Study of comparison of lipid profile in premenopausal and postmenopausal women

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Abstract
Introduction: The present study was carried out to compare the lipid profile in between premenopausal and postmenopausal women which helps them to protect from CAD. **Aims and Objectives:** To compare the lipid profile in premenopausal women and postmenopausal women. **Material and Method:** fifty premenopausal and fifty postmenopausal women were enrolled in the study after institutional ethical committee's clearance was obtained. Lipid profile and atherogenic index was calculated in both the groups and compared. **Result:** In our study, we found that the mean value of serum TC, TG, LDL-C, VLDL-C and atherogenic ratio in postmenopausal women was significantly at higher level and the mean value of serum HDL-C was significantly at lower level than premenopausal women. **Discussion and Conclusion:** From our study it is evident that the mean values of serum total cholesterol, triglycerides, LDL-C, VLDL-C and atherogenic index were higher and HDL-C was lower in postmenopausal women due to estrogen deficiency when compared to premenopausal women. This will help to take to the preventive measure to protect the postmenopausal women from CAD.
Keywords: Atherogenic index, CAD, Estrogen, Lipid profile, Menopause.

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INTRODUCTION

Menopause is the natural process of ageing during which woman passes from reproductive to non-reproductive phase with cessation of cyclic ovarian functions as manifested by cyclic menstruation.[1] The transition from reproductive to non-reproductive is the result of a major reduction in female hormonal production by the ovaries. This transition is normally not sudden or abrupt, tends to occur over a period of years and is a natural consequence of ageing.[2] The Cardiovascular diseases account for more than 50% of all deaths in women over 50 years of age.[3] Coronary artery disease (CAD) is the single most important disease entity in terms of both mortality and morbidity in the entire world population. Coronary artery disease (CAD) is the most important cause of death and disability among older women.[4] High circulating serum cholesterol, low-density lipoprotein cholesterol (LDL-C) and serum triglycerides are major risk factors of this disease. The modification of lipid profile may be important both in the prevention and control of coronary heart disease.[5] The deficiency of estrogen leads to the increased risk of cardiovascular diseases after menopause, as evidenced by reduction in the cardiovascular diseases after administration of hormone replacement therapy. Estrogen replacement therapy, through an effect on the blood vessel wall and on serum lipids, also appears to stabilize existing atherosclerotic plaques. Other measures, such as antithrombotic therapy, exercise and smoking cessation also contribute to reduced risk of cardiovascular disease

in older women.[6] In order to contribute to the better understanding of lipid profile status in postmenopausal women, the present study was conducted to estimate the serum levels of total cholesterol (TC), triglyceride (TG), high density lipoprotein cholesterol (HDL-C), low density lipoprotein cholesterol (LDL-C), very low density lipoprotein cholesterol (VLDL-C), and atherogenic index and compare it with premenopausal women.

AIMS AND OBJECTIVES
a) To estimate the lipid profile in
    a) Premenopausal women
    b) Postmenopausal women
b) To compare the lipid profile in premenopausal women and postmenopausal women.

MATERIAL AND METHODS
The present study was undertaken in the department of Biochemistry, in tertiary care institute. The period of study was from January 2011 to July 2012.

Study design
Study groups includes
Group-1: Fifty premenopausal women
Group-2: Fifty postmenopausal women

Inclusion criteria
a. Females in age group 30 to 60 years
b. Premenopausal women 30-45 years
c. Postmenopausal women 45-60 years with cessation of menstruation

Exclusion criteria
a. Age less than 30 and more than 60 years
b. Major surgery e.g. Hysterectomy
c. Hypertension , Diabetes mellitus
d. Hepatic diseases
e. Acute illness, recurrent myocardial infarction, unstable angina.
f. Drug therapy that interferes with serum lipid levels such as[7]
g. Patients on lipid lowering medications[8]

Clinical data recording
All the subjects included in the study were evaluated as per the proforma given herewith. Each patient underwent detailed clinical history, physical examination and investigations. In this study, we measured serum levels of lipid profile comprising of total cholesterol (TC), triglyceride (TG), high density lipoprotein cholesterol (HDL-C), low density lipoprotein cholesterol (LDL-C) and very low density lipoprotein cholesterol (VLDL-C).

