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Study on Thyroid Function, Lipid Profile and Vitamin D Levels in Perimenopausal and Postmenopausal Women

*Paul AR[1], Shahidullah ASM[2], Sen B[3], Tumpa MP[4], Farzana S[5], Suny NS[6], Rahman MM[7]

Abstract

A cross-sectional study was conducted in the Department of Medicine, Community Based Medical College, Bangladesh (CBMC,B) Hospital, Mymensingh, Bangladesh, between July and December of 2022, to compare thyroid function, lipid profile and vitamin D levels between perimenopausal and postmenopausal women. Among 257 participants aged between 45 and 65, the control group included 100 perimenopausal women, while the study group included 157 postmenopausal women with duration not more than 5 years of menopause. Serum TSH, T4, and T3 levels (as thyroid function tests), lipid profile and vitamin D3 levels were estimated by using chemiluminescent microparticle immunoassay method and following standard laboratory procedures in an autoanalyzer. The mean age of women in the perimenopausal group was 48.6±2.7 years, while in the postmenopausal group was 56.4±3.4 years (p<0.001). There were no differences in serum TSH (2.02±0.927 µIU/ml vs. 3.30±3.632 µIU/ml), T4 (104.88±22.02 nmol/L vs. 96.98±34.14 nmol/L) and T3 (1.02±0.141 ng/ml vs. 0.92±0.144 ng/ml) levels between two groups (p>0.05). Comparing lipid profile, total cholesterol levels were 205.05±36.69 mg/dl and 223.96±36.86 mg/dl (p<0.001), HDL 65.11±16.42 mg/dl and 65.90±13.60 mg/dl (p>0.05), LDL 118.17±28.64 mg/dl and 136.59±33.56 mg/dl (p<0.001), and triglycerides levels were found 108.86±54.69 mg/dl and 107.28±53.57 mg/dl (p>0.05) respectively. No difference was also observed in vitamin D3 levels between the groups (17.09±9.37 vs. 17.31±8.79) (p>0.05). However, hyperthyroid and hypothyroid status were found in 12% vs. 14.01% and 4% vs. 4.46% respectively between two groups. In lipid profile, increased levels of cholesterol, LDL and triglycerides were observed in 64% vs. 84.08%, 54% vs. 75.16% and 17% vs. 14.65, while decreased HDL levels were found in 9% vs. 10.83% respectively between two groups. Besides, mild, moderate and severe vitamin D deficiencies were found in 22% vs. 20.38%, 42% vs. 49.05% and 26% vs. 20.38% respectively between two groups.

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Introduction

The Disorder of the thyroid glands are among the most abundant problems worldwide second only to diabetes'.[1] Typical degrees of thyroid chemical are fundamental for ordinary regenerative way of behaving and physiology. Onset of thyroid disorders increases with age in women; it is assessed that 26% of perimenopausal and menopausal women are determined to have thyroid disease.[2] Overt thyroid dysfunction is phenomenal in female under 40 years of age and in men under 60 years.

1. *Dr. Arup Ratan Paul, Associate Professor, Department of Biochemistry, Community Based Medical College Bangladesh.
2. Prof. Dr. ASM Shahidullah, Professor, Department of Biochemistry, Community Based Medical College Bangladesh.
3. Prof. Dr. Bina Sen, Professor, Department of Biochemistry, Community Based Medical College Bangladesh.
4. Dr. Manisha Paul Tumpa, Lecturer, Department of Pharmacology, Community Based Medical College Bangladesh.
5. Dr. Shahanur Farzana, Assistant Professor, Department of Biochemistry, Community Based Medical College Bangladesh.
6. Dr. Nayem Sultana Suny, Assistant Professor (C.C.), Department of Biochemistry, Community Based Medical College Bangladesh.
7. Dr. Md. Mahamudur Rahman, Associate Professor, Department of Microbiology, Community Based Medical College Bangladesh.

Address of Correspondence:
Email: drmanisha86.mpt@gmail.com

Hypothyroidism is a common component in an expansive range of conceptive problems going from unusual sexual development through menstrual irregularities to infertility.[3] The effect of hypothyroidism on menstrual cycle and flow is recognized and prompts changes in cycle length and blood flow. Women in their 40s and 50s frequently experience the disturbing effects of side effects like fatigue, irritability, erratic periods, rest issues, loss of sex drive and weight gain. However, these are the side effects of hypothyroidism too which go unidentified. As opposed to thinking thyroid issues and getting the legitimate tests and assessment, however, women are frequently being given oestrogen and progesterone chemical medicines e.g., HRT, and/antidepressants or dozing pills-which miss the genuine issue completely, or even aggravate side effects.[4] The maintenance of calcium and phosphorus homeostasis and advancement of bone mineralization are significant elements of vitamin D. The presence of explicit vitamin D receptors (VDR) outside the skeletal framework, upholds the significant job of vitamin D in the guideline of resistant and provocative cycles and adjustment of cell development.[5-7] Because of decreased oestrogen levels and other hormonal changes, perimenopausal and postmenopausal ladies are especially inclined to foster low vitamin D levels, as well as expanded hazard of metabolic anomalies and cardiovascular diseases.[8-10] The pervasiveness of lack of vitamin D in postmenopausal ladies has been accounted for to be between 31-70%.[6]

