

LIPID PROFILE IN PREMENOPAUSAL AND POSTMENOPAUSAL WOMEN

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ABSTRACT

Background: Menopause is known to be associated with many changes in hormonal status causing alterations in lipid profiles which may predispose the menopausal women to high risk for cardiovascular diseases. This study was conducted to estimate and compare lipid profile levels in premenopausal and postmenopausal women. **Materials and Methods:** It was a cross-sectional study, done in the Department of Biochemistry in collaboration with Department of Obstetrics and Gynaecology, Regional Institute of Medical Sciences, Imphal from Sept 2022 to August 2023. 110 apparently healthy subjects were recruited for the study and the study population were divided into two groups, 55 premenopausal women and 55 postmenopausal women. Fasting blood samples were drawn after obtaining informed consent. Blood samples were analysed for total cholesterol (TC), triglyceride (TG), low density lipoprotein cholesterol (LDL-C), very low density lipoprotein cholesterol (VLDL-C) and high density lipoprotein cholesterol (HDL-C) using Randox Rx Imola auto analyser. **Result:** Mean TC(205.8±39.8mg/dl), TG (164.5±41.1 mg/dl) and LDL-C (132.7±30.1 mg/dl) were found to be significantly higher in postmenopausal women when compared to premenopausal women with TC (170.3±35.3mg/dl), TG (124.8±47.7 mg/dl) and LDL-C (112.1±25.3mg/dl) respectively (p<0.001). However, no significant difference was observed in the mean HDL-C between premenopausal (48.9±10.2) and postmenopausal women (46.6±8.7) with (p=0.196). **Conclusion:** There is altered level of lipid parameters which is evident as elevated TC, TG and LDL-C in postmenopausal women when comparison with premenopausal women which might predispose them to the risk of osteoporosis, hypertension, cardiovascular diseases and diabetes mellitus. Thus, there is need for screening of dyslipidaemia in postmenopausal women so that appropriate lifestyle modifications can be made to improve the quality of life.

INTRODUCTION

Menopause is the transition phase from reproductive to non-reproductive years of a woman which is marked by the termination of cyclic ovarian activities and menstruation.^[1] This change is often gradual and

occurs over time, as a natural part of aging.^[2] Menopausal hormonal alterations have a significant impact on blood cholesterol levels, which can contribute to cardiac-related illnesses.^[3] Cardiovascular illnesses cause more than half of all fatalities in women over the age of 50.^[4] Research

indicates that females have lower chance of getting coronary artery disease than men, but the chance of developing the disease increases from menopause.^[5,6] Cardiovascular disease is found to be the main cause of death in post-menopausal women. Hypercholesterolemia contributes significantly in the development of atherosclerosis.^[7] Pre-menopausal women may benefit from estrogen's cardio-protective effects when high density lipoprotein cholesterol (HDL-C), lowering low density lipoprotein cholesterol (LDL-C) and triglyceride (TG) levels are maintained.^[8-11] As the estrogen level decreases in post-menopause, the protective effect to cardiac system is decreased that predispose to higher chance of cardiovascular disease in the following years.^[12] This causes unfavourable alteration in carbohydrate metabolism and insulin sensitivity, distribution of fat in the body, fibrinolysis, change in coagulation and lipid profile. However, the awareness of various health risk to post-menopausal women seems to be low.^[13,14]

Many studies have suggested that maintaining lipid profile is important in the prevention of coronary artery disease.^[15] This study compared the serum levels of total cholesterol (TC), TG, HDL-C, LDL-C and very low density lipoprotein (VLDL) between premenopausal and postmenopausal women.