Specimen collection and preservation
Fasting sample

5 ml of blood was collected in clean plain bulb after an overnight fast. (i.e. after 12 hours). The serum was separated and serum lipid profile was estimated on the same day.

Study duration: 18 months

Methods
Cholesterol: Cholesterol oxidase – peroxidase enzymatic method[9]

Expected cholesterol Values Cholesterol (mg/dl)
Desirable <200, Borderline 200 – 239, High (undesirable) >240

HDL - Cholesterol: Phosphotungstate/Mg2+ precipitation + HDL cholesterol enzymatic method[10]
Normal range of HDL Cholesterol - 30-70 mg%

Triglycerides: Lipase- oxidase enzymatic method[11]
Expected value of TG: ≤ 170 mg%

LDL-Cholesterol: calculated by Friedewald formula[12]
Serum LDL = Serum total cholesterol - (serum VLDL + Serum HDL)

VLDL-Cholesterol = TG/5

Atherogenic Ratio
1. LDL-C/HDL-C[13] The LDL/HDL ratio is more important ratio than total cholesterol/HDL because LDL is a measure of bad cholesterol and HDL is a measure of good cholesterol. LDL/HDL is therefore an accurate measure of heart disease although it is costly to measure LDL cholesterol. The risk levels of different values of LDL/HDL ratios are:

Risk Factor	LDL-C/HDL-C	
	Female	Male
Average	3.2-5	3.6-6.3
Moderate	5-6.1	6.3-8
High	>6.1	>8

2. TC/HDL-C[10] The clinical risk factor for heart disease is also represented by the ratio of TC/HDL-C

Risk Factor	TC/HDL-C	
	Female	Male
Average × 0.5	3.3	3.4
Average × 1	4.5	5
Average × 2	7	9.6
Average × 3	11	24

STATISTICAL ANALYSIS
Statistical data was recorded on Microsoft Excel programme. Data was analyzed using prism GraphPad software. The values were quoted in the form of mean ± standard deviation wherever required. Data between two groups was compared using unpaired student's t-test. The p value (p< 0.05) is considered as significant and the p value (p< 0.001) is considered as highly significant.

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RESULT

Table 1: The mean age and weight of distribution of subjects

Groups	Age in years	Weight in kg
Premenopausal women (n=50) (Mean ± SD)	37.8 ± 3.39	55.14 ± 4.62
Postmenopausal women (n=50) (Mean ± SD)	51.74 ± 3.41	57.94 ± 5.14

Table 2: Serum lipid profile in premenopausal and postmenopausal women

SERUM LIPIDS (MG/DL)	Premenopausal women (n=50) (Mean ± SD)	Postmenopausal women (n=50) (Mean ± SD)	p value
Total Cholesterol	160.96 ± 48.12	200.74 ± 79.27	0.0031**
Triglycerides	126.88 ± 41.78	185.9 ± 65.12	0.000***
HDL Cholesterol	42.48 ± 8.92	37.8 ± 9.20	0.0113*
LDL Cholesterol	93.10 ± 46.04	125.76 ± 74.99	0.0101*
VLDL Cholesterol	25.37 ± 8.35	37.18 ± 13.02	0.000***
LDL-C/HDL-C	2.36 ± 1.43	3.88 ± 3.08	0.0020**
TC/HDL-C	3.99 ± 1.60	5.98 ± 3.60	0.000***

