

A COMPARATIVE STUDY OF SERUM LIPID PROFILE IN PREMENOPAUSAL, PERIMENOPAUSAL AND POSTMENOPAUSAL FEMALES

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ABSTRACT

Hormonal changes associated with menopause alter serum lipid levels, which may play an important role in cardiac related disorders associated with menopause. We studied serum lipid profile changes in premenopausal, perimenopausal and postmenopausal females, so as to assess the differences in lipid levels amongst these three groups. The fasting blood samples were collected from 210 healthy volunteers who were allocated into three groups – Group I comprised of young healthy premenopausal females, Group II comprised of healthy perimenopausal females and Group III comprised of healthy postmenopausal females. Blood was collected after overnight fasting of 12 hours in all the subjects for estimation of serum levels of total cholesterol, high density lipoprotein, low density lipoprotein and triglycerides by enzymatic method. Statistically, significant increase was observed in total cholesterol and also in triglycerides and low density level in postmenopausal females as compared to premenopausal women. High density lipoprotein showed non-significant decrease in postmenopausal females.

KEYWORDS

Serum Lipid Profile, Total Cholesterol, High Density Lipoprotein, Low Density Lipoprotein, Triglycerides, Menopause.

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INTRODUCTION: Menopause is a permanent cessation of menstruation due to loss of ovarian function at the end of reproductive life. Hormonal changes associated with menopause alter serum lipid levels, which may play an important role in cardiac related disorders associated with the menopause.⁽¹⁾ The prevalence of coronary artery disease among women is lower than among men up to the age of 50 years, but the incidence rises significantly after menopause. The incidence of coronary heart disease has been observed to increase in postmenopausal women until they become similar to the corresponding rates in men of similar age.⁽²⁾

Multiple risk factors have been identified as contributing to the development of coronary artery disease. Hormonal changes associated with menopause [low plasma level of oestrogen and marked increase in luteinising hormone and follicle stimulating hormone levels] exert a significant effect on the metabolism of plasma lipids and lipoproteins.⁽³⁾ Hypercholesterolaemia is a key factor in pathophysiology of atherosclerosis.⁽⁴⁾ The gradual change from reproductive to non-reproductive phase of life results in adverse changes in glucose and insulin metabolism, body fat distribution, fibrinolysis, vascular endothelial dysfunction and also causes derangement of lipoprotein profile. Lack of oestrogen is an essential factor in the mechanism.⁽⁵⁾ The present study is aimed to assess the difference in serum lipid levels among premenopausal, perimenopausal and postmenopausal females.

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MATERIAL AND METHODS: This prospective observational study was carried out in the Postgraduate Department of Physiology, Government Medical College, Jammu during a one year period from November 2012 to October 2013 after approval from the Institutional Ethical Committee. The subjects having risk factors which may affect the lipid profile were excluded. A total of 210 subjects were recruited in the study and 70 each were allocated to three groups i.e.

Premenopausal (20 to 40 years).

Perimenopausal (40 to 45 years) and

Postmenopausal (45 to 65 years).

The subjects in all the three groups were apparently healthy. After taking informed consent from the subjects, a detailed history of each was taken and a thorough general examination was conducted. Premenopausal women with pre-existing abnormal serum lipid profiles were also excluded from the study, as were smokers and alcoholics. 5 mL of venous blood was collected after overnight fasting of 12 hours from all the subjects. Estimation of serum levels of total cholesterol, high density lipoprotein, low density lipoprotein and triglycerides was done and the results were obtained in mg/dL.

Statistical Analysis of Data: All parameters were reported as mean±standard deviation. The statistical analysis was carried out by using unpaired student's 't'-test. A p-value of <0.05 was considered statistically significant for analytical purpose.

RESULTS: The study was carried out on 70 healthy subjects each of premenopausal, perimenopausal and postmenopausal age. The comparison of serum lipid profile among three groups is given in Table 1.

Lipid Parameters	Premenopausal Group Mean±SD (Range)	Perimenopausal Group Mean±SD (Range)	Postmenopausal Group Mean±SD (Range)	p-value
Serum total cholesterol (mg/dL)	175.24±28.56 (120-266)	190.82±28.92 (135-254)	199.38±28.92 (110-261)	.000*
Serum HDL	45.07±5.77 (35-76)	46.52±4.86 (38-59)	44.54±3.91 (36-56)	.049**
Serum LDL	105.40±25.60 (43.6-183)	115.59±23.36 (73-176.2)	124.34±28.87 (50.4-197.4)	.000*
Serum TG	122.45±32.85 (65-225)	145.12±47.74 (60-345)	154.57±56.18 (68-330)	.000*

Table 1: Comparison of Mean Serum Lipid Profile of Subjects in Premenopausal, Perimenopausal and Postmenopausal Groups

*Highly significant **Significant

Mean total cholesterol showed a significant rise from premenopausal group to postmenopausal group ($p=.000$). Intergroup comparison of mean total cholesterol showed a highly significant difference between Group-I and Group-II ($p=.005$) and between Group-I and Group-III ($p=.000$), but non-significant difference between Group-II and Group-III ($p=.254$). Mean high-density lipoprotein in the three groups is comparable ($p=.049$). Intergroup comparison of the mean high-density lipoprotein also did not show any significant difference between Group-I and Group-II ($p=.0242$) or between Group-I and Group-III ($p=1.00$) or between Group-II and Group-III ($p=.053$). Mean low-density lipoprotein showed a significant rise from premenopausal to postmenopausal group ($p=.000$).