MATERIALS AND METHODS

It was a cross-sectional study carried out in Regional Institute of Medical Sciences, Imphal, Manipur during the period from September 2022 to August 2023. After taking Institutional Ethical Committee approval, 110 apparently healthy subjects were enrolled for the study out of which 55 were premenopausal women between the age of 18-52 years and 55 were postmenopausal women with age of 48-82 years. Premenopausal women of more than 18 years of age who had normal menstrual cycle and postmenopausal women who were apparently healthy with discontinuation of menstruation for at least one year were included. The participants

exposed to conditions which might influence the lipid parameters like history of use of oral contraceptives pills or hormone replacement therapy (OCP or HRT) within the preceding six months and intake of lipid lowering agents, pregnant and lactating mother, participants who had hypertension, type 2 diabetes mellitus, renal disease, cardiovascular diseases, stroke, malignant conditions and those who underwent hysterectomy were all excluded from the study.

With informed consent from the participants, detailed history were recorded and 5 ml of fasting blood samples were collected. Estimation of parameters of lipid profile like TC, LDL-C, VLDL and HDL-C were done using Randox Rx Imola auto analyser. Data analysis was performed by IBM SPSS version 21.0 for windows. Descriptive statistics such as mean and standard deviation (SD) was used to summarize the observations. Continuous data like age, lipid profile, random blood sugar was expressed in mean and SD. P value <0.05 was taken statistically significant.

RESULTS

In Table.1 it is observed that out of 110 women, mean age of premenopausal women was 37.9±7.4 years and that of postmenopausal women mean age was 59.3±9.3 years respectively. Table 2 shows that TC level in postmenopausal women was significantly higher than premenopausal women (p<0.05). Similarly, Table 3 shows that the level of triglyceride (TG) in postmenopausal women was higher in comparison with premenopausal women which statistically significant (p<0.05). Also, as evident from Table 4, low density lipoprotein (LDL) levels in postmenopausal women was comparatively higher in comparison to premenopausal women with p<0.05. Whereas, for high density lipoprotein (HDL-C), the level was lower postmenopausal women compared to premenopausal women but was not statistically significant (p=0.196).

Table 1: Mean age of the premenopausal and postmenopausal women

	Premenopausal women N=55	Postmenopausal women N=55
Age (Mean±SD) years	37.9±7.4	59.3 ±9.3

Table 2: Comparison of total cholesterol levels between the two groups (N=110)

Group	Total cholesterol (mg/dl)		p value
	Mean	SD	
Premenopausal	170.3	35.3	<0.001
Postmenopausal	205.8	39.8	

Table 3: Comparison of triglyceride levels between the two groups (N=110)

Group	Triglycerides (mg/dl)		p value
	Mean	SD	
Premenopausal	124.8	47.7	<0.001
Postmenopausal	164.5	41.1	

Table 4: Comparison of low density lipoprotein levels between the two groups (N=110)

Group	Low density lipoproteins (mg/dl)		p value
	Mean	SD	
Premenopausal	112.1	25.3	<0.001
Postmenopausal	132.7	30.1	

Table 5: Comparison of high density lipoproteins between the groups (N=110)

Group	High density lipoproteins (mg/dl)		p value
	Mean	SD	
Premenopausal	48.9	10.2	0.196
Postmenopausal	46.6	8.7	

DISCUSSION

Our results showed that mean age of premenopausal women was 37.9 ± 7.4 years and mean age for postmenopausal women was 59.3 ± 9.3 years respectively. It shows that a significant difference exists in the total cholesterol (TC), triglyceride (TG), low density lipoprotein cholesterol (LDL-C) levels between the premenopausal and postmenopausal women. The level of TC in postmenopausal participants was 205.8 ± 39.8 mg/dl, which was significantly higher in comparison with premenopausal women (170.3 ± 35.3 mg/dl) ($p < 0.05$). Similarly, the level of TG in postmenopausal women was 164.5 ± 41.1 mg/dl which was significantly higher as compared to premenopausal women which was 124.8 ± 47.7 mg/dl. It was also observed that the level of LDL in postmenopausal women was 132.7 ± 30.1 mg/dl, which was comparatively higher in comparison to premenopausal women which was 112.1 ± 25.3 mg/dl and it was significant statistically. Whereas, for high density lipoprotein (HDL-C), the level was higher in premenopausal women with value of 48.9 ± 10.2 mg/dl compared to postmenopausal women with value of 46.6 ± 8.7 mg/dl, but the difference was not significant statistically.