* = ($p<0.05$), ** = ($p<0.01$), *** = ($p<0.001$)
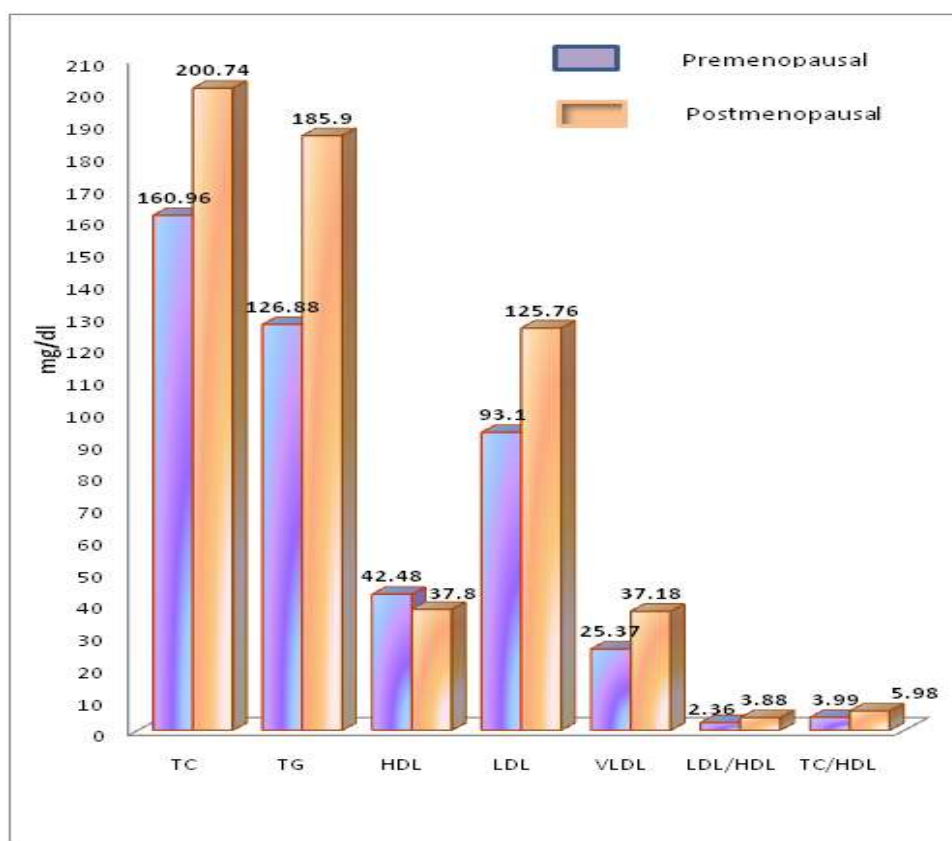
Figure 1: Lipid profile in premenopausal and postmenopausal

DISCUSSION

The present study "Study of comparison of lipid profile in premenopausal and postmenopausal women" was carried out in Tertiary Care Institute, from Jan 2011 to July 2012. In our study it is evident that the mean value of serum TC, TG, LDL-C,VLDL-C and atherogenic ratio was at higher level in postmenopausal women as compared to premenopausal women and the mean values of serum HDL-cholesterol in postmenopausal women were significantly lower as compared to premenopausal women. Our study very well correlates with the study done by **Awanti et al (2011)**[18] **and Mesalic et al (2008).**[14] They compared lipid profile in pre and post-menopausal women. They found significant higher values of Serum TC, LDL-C, TG and significant lower values of HDL-C in postmenopausal women compared to

