

Assessment of Plasma Lipid Profile Among Sudanese Menopausal Women in Khartoum State-Sudan

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Postmenopausal women tend to have significant changes in lipid profile when compared with premenopausal women. Incidence of cardiovascular disease after menopause believed to occur due to changes in the plasma lipid levels. This study was conducted to estimate and compare serum levels of total cholesterol(TC), triglycerides(TG), low-density lipoprotein cholesterol (LDL-c) and high-density lipoprotein cholesterol (HDL-c) among Sudanese pre and postmenopausal women. 94 participant women were enrolled in this cross-sectional study. 47 post-menopause women age 48 - 70 years and 47 pre-menopause women age 25-47 years. Estimation of serum lipid profile was carried out using Biosystems colorimetric methods and results statistics were computed by using SPSS. A significant increase in total cholesterol(TC), triglyceride, and LDL-c with a significant decrease in (HDL-c) level among postmenopausal women where found, when compared with pre-menopause women (P-value= <0.05). Total cholesterol and LDL-C level were observed significantly increased according to three interval time duration of menopausal onset (p=0.009 and p=0.034). A positive correlation was observed between the age of and total cholesterol levels in postmenopausal women (R=0.463, P-value =0.001). Study results revealed that postmenopausal status was associated with substantial changes in lipid profile that considered risk factors for cardiovascular disease in Sudanese women.

Keywords: lipid profile; pre-menopause; post-menopause; cardiovascular disease; Sudanese women.

Menopause is the natural process of aging during which a woman passes from reproductive to non-reproductive phase due to major reduction in female hormonal production resulting in a stop of ovarian functions with the cessation of the menstrual cycle¹. These hormonal changes include the cessation of estrogen production and a marked increase in follicle-stimulating hormone level that occurs after menopause can exert a

significant effect on plasma lipids and lipoprotein metabolism². Reduction in estrogen production causes adverse changes in glucose and insulin metabolism, body fat distribution, coagulation, fibrinolysis, and vascular endothelial reduction^{3,5}.

Estrogen stimulates the production of nitrous oxide that promotes cardioprotective mechanisms which include, change in the vascular tone, stabilize endothelial cells, enhance

antioxidant effects and alteration of fibrinolytic protein^{6,7}. Derangement in lipid profiles that occur after menopause includes increased levels of total cholesterol (TC), triglycerides (TG) and low-density lipoprotein cholesterol (LDL-c), and a decrease in high-density lipoprotein cholesterol (HDL-c)⁸. Increased levels of cholesterol that corresponded with menopause suggested being a causal role of altering lipids levels in menopausal women⁹. Many factors reported as risk factors contributing to the development of coronary artery disease. Among women, the prevalence of coronary artery increased with menopausal age due to associated hormonal changes¹⁰. Hypercholesterolemia is a major lipid change associated with modification in the size and density of lipoprotein particles, which explain the increased cardiovascular risk in postmenopausal women⁷. Globally, these changes in the lipid profiles are highly prevalent in postmenopause women and strongly associated with an increased incidence of cardiovascular disease. Extensive guidelines such as a change in lifestyle, change in food habits, daily exercise, and meditation are required for the management of these complications. The purpose of this study is to assess the changes in serum lipid levels, as it has a major impact on the progress of

cardiovascular diseases among postmenopausal Sudanese women.

MATERIALS AND METHODS

In this present cross-sectional study, a group of 47 premenopausal women and 47 postmenopausal women were randomly selected. The postmenopausal women who were studied in the age group of 48-70 years with natural menopause, apparently healthy who had a cessation of menstruation for at least one year and pre-menopause women in the age group of 25-47 years who had regular menstruation. Women with hypertension, diabetes mellitus, Hepatic, metabolic and renal disease, and those who were on lipid-lowering medication were excluded from the study.

The study was approved by the clinical chemistry department scientific committee to estimate the lipids profile level among pre and postmenopausal women in Khartoum city during the period from April to August 2018. After getting their informed consent, venous blood samples were taken from participants in the morning after a minimum of 8 hours of overnight fasting. Then specimens were centrifuged at 3000 rpm for 5 minutes, serum was separated and used

Table 1. Comparison of lipids parameters in premenopausal and postmenopausal women

Lipid test	Mean \pm STD (mg/dl)		P- value
	Pre-menopausal (n=47)	Post-menopausal (n= 47)	
TC	175.9 \pm 40.5	245.1 \pm 32.0	<0.001
TG	87.40 \pm 41.1	142.7 \pm 31.3	<0.001
HDL-C	52.04 \pm 10.1	40.72 \pm 11.9	<0.001
LDL-C	159.1 \pm 30.6	171.2 \pm 31.3	0.044

P-value based on Student's t-test: significant at (p< 0.05)

Table 2. Comparison of lipids parameters according to menopausal duration

Lipid test (mg/dl)	Mean \pm STD (years)			P- value
	1-5	7-12	>12	
TC	233.8 \pm 25.7	239.6 \pm 25.9	267.2 \pm 37.4	0.009
TG	135.8 \pm 32.5	145.8 \pm 30.6	147.6 \pm 31.3	0.526
HDL-C	36.94 \pm 6.49	42.47 \pm 16.94	43.38 \pm 8.90	0.256
LDL-C	153.9 \pm 44.53	177.7 \pm 31.24	185.2 \pm 35.78	0.034

P-value based on Student's t-test: significant at (p< 0.05)

for lipid profile analysis. The total cholesterol and triglycerides were measured by enzymatic colorimetric methods. HDL and LDL were measured by precipitation method.

