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Atherogenic Index of Plasma(AIP) in Post Menopausal Women

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ABSTRACT

Menopause is the phase of declined ovarian activity & fall in estrogen level. Since there is an increased risk of cardiovascular diseases for women after menopause, the present study was carried out to evaluate the lipid profile status and Atherogenic index of plasma (AIP) in Postmenopausal women. Blood samples from 30 pre-menopausal and 30 post-menopausal women were collected for this study. Atherogenic index of plasma a risk for coronary heart disease was calculated using the formula log (TG/HDL-C). There was significant increase in TC, LDL-C, TG and significant decrease in HDL-C ($p<0.01$) in post-menopausal women compared to pre-menopausal women. The (AIP) was found to be significantly elevated in post-menopausal women compared to pre-menopausal women and correlated positively with TG ($r= 0.258, p<0.01$) and negatively with HDL-C ($r= -0.306$, $p<0.01$) in post-menopausal women. This suggests that female sex steroids in "pre-menopausal" women has plasma cholesterol lowering action, where as in post-menopausal women due estrogen deficiency causes increase in serum cholesterol levels. Hence "post-menopausal" women are more prone for coronary artery disease compared to premenopausal women.

Keywords: AIP (Atherogenic Index of plasma), HDL-C, LDL-C, Total Cholesterol (TC), Triglyceride (TG)

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INTRODUCTION

Menopause is the permanent amenorrhea, which lasts at least for a period of one year due to the cessation of ovarian function [1]. In young women, where estrogen production is high, serum lipids are normal but after menopause, lipid levels are increased and also the increased incidence of Coronary Artery Disease (CAD). This shows the possible relationship among estrogen, normal lipid profile and the relative immunity to CAD [2]. Hence after menopause, risk of atherosclerosis and CAD are more frequent [3]. Natural menopause confers a threefold increase in CAD risk [4]. Currently postmenopausal women account for more than 30% of the female population at risk for CAD in India [5]. Atherogenic Index of plasma (AIP) defined as log(TG/HDL-c in mmol/l) has recently been proposed as a marker of atherogenicity.An abnormal ratio of Triglycerides(TG) to HDL indicates an atherogenic lipid profile and a risk for the development of Myocardial infarction. The present study was conducted to know the effect of menopause on lipids and to assess the lipidemic status of post-menopausal women by calculating the atherogenic index of plasma (AIP).

MATERIALS AND METHODS

The study was conducted on 60 normal female volunteers with no history of hypertension and diabetes. The volunteers were divided into premenopausal (n: 30) and "post-menopausal" (n: 30). Under aseptic conditions blood samples (5 ml) were drawn into plain vacutainers from ante-cubital veins. The collected blood was allowed to clot for 30 minutes, and then centrifuged at 2000 g for 15 minutes for clear separation of serum. All assays were performed immediately after serum was separated. Concentrations of serum TC, TG, LDL-C, HDL-C, were determined on semiautomatic biochemical analyser using enzymatic colorimetric kit (Agappe diagnostic kit).

Statistical Analysis

All the values are expressed as mean ± SEM. A p value less than 0.05 was considered as significant. Statistical analysis was done using SPSS (statistical package for social sciences, SPSS-17, Chicago, USA). Independent sample t test was used to compare mean values. Pearson's correlation was used to correlate between the parameters.

RESULTS

Atherogenic index of plasma a risk for coronary heart disease was calculated using the formula log (TG/HDL-C). Table 1 shows significant increase in TC, LDL-C,TG and significant decrease in HDL-C ($p<0.01$) in post-menopausal women compared to pre-menopausal women. The (AIP) was found to be significantly elevated in post-menopausal women compared to pre-menopausal women and correlated positively with TG ($r= 0.258, p<0.01$)(fig-1) and negatively with HDL-C ($r= -0.306, p<0.01$)(fig-2) in post-menopausal women.

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Table I. Serum lipid profile and Atherogenic index of plasma(AIP) in pre and "post-menopausal" women (expressed in mean ± SD).

Parameters	"pre-menopausal" women (n = 30)	"post-menopausal" women (n = 30)
Serum Total cholesterol (mg/dl)	179 ± 20.6	198 ± 29.6
Serum LDL-C (mg/dl)	117 ± 21	119.0 ± 24.9
Serum Triglycerides (mg/dl)	136.7 ± 47.8	255.1 ± 110
Serum HDL-C (mg/dl)	39.5 ± 2.5	35.4 ± 4.6
AIP(Atherogenic index of plasma)	3.17±0.41	5.88±0.72

*P value < 0.01 compared to healthy controls

Figure 1: Correlation between serum triglyceride and Atherogenic index of plasma(AIP)

