those of the study, where reported a mean BMI of 26.27 ± 3.84 kg/m².[15] However, another study reported a higher mean BMI of 34.65 ± 4.0 kg/m², which is considerably greater than the current study, likely due to differences in patient populations.[16] The prevalence of thyroid dysfunction in the present study was found to be 46%, which is higher compared to another study, which reported a prevalence of 13% among postmenopausal women.[17] The higher prevalence in this study may be attributed to a higher frequency of iodine deficiency in the population before iodine supplementation. Among the participants with thyroid dysfunction, subclinical hypothyroidism had the highest prevalence (40%), whereas hyperthyroidism was less common. Another study reported a higher prevalence of hyperthyroidism in the Western region of Nepal, likely due to thyroid autonomy associated with endemic goiter or excess iodized salt consumption. The prevalence of thyroid dysfunction can be influenced by various factors, including dietary iodine intake, geographic variations, genetic

predisposition, ethnicity, and the use of medications, particularly in the elderly.[18]

The study found that the majority (54%) of participants were euthyroid, while 46% had thyroid dysfunction. Of those with thyroid dysfunction, 93.5% were hypothyroid, and 6.5% were hyperthyroid. Among the hypothyroid participants, 7% had primary hypothyroidism and 93% had subclinical hypothyroidism. Among the hyperthyroid participants, 66.7% had primary hyperthyroidism, and 33.3% had subclinical hyperthyroidism. Significant associations were observed between thyroid status and both age ($p = 0.040$) and BMI ($p < 0.001$), which is consistent with findings from other studies, who also reported significant associations between thyroid status, age, and BMI. In the current study, anti-TPO antibodies were positive in 22% of participants, while anti-TG antibodies were positive in 38% of participants. Both anti-TPO and anti-TG antibodies showed significant alterations in relation to thyroid status ($p < 0.05$), similar to findings from other studies, which reported a significant association of these antibodies with thyroid function.[19] The mean values for serum TSH, FT3, and FT4 were 5.36 ± 4.53 mIU/L, 3.58 ± 2.29 pmol/L, and 8.29 ± 7.31 pmol/L, respectively. These values are comparable to those reported by other studies, which found mean TSH values of 3.30 ± 3.63 mIU/L and 3.39 ± 2.45 mIU/L, respectively. Finally, the mean hormone levels (TSH, FT3, and FT4) differed significantly across different thyroid disorders ($p < 0.001$). In euthyroid participants, the mean TSH was 2.25 ± 0.91 mIU/L, FT3 was 4.78 ± 0.58 pmol/L, and FT4 was 11.47 ± 0.28 pmol/L. In hypothyroid participants, the mean TSH was elevated at 9.64 ± 3.75 mIU/L, while FT3 (1.47 ± 0.55 pmol/L) and FT4 (2.12 ± 0.96 pmol/L) levels were markedly reduced. In hyperthyroid participants, TSH levels were significantly low (0.15 ± 0.14 mIU/L), while FT3 (12.10 ± 0.00 pmol/L) and FT4 (39.60 ± 7.39 pmol/L) levels were substantially elevated.[20]

CONCLUSION

This study aimed to evaluate thyroid status in postmenopausal women. The findings revealed that the majority of postmenopausal women were euthyroid, followed by hypothyroid and hyperthyroid individuals. Among those with thyroid abnormalities, subclinical hypothyroidism was the most prevalent, followed by primary hypothyroidism, primary hyperthyroidism, and subclinical hyperthyroidism. These results align with the findings of previous studies, with some variations in prevalence rates, reflecting differences in study populations and methodologies.