In menopausal women, the diminished capacity of the skin and kidneys to create the dynamic type of vitamin D, as well as diminished gastrointestinal retention, are answerable for changes in vitamin D digestion.[6] Although a few previously published studies have been conducted, the connection between blood vitamin D fixations and the singular parts of metabolic condition (hypertension, hyperlipidemia, diabetes) in menopausal ladies stays hazy. In any case, the serum centralizations of vitamin D might rely upon numerous different elements, including explicit way of life variables and those connected with the kind of work done.[10] Therefore, this study aims to compare the thyroid function, lipid profile and vitamin D status between perimenopausal and postmenopausal women.

Methods

The cross-sectional study was conducted in the Department of Medicine, Community Based Medical College, Bangladesh (CBMC,B) Hospital, Mymensingh, Bangladesh, between July and December of 2022. A total of 257 women aged between 45 and 65 attending OPD of this were included in this study. Among them, 100 were early perimenopausal and 157 were postmenopausal (with the duration of menopause for not more than 5 years).

Inclusion criteria: Patients with at least three out of ten menopausal symptoms, according to the Kupperman menopausal index[8]: hot flushes, excessive sweating, sleep disorders, irritability, depression, dizziness, lack of energy, headaches, osteoarticular pain and cardiac arrhythmia and signed the written consent form about the study and it purpose were included in this study.

Exclusion criteria: Any women with the presence of chronic diseases, including diabetes mellitus, glucose tolerance disorders, vitamin D supplementation, drug addictions, or a diagnosis of mental disease and patients who were unable to give informed medical consent were excluded.

Blood samples were collected to measure thyroid function, lipid profile and vitamin D levels from women of both groups. Serum TSH, T3, and T4 levels (as thyroid function tests), lipid profile and vitamin D_3 levels were estimated done by using chemiluminescent microparticle immunoassay method (ARCHITECT i1000SR immunoassay analyzer by Abbott, USA). For estimation of LDL cholesterol Friedewald equation was used. The following lipid reference limits were used: total cholesterol (TC) <190 mg/dL; HDL-cholesterol>45 mg/dL; triglycerides (TG) <150 mg/dL; and LDL-cholesterol <115 mg/dL.[11]

Data obtained through patient data sheet was checked, edited and analyzed by using Statistical Package for the Social Sciences (SPSS) version 25.0 for the Windows. Statistical analysis using Chi-square tests were employed to compare thyroid markers, lipid profiles and vitamin D levels between two groups. A p-value <0.05 was considered as statistically significant. Ethical clearance was taken from the Ethical Review Committee of Community Based Medical College, Bangladesh (CBMC,B), Mymensingh, Bangladesh.

Results

Among 257 women included in this study – 100(38.91%) in the perimenopausal group and 157(61.09%) in the postmenopausal group. The mean age of women in the perimenopausal group was 48.6±2.7 years, while in the postmenopausal group was 56.4±3.4 years (p<0.001) (Table-I). There were no differences in serum TSH (2.02±0.927 µIU/ml vs. 3.30±3.632 µIU/ml), T4 (104.88±22.02 nmol/L vs. 96.98±34.14 nmol/L) and T3 (1.02±0.141 ng/ml vs. 0.92±0.144 ng/ml) levels between two groups (p>0.05). Comparing lipid profile, total cholesterol levels were 205.05±36.69 mg/dl and 223.96±36.86 mg/dl (p<0.001), HDL levels were 65.11±16.42 mg/dl and 65.90±13.60 mg/dl (p>0.05), LDL levels were 118.17±28.64 mg/dl and 136.59±33.56 mg/dl (p<0.001), and triglycerides levels were found 108.86±54.69 mg/dl and 107.28±53.57 mg/dl (p>0.05) respectively. No difference was also observed in vitamin D3 levels between the groups (17.09±9.37 vs. 17.31±8.79) (p>0.05) (Table-II).

In thyroid status, hyperthyroid and hypothyroid status were found in 12% vs. 14.01% and 4% vs. 4.46% respectively between two groups. In lipid profile increased levels of cholesterol, LDL and triglycerides were observed in 64% vs. 84.08%, 54% vs. 75.16% and 17% vs. 14.65 respectively between two groups; decreased HDL levels were found in 9% vs. 10.83% respectively between two groups. Vitamin D levels showed that mild, moderate and severe deficiencies were found in 22% vs. 20.38%, 42% vs. 49.05% and 26% vs. 20.38% respectively between two groups (Table-III).

Table-I: Age distribution of the participants (N=257)

Age group (in years)	Peri-menopausal (n=100)	Post-menopausal (n=157)	p-value
45-49	69 (69%)	7 (4.46%)	<0.001
50-54	26 (26%)	37 (23.57%)	
55-59	5 (5%)	83 (52.87%)	
60-65	-	30 (19.11%)	
Mean±SD	48.6±2.7	56.4±3.4	

p-value reached from Student's-t test.

