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Lipid Profile of Postmenopausal Women in Calabar, Nigeria

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Abstract: The study aimed to determine the influence of menopause on lipid profile in women. The serum lipid profile consisting of total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C), low-density lipoprotein cholesterol (LDL-C), triglyceride (TG), very low-density lipoprotein cholesterol (VLDL-C) and atherogenic index (TC/HDL-C ratio) of 51 postmenopausal women and 43 premenopausal women were estimated colorimetrically using the enzymatic method. The subjects were arranged in two different age ranges of 25 - 45 years and above 45 years of age. The premenopausal and postmenopausal women were recruited and classified using a comprehensive questionnaire. The total cholesterol, LDL-C and atherogenic index of post menopausal 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. No significant differences ($p>0.05$) were observed in both TG and VLDL-C levels in both the postmenopausal and premenopausal women and also in women in the specified age ranges of 25-45 years and above 45 years. There is therefore evidence of 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.

Key words: Lipid profile, postmenopausal women, premenopausal women

Introduction

Menopause is a natural event in the ageing process and signifies the end of reproductive years with cessation of cyclic ovarian functions as manifested by cyclic menstruation. It is heralded by menopausal transition, a period when the endocrine, biological and clinical features of approaching menopause begins (Burger *et al*., 2002). The average age of menopause is 51 years and less than 1% of women experience it before the age of 40 years, with some women undergoing premature menopause at a very early age, affecting their ability to have children (Derek, 1990). Apart from being a natural process, menopause could also be induced by surgery by removal of the ovaries, chemotherapy or high dose radiotherapy related to cancer treatment and premature occurrence due to ovarian failure (Barrett and Bush, 2001). The hormonal changes associated with menopause e.g. low plasma levels of estrogen and marked increase in leutenizing and follicle stimulating hormone levels exerts a significant effect on the metabolism of plasma lipids and lipoproteins (Sacks *et al*., 1992). The behaviour of lipoproteins during the menopausal transition and their relationship with the sex hormones and body fat distribution is still unclear (Berg *et al*., 2004). Atherogenic alterations in lipid and lipoprotein profiles have been found in studies of surgically induced menopause (Lip *et al*., 1997, Griffin *et al*., 1993, Wakatsuki and Sagara, 1995) and epidemiological studies comparing premenopausal women with menopausal and postmenopausal women (Bouthon-kopp *et al*., 1990, Stevenson *et al*., 1993, Stampfer and Willet, 1999, Dallongeville *et al*., 1995, Tremollieres *et al*., 1999, De Aloysio *et al*., 1999). The risk of coronary artery disease increases in women after menopause. This increased risk may be associated with alterations in the lipid profile characterized by changes in low density lipoprotein particle size and buoyancy (Carr *et al*., 2000). Low-density lipoprotein has been implicated in the development of coronary heart diseases (CHD). The incidence of coronary heart disease have been observed to be increased in postmenopausal women until they become similar to the corresponding rates in men of similar age (Berg *et al*., 2004). This has been attributed in part to adverse changes in plasma lipids and lipoprotein levels due to reduced estrogen levels (Poehlman *et al*., 1995). Deposition of fatty plaques on arterial walls (arteriosclerosis) is a predisposing factor for CHD (Kannel, 1987). Variations in the distribution of serum lipids and lipoproteins have been implicated in the etiology of arteriosclerosis and cardiovascular disease. The effect of the hormonal changes associated with menopause on the serum lipid levels play important role in most cardiac related disorders associated with menopause (Do *et al*., 2000).

This study aimed 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 in

Table 1: Serum lipid profile of premenopausal and postmenopausal women

Subjects	T C	Lipid HDL-C	Profile TG	LDL-C (mmol/l)	VLDL-C	Atherogenic Index
Premenopausal n = 43	3.78±1.03	1.55±0.59	1.44±0.62	1.57±1.00	0.65±0.28	2.96±2.45
Postmenopausal n = 51	5.00±1.28	1.24±0.43	1.42±0.57	3.12±1.35	0.67±0.26	4.81±3.11
p-value	p<0.05	p<0.05	p>0.05	p<0.05	p>0.05	p<0.05

premenopausal and postmenopausal women and to determine the effect of age on the lipid profile in these women.

Materials and Methods

Premenopausal and Postmenopausal women living within Calabar and its environs were recruited for the study. Ninety-four apparently healthy women aged between 25-69 years were selected for the study. Their ages, health status, smoking habits and other personal data were obtained via a comprehensive questionnaire. Fasting venous blood were collected into plain sample containers, the serum extracted and analyzed immediately for lipid profile.

Lipid profile determination was done using enzymatic methods.

