

## Serum Lipid Profile and Atherogenic Index of Plasma in Premenopausal and Post-Menopausal Women

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Received: 25-09-2023 / Revised: 28-10-2023 / Accepted: 30-11-2023

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Conflict of interest: Nil

### Abstract:

**Background:** Hyperlipidemia is one of the important risk factor for development of cardiovascular disease in post-menopausal women. Our study compared the serum lipid profile and atherogenic index of plasma between premenopausal and post-menopausal women.

**Methods:** Between July 2022 and June 2023, a cross-sectional study was carried out at the Patna Medical College and Hospital in Patna, Bihar. Ninety-seven female patients of whom forty-three were premenopausal and the remaining fifty-four were postmenopausal submitted fasting samples. For every sample, a lipid profile was created and an AIP was determined. Conducted using paired t tests in the two groups. The data was shown as mean  $\pm$ SD, and a p-value of less than 0.05 was considered significant.

**Results:** Compared to premenopausal women, the mean values of triglycerides, low-density lipoprotein cholesterol, and total cholesterol were considerably higher in postmenopausal women. Postmenopausal women had higher levels of high-density lipoprotein cholesterol; however the difference was not statistically significant. Postmenopausal women had a higher plasma atherogenic index ( $0.21 \pm 0.24$  mmol/l). This indicates that the risk of cardiovascular disease development is medium for postmenopausal women in our scenario.

**Conclusion:** Because of an increase in their atherogenic lipid profile, postmenopausal women were more likely to develop cardiovascular disease than premenopausal women. Age, body mass index, systolic and diastolic blood pressure, and the atherogenic index of plasma were found to be significantly correlated.

**Keywords:** Atherogenic index of plasma (AIP). Lipid Profile, pre-post-menopausal women.

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### Introduction

Menopause is defined as "the loss of ovarian follicular activity resulting in a permanent cessation of menstruation for more than a year." [1] AIP, or the atherogenic index of plasma, has been proposed as a measure of atherogenicity. It is defined as  $\log(\text{triglyceride}/\text{high density lipoprotein cholesterol})$ , or  $\text{TG}/\text{HDL-C}$  in mmol/l.

An atherogenic lipid profile and an increased risk of myocardial infarction are indicated by this abnormal TG to HDL-C ratio. [2] AIP readings above 0.24 are associated with high cardiovascular risk, 0.1 to 0.24 with medium risk, and -0.3 to 0.1 with moderate risk, according to a theory. [3] In situations where other atherogenic risk factors seem normal, AIP is regarded as a diagnostic option. [4] Cardiovascular diseases (CVDs) are one of the leading causes of death in India.

The prevalence of coronary heart disease in India has been estimated to have ranged from 1.6% to 7.4% in rural regions and from 1% to 13.2% in urban areas over the course of several decades. [5]

It was estimated that 54.5 million Indians suffered from cardiovascular disease in 2016. In India, cardiovascular diseases cause one in four deaths, with ischemic heart disease and stroke contributing more than 80% of this burden. [6] Cardiovascular disorders are more prevalent in women after menopause due to the dyslipidemic pattern that results in these conditions and the challenges that go along with it. These hormonal changes are brought on by the menopause. Lipid-related disorders, including atherosclerosis, are diagnosed and treated by a panel of biochemical tests called lipid profiles. [7,8]

Triglycerides (TAG), low-density lipoprotein cholesterol (LDL-C), apolipoprotein B, and high-density lipoprotein cholesterol (HDL-C) and apolipoprotein A levels are all on the rise in a postmenopausal lipid profile. [9]

## Material and Methods

From July 2022 to June 2023, a cross-sectional study was carried out at the Department of Biochemistry, Patna Medical College, Patna, Bihar. Patients selected from Obstetrics and Gynaecology OPD of PMCH, Patna, Bihar. 97 female patients (43 premenopausal and 54 postmenopausal) who were willing to take part in the study and give informed consent and age group of 30-60 years were included in the study.

A thorough history was recorded. The study excluded women who were pregnant, had a history of irregular menstruation, had cardiovascular disease, diabetes mellitus, or hypertension.