Table-II: Laboratory profiles of the participants (N=257)

Variables	Perimenopausal (n=100)	Postmenopausal (n=157)	p-value
Thyroid Function Test			
TSH	2.02±0.927	3.30±3.632	>0.05
T4	104.88±22.02	96.98±34.14	>0.05
T3	1.02±0.141	0.92±0.144	>0.05
Lipid Profile			
Total cholesterol (mg/dl)	205.05±36.69	223.96±36.86	<0.001
HDL-cholesterol (mg/dl)	65.11±16.42	65.90±13.60	>0.05
LDL-cholesterol (mg/dl)	118.17±28.64	136.59±33.56	<0.001
Triglycerides (mg/dl)	108.86±54.69	107.28±53.57	>0.05
Vitamin D_3	17.09±9.37	17.31±8.79	>0.05

p-value reached from Chi-square test.

Table-III: Clinical distribution based on laboratory profiles of the participants (N=257)

Variables	Perimenopausal (n=100)		Postmenopausal (n=157)	
	Frequency	Percentage	Frequency	Percentage
Thyroid Function Test				
Normal	84	84	128	81.53
Hypothyroid	12	12	22	14.01
Hyperthyroid	4	4	7	4.46
Lipid Profile				
Total cholesterol				
Normal	36	36	25	15.92
Above normal	64	64	132	84.08
HDL-cholesterol				
Normal	91	91	140	89.17
Below normal	9	9	17	10.83
LDL-cholesterol				
Normal	46	46	39	24.84
Above normal	54	54	118	75.16
Triglycerides				
Normal	83	83	134	85.35
Above normal	17	17	23	14.65
Vitamin D				
Optimum	10	10	16	10.19
Mild deficiency	22	22	32	20.38
Moderate deficiency	42	42	77	49.05
Severe deficiency	26	26	32	20.38

Discussion

According to the present study, a greater proportion of the women in the postmenopausal group had a total cholesterol and an LDL cholesterol above the normal range, compared to the women in the perimenopausal group. We also observed that 9 postmenopausal subjects (18%) had high TSH, T4 and T3 values suggestive of hypothyroidism and 3 postmenopausal subjects (6%) had low TSH, T4 and T3 values suggestive of hyperthyroidism. It is plausible that in perimenopausal and postmenopausal women, oestrogen lack along with lack of vitamin D outcomes in expanded hazard of metabolic and cardiovascular entanglements.[3] As per evidence, dyslipidemia in menopause period is described by a rise of the blood low-density lipoprotein (LDL) cholesterol and fatty substances (TG), too as the reduction in high-thickness

lipoprotein (HDL) cholesterol fixations.[12] In a study done by Mascarenhas-Melo *et al.* reported a significant increase in total cholesterol and LDL cholesterol along with a significant decrease in HDL cholesterol in postmenopausal women when compared with perimenopausal women.[13] However, the relationship between vitamin D and dyslipidemia is not well understood in that research. In contrast, Schnatz *et al.* showed that lower serum vitamin D levels might result in more atherogenic lipid profile.[14] It is thought that vitamin D may regulate reverse cholesterol transport, in which HDL particles carry cholesterol out of atherosclerotic plaques.[15] Godala *et al.* showed that vitamin D levels were significantly lower in women diagnosed with metabolic syndrome when compared with patients without metabolic syndrome in both perimenopausal and postmenopausal groups.[16] Chon *et al*. studied on a group of Korean postmenopausal women and found that adequate serum vitamin D levels were significantly associated with the normalization of triglycerides and HDL cholesterol levels.[9] Besides, studies on the association between vitamin D supplementation and beneficial changes in lipids are inconclusive.[6,17,18]

Sowers *et al.* found ethnic variations in thyroid functions in the menopausal transition (pre and early perimenopausal), as Afro-American women had significantly lower mean TSH concentrations than Caucasian, Hispanic and Chinese women.[19] In another study done in a menopause clinic reported prevalence of 7.2% of thyroid disease (6.6% of hypothyroidism) and on the detection of 4.6% of new cases of thyroid dysfunction (half of them with overt disease). Their data also indicated that TSH alone should be sufficient as a screening tool, if carefully determined reference values are used.[20] Ranawat *et al.* observed that TSH levels were significantly higher, and HDL levels were significantly lower in the depressed group, while LDL and VLDL levels were comparable in both the groups.[21] Another study on the TSH status in Hispanic women during the menopause transition. No significant difference between TSH levels and menopausal stage were found nor did they observe difference between pre and postmenopausal states.[22] However, our single centre study limits the illustration of the overall scenario of Bangladesh. Further studies with larger samples and multicenter observations are warranted.

Conclusion

From the findings and comparison with other studies, it is advisable to include thyroid screening as routine parameters especially for women of reproductive age and beyond. Vitamin D rich diet and supplementation should be promoted among perimenopausal and menopausal women.

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