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REFERENCES

1. Gandhi J, Chen A, Dagur G, Suh Y, Smith N, Cali B, Khan SA. Genitourinary syndrome of menopause: an overview of clinical manifestations, pathophysiology, etiology, evaluation, and management. American journal of obstetrics and gynecology. 2016 Dec 1;215(6):704-11.
2. Avis NE, Crawford SL, Greendale G, Bromberger JT, Everson-Rose SA, Gold EB, Hess R, Joffe H, Kravitz HM, Tepper PG, Thurston RC. Duration of menopausal vasomotor symptoms over the menopause transition. JAMA internal medicine. 2015 Apr 1;175(4):531-9.
3. Perlman B, Kulak D, Goldsmith LT, Weiss G. The etiology of menopause: not just ovarian dysfunction but also a role for the central nervous system. Global Reproductive Health. 2018 Jun 1;3(2):e8.
4. Santoro N, Epperson CN, Mathews SB. Menopausal symptoms and their management. Endocrinology and Metabolism Clinics. 2015 Sep 1;44(3):497-515.
5. Bordoloi G, Jahan W. A study of thyroid function in premenopausal and postmenopausal women of Dibrugarh town, Assam, India. Int. J. Res. Med. Sci. 2018 Sep;6(9):3015-9.
6. Bremner AP, Feddema P, Leedman PJ, Brown SJ, Beilby JP, Lim EM, Wilson SG, O'Leary PC, Walsh JP. Age-related changes in thyroid function: a longitudinal study of a community-based cohort. The Journal of Clinical Endocrinology. 2012 Feb 16;97(5):1554-62.
7. Gietka-Czernel M. The thyroid gland in postmenopausal women: physiology and diseases. Menopause Review/Przegląd Menopauzalny. 2017 Jun 30;16(2):33-7.
8. Mitchell AL, Pearce SH. How should we treat patients with low serum thyrotropin

concentrations?. Clinical endocrinology. 2010 Mar;72(3):292-6.
9. Kapadia NA, Mehta N. Comparison of thyroid profile in premenopausal and postmenopausal women. Int. J. Basic Appl. Physiol. 2017;6:150-4.
10. Pradhan B, Pradhan SB. Prevalence of thyroid dysfunction in community of Duwakot, Bhaktapur. Journal of Pathology of Nepal. 2017 Sep 1;7(2):1184-7.
11. Chaker L, Cappola AR, Mooijaart SP, Peeters RP. Clinical aspects of thyroid function during ageing. The lancet Diabetes & endocrinology. 2018 Sep 1;6(9):733-42.
12. Shrestha M, Shrestha R. Status of thyroid disorder among the thyroid function test samples received in a laboratory among postmenopausal women: a descriptive cross-sectional study. JNMA: Journal of the Nepal Medical Association. 2021 Feb;59(234):170.
13. Shaikh S, Noor F, Ali S, Sajjad S. Hypothyroidism screening in menopausal women. Pak J Med Health Sci. 2017 Jan 1;11(1):14-7.
14. Nazneen T. Objective evaluation of thyroid function in postmenopausal women. National Journal of Physiology, Pharmacy and Pharmacology. 2023 Aug 1;13(8):1771-.
15. Shaikh S, Noor F, Ali S, Sajjad S. Hypothyroidism screening in menopausal women. Pak J Med Health Sci. 2017 Jan 1;11(1):14-7.
16. Radwan, AM & Ahmed, S.M., Thyroid Dysfunction in Postmenopausal Women Across Section Study Journal of Women Health Care and Issues, 2022. 5(f),1-5
17. Bordoloi, G. & Jahan, W, 2018 A study of thyroid function in premenopausal and postmenopausal women of Dibrugarh town, Assam, India. Int J Res. Med Sct. 6(9) 3015-3019
18. Yadav M, Kose V, Bhalerao A. Frequency of Thyroid Disorder in Pre-and Postmenopausal Women and Its Association With Menopausal Symptoms. Cureus. 2023 Jun;15(6).
19. 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.
20. Kolanu BR, Vadakedath S, Boddula V, Kandi V. Evaluation of the activities of thyroid hormones among pre-and post-menopausal euthyroid women: a cross-sectional study from a tertiary care teaching hospital in India. Cureus. 2019 Mar;11(3).

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