Intergroup comparison of mean low-density lipoprotein showed a highly significant difference between Group-I and Group-III ($p=.000$), but the difference between Group-I and Group-II ($p=.065$) and between Group-II and Group-III ($p=.145$) was not statistically significant. Estimation of mean triglyceride levels showed a significant rise from premenopausal to postmenopausal group ($p=.000$). Intergroup comparison of mean triglycerides showed a significant difference between Group-I and Group-II ($p=.013$), a highly significant difference between Group-I and Group-III ($p=.000$) and a non-significant difference between Group-II and Group-III ($p=.696$).

DISCUSSION: In the present prospective observational study, mean level of total serum cholesterol, serum low density lipoprotein and serum triglycerides were significantly higher in postmenopausal females as compared to premenopausal females, while the level of serum high density lipoprotein was lower in postmenopausal females as compared to other two groups, although the difference was statistically not significant. Since the factors affecting serum lipid profile were excluded, these changes may be related to deficiency of oestrogen occurring after menopause. The findings of present study correlate with the results of Usoro et al⁽⁶⁾ who found statistically significant increase in serum total cholesterol and serum low density lipoprotein and statistically significant decrease in serum high density lipoprotein after menopause. The result of the present study also correlates with the study of Bonithon-Kopp et al⁽⁷⁾ who concluded that total cholesterol and low density lipoprotein

cholesterol significantly increased in postmenopausal women.

Poehlman et al⁽⁸⁾ found that the prospective transition to postmenopause was associated with 16% increase in triglycerides. The present study is also similar to the study of Nanda et al⁽⁹⁾ and Nebrand et al⁽¹⁰⁾ who suggested that loss of endogenous sex steroids contributes substantially to increased atherogenic lipid profile. Significant increase in triglycerides was observed in the study of Bhagya et al.⁽¹¹⁾ Similar findings were also observed by Arunima et al.⁽¹²⁾ Wachara et al⁽¹³⁾ reported that hormone therapy in menopausal women can improve cholesterol levels by decreasing low density lipoprotein and increasing high density lipoprotein levels.

Hypercholesterolaemia in postmenopausal women is due to impairment of the low density lipoprotein receptor. Oestrogen stimulates the synthesis of low density lipoprotein receptors and lowers the plasma level of low density lipoprotein-cholesterol and this effect may reduce the incidence of cardiovascular disease in postmenopausal women.⁽¹⁴⁾ Atherogenic alterations in lipid and lipoprotein profile have been found in studies of surgically induced menopause and epidemiological studies comparing premenopausal women with postmenopausal women.⁽¹⁵⁾

The risk of coronary artery disease increases in women after menopause. This increased risk may be associated with alteration in lipid profile characterised by changes in low density lipoprotein particle size.⁽¹⁶⁾ Lipid oxidation plays a central role in the pathogenesis of atherosclerosis and it may also promote osteoporosis. Low density lipoprotein has been implicated in the development of coronary heart disease.⁽¹⁷⁾ The present study supports the view that the elevated total cholesterol, low density lipoprotein, triglycerides in postmenopausal women >45 years of age have been attributed to hormonal changes and failure of follicular development, when the plasma estradiol levels that reduces the risk of coronary heart disease falls below the level as observed in premenopausal women.⁽¹⁸⁾ Premenopausal women with ages between 20 to 40 years included in this study satisfy the criteria for reduced risk for coronary heart disease by the Revised Guidelines of American National Cholesterol Education Programme.⁽¹⁹⁾ and hence are less predisposed to atherosclerosis.

CONCLUSION: Total cholesterol, triglycerides and low density lipoprotein increases significantly from reproductive period to menopausal period.

The rise in triglycerides can be attributed to the age and the rise in low density lipoprotein can also be attributed to age and the significant increase in low density lipoprotein after menopause can be explained by changes in hormone level, which is in agreement with Goswami and Bandyopadhyay.⁽²⁰⁾ The decrease in high density lipoprotein after menopause can be attributed to hormonal changes, which is in agreement with Notelovitz et al⁽²¹⁾ and Fahraeus et al.⁽²²⁾

These changes may be attributed to postmenopausal changes in female sex steroidal hormonal profile, with decline in both oestrogen and progesterone. Alterations in lipid metabolism have been implicated in atherosclerosis and coronary artery disease. Menopause is associated with altered serum lipid profile and thus is an independent risk factor for developing cardiovascular disease. Therefore, it is important that every postmenopausal woman undergoes screening for lipid profile to decrease the risk of cardiovascular diseases.

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