The underlying mechanism for the change in lipid parameters between these groups may be due to the effect of hormones. After menopause, there is loss of ovarian functions which lead to the inadequate synthesis and production of ovarian hormones. This may lead to changes in glucose and insulin metabolism, body fat topography, coagulation, fibrinolysis and vascular endothelial function. As the level of estrogen secretion is reduced, there is rise in the level of LDL-C in postmenopausal women as the function of estrogen induced hepatic synthesis of Apo-B 100 which is a LDL-C receptor is reduced.^[16] Therefore, estrogen has a major role in lipid metabolism since it regulates the LDL-C level by acting on the LDL receptors in the liver, the effect of which is lost in postmenopausal women.^[17]

Also, in postmenopausal women as a result of excessive accumulation of fat and secretion of free fatty acids in the bloodstream, the level of triglyceride also rises as it aids in providing substrate for hepatic TG synthesis.^[18] And as there is reduced level of estrogen, the above mentioned function of estrogen is disrupted leading to alteration in various lipid parameters. The rise in TG and LDL-C is also attributed to reduced function of Lipoprotein lipase

which is normally regulated by the estrogen. Lipoprotein lipase helps in hydrolysis of VLDL to IDL and finally convert to LDL. But with the deficiency of estrogen in menopause, the activity of LDL and hepatic TG lipase is increased leading to rise in LDL and TG level.^[19] Following menopause, decrease in HDL cholesterol concentration related to estrogen level may be caused by a drop in cholesterol amount of cholesterol-rich HDL2 sub-fraction. This decrease is most likely the result of increased HDL apoA-1 production rates with little to no change in HDL apoA-1 removal rates.^[20]

A study by Signorelli SS et al,^[21] found similar findings which showed increased in the levels of oxidized low-density lipoprotein (ox-LDL) in postmenopausal women as compared to premenopausal women. A research by Zhou JL et al,^[22] observed that the total cholesterol (TC), triglyceride (TG) levels, and total cholesterol-to-HDL ratio were raised in women exhibiting menopausal transition when compared with those in the premenopausal women and on contradictory, there was no significant difference in HDL-C, which is in line with our study findings.

Menopause can result in changes in lipid parameters by causing alterations in total cholesterol, triglyceride, low density lipoprotein and by reducing high density cholesterol. Due to alterations in the patterns of lipid parameters, postmenopausal women may be at higher risk of manifesting cardiovascular diseases, hypertension, diabetes mellitus and osteoporosis.

Conflict of interest: none

CONCLUSION

Our study shows that decreased estrogen levels during menopause cause lipid profile changes, which are reflected in the study as elevated Total Cholesterol (TC), triglycerides (TG), low density lipoprotein (LDL) and decreased HDL cholesterol. Thus post-menopausal women has risk of having various health problem including development of cardiovascular disease. Therefore, it may be suggested that regular screening for dyslipidemia in postmenopausal women is needed so that appropriate lifestyle modifications may be taken up early in these women and also to have a better quality of life. However, this study could not reveal the exact cause for alteration in lipid profile parameters after menopause and because of small sample size the

findings of the study may not be representative of the true burden of the disease in the community.