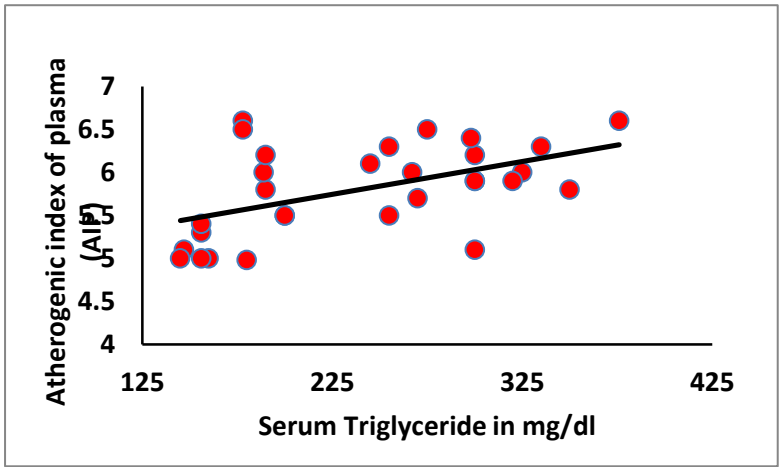
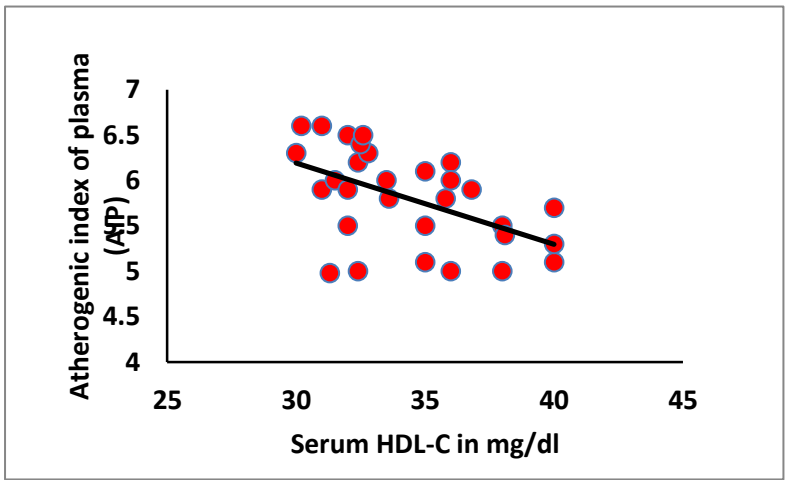


Figure 2: Correlation between serum HDL-C and Atherogenic index of plasma(AIP)



DISCUSSION

Coronary Artery Disease is the leading cause of death among the postmenopausal women. Indeed postmenopausal women are four to eight times more likely to die of CAD than

of any other disease [6]. Blood lipids are an important metabolic feature of the atherosclerotic process in women [7]. The mean age in the postmenopausal women is 56.6 ± 8.0 years and in the premenopausal women is 32.2 ± 5.8 years. The mean age in postmenopausal group is greater than that of premenopausal women. Unavoidably, there is difference in age between both groups of women because it is difficult to design studies that can separate the effects of the normal ageing process from natural menopause [8]. Menopause normally occurs between 45 to 50 years of age [9]. In our study it is evident that the total cholesterol is increased in postmenopausal women due to estrogen deficiency when compared to premenopausal women and is statistically significant ($p<0.001$) and these findings are in accordance with other studies [3,12-13]. 1% increase in TC is associated with atleast 2% increase in the incidence of CAD and they also showed that TC was 19% (1.0 mmol/L) higher in postmenopausal women compared to premenopausal women [7,10]. In our study when compared to premenopausal women, postmenopausal women are having high TG and was statistically significant ($p<0.001$). These findings are in accordance with other studies [4,11]. The atherogenic index of plasma was found to be significantly elevated in post-menopausal women compared to pre-menopausal women.

Hypercholesterolemia is a key factor in the pathophysiology of atherosclerosis [20]. Studies have shown that women are at less risk of developing CAD than their male counterparts but this gets abolished after 60 years of age [12,13]. After menopause, there is loss of ovarian function, metabolism, body fat distribution, coagulation, fibrinolysis and vascular endothelial dysfunction [14]. The changes that occur in the lipid profile after menopause are associated with increased cardiovascular disease risk. Estrogen is a female sex hormone that has plasma cholesterol lowering action. It also produces vasodilatation [15]. 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 cardio protective mechanisms are lost in menopause. The circulating levels of estrogen are considerably lower in “post-menopausal” women along with increase in serum total cholesterol, triglycerides, LDL cholesterol and decrease in HDL cholesterol [16, 17]. As estrogen levels are low in “post-menopausal” women, the lipid lowering action is lost, thus leading to increased serum lipids. So this implies that in order to modify risks of CAD in older women intervention with regard to lipid status should begin in perimenopausal state. Hence raised atherogenic index along with increase in serum total lipids could further double the risk of causing coronary heart disease in post-menopausal women.

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