Statistical analysis of the data was performed using the SPSS program to the arithmetic mean, standard deviation, t-test, and Pearson's test of correlation. The level of confidence ($P < 0.05$) was considered as a cutoff value for significance.

RESULTS

Table 1 shows the statistics of measured lipid profile parameters computed for premenopausal and postmenopausal women which indicate that results were found to be significantly increased for total cholesterol, triglycerides, HDL-C and significantly decreased for LDL-C in postmenopausal women when compared with premenopausal women, respectively ($p < 0.05$).

Table 2 shows a comparison of three groups' duration time of menopausal onset. The results reflect that there is a significant increase in total cholesterol and LDL-C levels according to the duration of menopausal status. For triglyceride and HDL-C levels, there is no statistical difference in the means for the three duration time groups.

Table 3 shows the statistics of non-HDL cholesterol computed for premenopausal and postmenopausal women which found to be higher than normal values in postmenopausal women when compared with premenopausal women.

Table 4 shows Pearson's correlation results which reflect statistically significant, positive correlation between the age of menopausal

women and total cholesterol level ($R = 0.463$, $P\text{-value} = 0.001$).

DISCUSSION

Menopause is a normal physiological transition of a woman from reproductive to non-reproductive life due to the stop of ovarian function which results in several hormonal changes. The main hormonal change in menopause include low circulating levels of estrogen and marked an increase in luteinizing and follicle-stimulating hormone levels that exerts a significant effect on the metabolism of plasma lipids and lipoproteins¹¹. In many studies increases in lipids profile reported as the main risk factor of coronary heart diseases that lead to the most common causes of deaths among post-menopausal women^{12,13}. In the present study, although the factors that affect the lipid profile were excluded, we found significant increases in total cholesterol, triglycerides, and LDL-C levels and decrease the level of HDL-C in postmenopausal women as compared to premenopausal women. these changes may occur as a result of low circulating estrogen in postmenopausal women. Our study findings were similar to findings reported by different researchers of different countries^{12,14,15}, they reported a significant increase was observed in total cholesterol and also in triglycerides and low-density level in postmenopausal females as compared to premenopausal women. Also, our study results were found following Shenoy R et al study findings who reported that TC was found to be increased due to estrogen deficiency in postmenopausal women¹⁶.

Table 3. Correlation between menopause age and lipids parameters

	Total cholesterol	HDL-C	Non -HDL cholesterol	TC/HDL ratio
Premenopause	179.9 mg/dl	52.0 mg/dl	127.9 mg/dl	3.5
Postmenopause	245.1mg/dl	40.7 mg/dl	204.4 mg/dl	6.0

Table 4. Correlation between menopause age and lipids parameters

Pearson's correlation	Total cholesterol	Triglycerides	HDL-C	LDL-C
R	0.463	0.186	0.220	0.206
p-value	0.001	0.210	0.137	0.165

However, lipid profile derangement in postmenopausal women is most probably due to the changes in the hormonal status of women, these changes may be related to the deficiency of estrogen occurring after menopause revealing the significant role of estrogen in lipids metabolism and distribution leading to increase causes of cardiovascular morbidity and mortality. In the current study, the postmenopausal women were divided into three groups based on the duration of menopause, in which a significant elevation was seen in the values of in TC, TG, and LDL-C as the duration of menopause increases. these results were agreed with other studies^{17,18}. Thus, the higher lipid levels in postmenopausal might be a result of the aging process as well as the menopausal status. Also, the present study finding revealed total cholesterol and LDL-C levels were statistically different within the interval age groups of postmenopausal women were found to be consistent Carol A. et al study finding that reports a gradual postmenopausal decrease in HDL-C cholesterol¹⁹.

Hypercholesterolaemia in postmenopausal women occurs due to impairment of the LDL-C receptor which is affected by the reduction in estrogen level²⁰. The antiatherogenic impact of estrogens and also the protection of females against cardiovascular disease, particularly coronary heart disease are reported throughout the premenopausal period²¹.

CONCLUSION

Study results revealed that postmenopausal status was associated with substantial changes in lipid profile that considered risk factors for cardiovascular disease in Sudanese women. Consistent follow-up and monitoring at regular intervals of deteriorated lipid balance are required in postmenopausal women by which secondary prevention strategies of cardiovascular diseases are approaching

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