Statistical analysis was carried out on the results using t- test analysis and one-way analysis of variance.

Results

Table 1 shows the mean serum lipid profile of premenopausal and postmenopausal women. The TC, LDL-C and atherogenic index were significantly higher ($p<0.05$) and HDL-C lower in postmenopausal women than in premenopausal women. No significant difference was observed in the TG and VLDL-C levels of both groups.

Table 2 shows the mean serum lipid profile of premenopausal women in the specified age ranges of 25-45 years and > 45 years. The serum lipid profile varied significantly ($p<0.05$) with the age ranges of the premenopausal women. TC, LDL-C and atherogenic index were significantly ($p<0.05$) higher and HDL-C lower in women above 45 years when compared to those of women aged between 25-45 years. No significant differences were observed in the TG and VLDL-C levels.

Discussion

Lipid profiles are affected by metabolic conditions (Winder, 1994), and alterations in lipid metabolism have been implicated in atherosclerosis and coronary heart disease. Results from this study on lipid profile in postmenopausal women indicate that menopause alters the lipid profile in women.

The total cholesterol, LDL-C and TC/HDL-C ratio (atherogenic index) were significantly higher and HDL-C lower in postmenopausal women and women greater than 45 years of age when compared to premenopausal women and women between the age ranges of 25-45 years. This agrees with the findings of (Berg *et al.*, 2004) who also demonstrated higher TC, LDL-C and triglycerides in menopausal transition and postmenopausal women in comparism with premenopausal women. A similar observation was also made by (Carr *et al.*, 2000; Mathews *et al.*, 1994; Berestein *et al.*, 1993) in postmenopausal Caucasians. Data on HDL-C have been inconsistent as HDL-C has been reported to remain unaffected (Jenson *et al.*, 1990). The elevated TC, LDL-C and atherogenic index in postmenopausal women and women greater than 45 years has been attributed to hormonal changes and failure of follicular development, where the plasma estradiol levels that reduces the risk of coronary heart disease falls below the levels seen in premenopausal women (Sarrel , 1990). The lower LDL-C levels of the premenopausal women and women between 25 and 45 years in this study could be explained by the increased HDL-C which scavenges cholesterol esters, reducing its availability for LDL-C formation. A lower atherogenic index indicates a greater proportion of HDL-C, and is a measure of risk for coronary heart disease. Thus premenopausal women and women between the age ranges of 25 to 45 years used in this study satisfy the criteria for reduced risk of coronary heart disease by the revised guidelines of American National Cholesterol Education Programme (Expert panel, 1993), hence are less predisposed to arteriosclerosis (Kinosa *et al.*, 1994). Unfavorable changes in HDL-C, LDL-C and increased atherogenic indexes after menopause have been independently reported by (Pascot *et al.*, 1999; Grady *et al.*, 1992).

Alterations in lipid profile have also been associated with age. The TC, LDL-C and atherogenic index were significantly higher and HDL-C lower in women above 45 years when compared to those of women aged between 25-45 years Increasing age has been associated with higher plasma LDL-C and Apo B levels in women, where significantly higher LDL-C and Apo B levels was observed in postmenopausal women than in premenopausal women (Schaefer *et al.*, 1994). Haarbo *et al.* (1990) also observed high total cholesterol, LDL-C and VLDL-C as well as triglycerides levels with increasing age.

Dietary compositions seem to affect the lipid profile in women. More than 50% of postmenopausal women and women greater than 45 years in this study were observed to consume a lot of calorie enriched foods and

Table 2: Serum lipid profile of premenopausal women 25 to 45 years and women > 45 years

Age range (years)	TC	HDL-C	TG	LDL-C	VLDL-C	Atherogenic index
25-45 n = 41	3.74±1.00	1.50±0.59	1.41±0.63	1.58±0.96	0.64±0.26	3.06±2.52
> 45 n=53	5.02±1.27	1.27±0.42	1.50±0.59	3.07±1.34	0.67±0.20	4.70±3.19
p-value	p<0.05	p<0.05	p>0.05	p<0.05	p>0.05	p<0.05

high cholesterol diets, and this may contribute to their abnormal lipid profile. This agrees with the findings of (Yong *et al.*, 1996), who demonstrated that calorie enriched food may increase the total cholesterol and low-density lipoprotein cholesterol levels in the body.

This study has shown that hormonal changes associated with menopause and age alters the lipid profile in women as evidenced by higher total cholesterol (TC), low-density lipoproteins cholesterol (LDL-C), arterogenic index (TC/HDL ratio) and lower high-density lipoprotein (HDL-C) seen in postmenopausal women. The higher HDL-C and lower LDL-C and atherogenic index in premenopausal women is protective against coronary heart disease.

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