REFERENCES

1. Usoro CA, Adikwuru CC, Usoro IN, Nsonwu AC. Lipid profile of postmenopausal women in Calabar, Nigeria. *Pak J Nutr*. 2006 Nov 8;5(1):79-82.
2. KS DP, Ashmitha DR. A comparative study on serum lipid profile between pre menopausal and postmenopausal women.
3. Do KA, Green A, Guthrie JR, Dudley EC, Burger HG, Dennerstein L. Longitudinal study of risk factors for coronary heart disease across the menopausal transition. *American journal of epidemiology*. 2000 Mar 15;151(6):584-93
4. Muhil M, Sembian U, Babitha, Meena T. A Duration Based Study Of Lipid Profile Status & Associated Changes In The Left Ventricular Function Of Postmenopausal Women. *Journal of Clinical and Diagnostic Research*. 2011 Feb 1;5(1):45-7.
5. Coudere R, Maachi M. Lipoprotein (a): risk factor for atherosclerotic vascular disease important to take into account in practice. In *Annales de Biologie Clinique* 1999 Apr 15 (Vol. 57, No. 2, pp. 157-67).
6. Rich-Edwards JW, Manson JE, Hennekens CH, Buring JE. The primary prevention of coronary heart disease in women. *New England Journal of Medicine*. 1995 Jun 29;332(26):1758-66.
7. Igweh JC, Nwagha IU, Okaro JM. The effects of menopause on the serum lipid profile of normal females of South East Nigeria. *Nigerian journal of physiological sciences*. 2005;20(1):48-53.
8. Adashi EY. The climacteric ovary as a functional gonadotropin driven androgen- producing gland. *Fertil Steril*. 1994;62:20-7.
9. Barrett-Connor E, Bush TL. Estrogen and coronary heart disease in women. *JAMA* 1991;265:1861-7.
10. Groedstein F, Stampfer MJ, Manson JE, Colditz GA, Willet WC, Rosner B, et al. Postmenopausal estrogen and progestin use and the risk of cardiovascular disease. *N Engl J Med* 1996;335:453-61.
11. Wild RA, Taylor EL, Knehans A. The gynecologist and the prevention of cardiovascular disease. *Am J Obstet Gynecol* 1995;172:1-13.
12. Schettler G, Nussel E. Enzymatic calorimetric determination of high density lipoprotein cholesterol by CHOD-PAP method. *Arav Med* 1975;10:25.
13. Bales A C: In search of lipid balance in older women; new studies raise questions about what works best. *Postgrad. Med*. 2000; 108 (7): 57-72.
14. Samaan SA, Crawford MH. Estrogen and cardiovascular function after menopause. *Journal of the American College of Cardiology*. 1995 Nov 15;26(6):1403-10.
15. Vyas R, Raval KV, Dikshit N. Effect of raja yoga meditation on lipid profile on post-menopausal women. *Indian J Physiolpharmacol*.2008;52(4):420.
16. Wild RA, Taylor EL, Knehans A. The gynecologist and the prevention of cardiovascular disease. *American journal of obstetrics and gynecology*. 1995 Jan 1;172(1):1-3.
17. Tiwari J, Naagar JK. Changes in serum lipid profile in postmenopausal women with reference to Body mass index (BMI). *Int J Med Res Rev* 2015;3(5):456-60.
18. Tanko LB, Bagger YZ, Qin G, Alexandersen P, Larsen PJ, Christiansen C. Enlarged waist combined with elevated triglycerides is a strong predictor of accelerated atherogenesis and related cardiovascular mortality in postmenopausal women. *Circulation*. 2005 Apr 19;111(15):1883-90.
19. Muzzio ML, Berg G, Zago V, Basilio F, Sanguinetti S, Lopez G, et al. Circulating small dense LDL, endothelial injuring factors and fibronectin in healthy postmenopausal women. *Clin Chim Acta* 2007;381:157-63.
20. Lamon-Fava S, Postfai B, Diffenderfer M, DeLuca C, O'Connor Jr J, Welty FK, Dolnikowski GG, Barrett PH, Schaefer EJ. Role of the estrogen and progestin in hormonal replacement therapy on apolipoprotein AI kinetics in postmenopausal women. *Arteriosclerosis, thrombosis, and vascular biology*. 2006 Feb 1;26(2):385-91.
21. Signorelli SS, Neri S, Sciacchitano S, Pino LD, Costa MP, Marchese G. Behaviour of some indicators of oxidative stress in postmenopausal and fertile women. *Maturitas*, 53(1):77–82.
22. Zhou JL, Lin SQ, Shen Y, Chen Y, Zhang Y, Chen FL. Serum lipid profile changes during the menopausal transition in Chinese women: a community-based cohort study. *Menopause*. 2010 Sep-Oct;17(5):997-003.