premenopausal women. They suggested that estrogen in premenopausal women has plasma cholesterol lowering action hence they are protected from CAD. They conclude that menopause leads to changes in lipid profile by reducing HDL, thus increasing the risk for cardiovascular disease. The findings of our study also correlate with **Usoro *et al* (2006).**[1] They studied the changes in lipid profile in menopausal women. The total cholesterol, LDL-C and atherogenic index of postmenopausal women and women above 45 years of age were significantly (p<0.05) higher and HDL-C lower than those of the premenopausal women and women between 25-45 years of age. They suggested that, there is a protective effect of endogenous estrogen against arteriosclerosis and coronary heart disease, as evidenced by increased HDL-C levels and reduced LDL-C and atherogenic index of the premenopausal women. **Igweh *et al* (2005)**[15] compared the lipid profile between pre and postmenopausal women and the result of this study very well correlates with the findings of our study. There was significant lower values of HDL in the postmenopausal group (P<0.005) and a significant higher values of the LDL in the postmenopausal group (P<0.005). The elevated LDL and the reduction of cardioprotective HDL is an indication that menopause is an independent risk factor for developing cardiovascular disease. **Sultan *et al*** [16] conductedthis study to evaluate the effect of oestrogen deficiency due to menopause on serum HDL-cholesterol level. They found that decrease in estradiol level and associated decrease in HDL-C seen in postmenopausal women may be responsible for the increased risk of coronary heart disease after menopause. This study also resembles with result of our study. The higher levels of TC, LDL-C and atherogenic index in postmenopausal women has been attributed to hormonal changes and failure of follicular development, where the plasma estradiol level falls below the level seen in premenopausal women. The lower LDL-C levels of the premenopausal women could be explained by the higher levels of HDL-C which scavenges cholesterol esters, reducing its availability for LDL-C formation.[1] In the postmenopausal women, the higher body weight is due to increased fat accumulation and there will be increased release of free fatty acids into the circulation. These excessive free fatty acids provide substrate for hepatic triglyceride and triglyceride rich lipoprotein production. In premenopausal women circulating estrogen is a regulator of Lipoprotein Lipase (LPL). LPL catalyzes the hydrolysis of VLDL to form IDL and later LDL. After menopause due to estrogen deficiency, there will be increased plasma LPL and hepatic TG lipase activity causing plasma LDL accumulation and also leads to down-regulation of LDL receptors. The higher the small dense LDL proportion which characterizes the atherogenic shift, higher is the LDL oxidation and these particles are associated with a threefold increase in CAD risk. 1% increase in LDL cholesterol increases the risk of CAD by 2%.[17] With increase in LDL concentration, the composition of LDL molecule also changes so that participation of low density lipoprotein is increased by 30-40%. During menopause, concentration of triglycerides also increases, which is related to the increase in the abdominal fat amount and insulin resistance. Menopause causes decrease in HDL concentration and changes in HDL structure as well. The concentration of HDL_2 decreases while concentration of HDL_3 increases. HDL concentration is in inverse proportion with abdominal fat level.[14]

Estrogen is a female sex hormone that has plasma cholesterol lowering action. It also produces vasodilatation. Apart from maintaining friendly lipid profile, estrogen changes the vascular tone by increasing nitrous oxide production. It stabilizes the endothelial cells, enhances antioxidant effects and alters fibrinolytic protein. These actions reduce atherogenesis; decrease the incidence of myocardial infarction and other complications of atherosclerotic valvular disease in premenopausal women. All these cardioprotective mechanisms are lost in menopause. The circulating levels of estrogen are considerably lower in postmenopausal women along with higher levels of serum total cholesterol, triglycerides, LDL cholesterol and lower levels of HDL cholesterol. As estrogen levels are low in postmenopausal women, the lipid lowering action is lost, thus leading to higher values of serum lipid profile. There is no doubt from this study that the changes that occur in the lipid profile after menopause is not friendly for the cardiovascular health of women. Hence postmenopausal women with dyslipidaemia could be more prone for coronary artery disease compared to premenopausal women.[18]

CONCLUSION

From our study it is evident that the mean values of serum total cholesterol, triglycerides, LDL-C, VLDL-C and atherogenic index were higher and HDL-C was lower in postmenopausal women due to estrogen deficiency when compared to premenopausal women. This will help to take to the preventive measure to protect the postmenopausal women from CAD. However further extensive and long term studies need to be done to prove these findings and understand the basic mechanism involved.

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