Premenopausal and postmenopausal women were the two categories into which the participants were divided. Menstruation within the previous three months was considered premenopause. The term "postmenopause" refers to the end of menstruation for 12 months in a row without any other explanation. Venopuncture was used to obtain fasting blood samples from the antecubital vein, which were then placed in sterile tubes. After

allowing the blood samples to coagulate, they were centrifuged for five minutes at 3000 rpm. TC, LDL-C, HDL-C, and TG were measured in the serum using an automated biochemistry analyzer. The following formula was used to determine the atherogenic index of plasma (AIP):  $\log(TG/HDL-C)$ . The computer was programmed with SPSS statistical software (version 17.0) for data entry and analysis. The findings were shown as mean plus standard deviation. The means of the AIP and serum lipid profile were compared between the premenopausal and postmenopausal groups using an independent sample t-test. The relationship between AIP and other factors was examined using the Pearson correlation test. P-value < 0.05 was considered statistically significant.

## Results

The premenopausal women, whose mean age was  $36.9 \pm 5.1$  years, belonged to the 30 to 44 year-old age range. The postmenopausal women, whose mean age was  $55.0 \pm 3.7$  years, belonged to the 47–60 year age range. In this study, the age range at menopause was determined to be 43–54 years, with a mean age of  $50.12 \pm 2.64$  years.

**Table 1: Comparison of Lipid Profile in premenopausal and postmenopausal women (n=97)**

Serum Biochemical parameters	Pre-menopausal Women n=43 (mean $\pm$ SD)	Post-menopausal women n=54 (mean $\pm$ SD)	p- value
TC (mg/dl)	156.34 $\pm$ 31.63	197.56 $\pm$ 42.50	0.000
HDL-C (mg/dl)	43.74 $\pm$ 10.42	44.74 $\pm$ 9.72	0.481
LDL-C (mg/dl)	85.42 $\pm$ 24.24	109.98 $\pm$ 32.48	0.000
TG (mg/dl)	126.35 $\pm$ 75.66	184.10 $\pm$ 89.38	0.000

The mean HDL-C level was increased in postmenopausal women but there was no significant difference between them ( $p > 0.05$ ) (Table 1).

**Table 2: Comparison of Atherogenic Index of Plasma (AIP) in premenopausal and postmenopausal women (n=97)**

Parameters	Pre-menopausal Women n=43 (mean $\pm$ SD)	Post-menopausal women n=54 (mean $\pm$ SD)	p- value
AIP= $\log(TG/HDL-C)$ (mmol/l)	0.04 $\pm$ 0.26	0.21 $\pm$ 0.24	0.000

Table 2 shows that the AIP value in postmenopausal women is significantly higher than the premenopausal women ( $p < 0.05$ ).

## Discussion

Coronary artery disease is the leading cause of death for postmenopausal women (CAD). Compared to other diseases, CAD is four to eight times more likely to kill postmenopausal women. After a natural menopause, the chance of developing CAD increases thrice. [13] In the current investigation, postmenopausal women's levels of TC, LDL-C, and TG were statistically significantly higher than those of premenopausal controls. These findings are in accordance with these studies [10,14,15]. An increase in HDL-C levels was linked to the premenopausal to postmenopausal transitions, yet the difference was not statistically significant. It implies that the

absence of sex hormones may not be the reason of the shift in HDL-C levels. [16] Comparable outcomes were noted. [15]

In contrast, menopause was found to cause a significant drop in HDL-C levels in other investigations. [4,14] There is a correlation between age and HDL-C levels. In females, the level of HDL-C gradually rises until the sixth decade, at which point it falls. Consequently, differences in HDL-C levels across studies may be caused by age. [17]

Premenopausal women's AIP mean value is  $0.04 \pm 0.26$  mmol/l, while postmenopausal women's mean value is  $0.21 \pm 0.24$  mmol/l (Table 2). Compared to premenopausal women, postmenopausal women have a considerably higher AIP ( $p < 0.05$ ). This outcome is consistent with previous research. [2,4] Successful use of the AIP as an additional index for

assessing cardiovascular risk factors has been demonstrated. [4] AIP readings of -0.3 to 0.1 have been linked to low cardiovascular risk, 0.1 to 0.24 to medium cardiovascular risk, and above 0.24 to high cardiovascular risk. [3] This means that postmenopausal women in our context have a medium chance of getting CAD.

### Conclusion

Men are more likely than women to have cardiovascular disease up to the age of 50. After that, though, the odds change, with postmenopausal women having a higher incidence of cardiovascular disease. This group of women has to be frequently followed in order to prevent cardiovascular issues and to provide early intervention. This basic prophylaxis can reduce morbidity and mortality in the susceptible group. The computation of AIP will help much more in monitoring the high-risk populations. Dietary changes and more exercise are required for all populations in order to improve their quality of life. Numerous studies also suggest that hormone replacement therapy improves the lipid profiles of postmenopausal women.

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