



## ATHEROGENIC INDEX OF PLASMA (AIP) A PREDICTIVE MARKER OF CARDIOVASCULAR RISK IN POSTMENOPAUSAL WOMEN WITH SUBCLINICAL HYPOTHYROIDISM

### Biochemistry

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### ABSTRACT

**Background:** Lipid metabolism is influenced by the thyroid function. Hyperlipidemia is one of the important risk factors of cardiovascular disease, especially in postmenopausal women with subclinical hypothyroidism.

**Objective:** To evaluate the usefulness of AIP in assessment of cardiovascular risk in postmenopausal women with subclinical hypothyroidism.

**Materials & Methods:** Present study was carried out at department of Biochemistry, Govt. Medical College Kota Rajasthan. 50 age matched female patients with equal number of controls attending Medicine & Gynaecology OPD and IPD were enrolled in this study based on the inclusion and exclusion criteria. Total Cholesterol (TC), and the various subfractions; high density lipoprotein cholesterol (HDL-C), very low density lipoprotein (VLDL-C), low density lipoprotein Cholesterol (LDL-C) and triglyceride were determined by fully automated analyser and FT3, FT4 & TSH were measured by electrochemiluminescence immunoassay method. AIP was derived by calculation method.

**Results:** There was significant increase ( $P < 0.05$ ) in TC, TG, VLDL-C, LDL-C and AIP but a significant decrease ( $P < 0.05$ ) in HDL-C. The AIP was found to be increased in postmenopausal women with subclinical hypothyroidism.

**Conclusion:** The present study indicates that AIP can be considered as a strong marker for predicting risk of CAD in postmenopausal women, especially those with subclinical hypothyroidism.

### KEYWORDS

AIP, risk factors, cardiovascular risk, subclinical hypothyroidism

### INTRODUCTION

Assessment of cardiovascular risk is the essential step for cardiovascular prevention. Different methods have been utilized for the finding and anticipation of cardiovascular disease. Atherogenic index of plasma is a logarithmically transformed proportion of molar concentration of triglycerides to HDL- Cholesterol. AIP is easily calculated from standard lipid profile. As a marker of lipoprotein particle size it adds predictive value beyond that of the individual lipids, and TC/HDL-C ratio. (Dobiasova M et al., 2001)

Menopause, which is that the permanent cessation of menstruation following the loss of ovarian activity, has a considerable impact on the social, reproductive, physical, and psychological health of the women. (Dosi R et al., 2014) Premenopausal women have a lower incidence of disorder (CVD) compared with men of equivalent age, the incidence of the disease in a woman increases dreadfully after the age of fifty years. (Dosi R et al., 2014). The antiatherogenic effect of estrogen and therefore the protection of females against CVD, especially coronary heart condition are well described during the premenopausal period. (Pahwa MB et al., 1998). Indeed, there's convincing evidence that menopause is related to a pro-atherogenic lipid profile characterized by lower high- density lipoproteins cholesterol (HDL-C), higher rarity lipoproteins cholesterol (LDL-C) and triglyceride (TG) level (Warren MP et al., 2004) central adiposity (Augoulea A et al., 2005) Increased diastolic blood pressure (Reckelhoff JF et al., 2004) and increased insulin resistance (Wu SI et al., 2001), hence an increased risk to develop CVD.

Subclinical hypothyroidism is termed as elevated levels of TSH (Thyroid stimulating hormone) and normal levels of FT4 free thyroxin. This can reach up to 10% and is very common among postmenopausal women. For example almost all studies report higher prevalence rates for hypothyroidism with advancing age (55-75) in women i.e., around 24%. (Canaris G. J. et al., 2000) The almost same findings of whichham survey suggested the prevalence rate 17% in women above 70 years of age. It has been known for a considerable long period of time that overt hypothyroidism adds to raised serum cholesterol levels and ongoing investigations propose this may likewise be valid with subclinical hypothyroidism. (Canaris G. J. et al., 2000). TSH has been suggested as the major factor in the relationship between lipid abnormalities and SCH.

Subclinical hypothyroidism, independently involved in lipid alterations mainly affecting total-C and LDL-C. (Peppia M. et al.,

2011). The diagnosis of thyroid disorder in postmenopausal women is difficult because the symptoms are very common with menopause and aging complaints or even absent. Undiagnosed thyroid dysfunction results in increased coronary risk, bone fracture, cognitive impairment depression and mortality. (Matgorzata G C., 2017).

It has been proven that thyroid dysfunction has a major impact on triple D's i.e., dementia depression and deaths and on CAD risk in postmenopausal women, but still, till date there is not any agreement on routine screening of thyroid profile. Likewise, AIP can be a good predictor of earlier CAD risk if used along with lipid profile.

### MATERIAL & METHODS

**Materials & Methods:** Present study was carried out at department of Biochemistry, Govt. Medical College Kota Rajasthan. 50 age matched female patients with equal number of controls attending Medicine & Gynaecology OPD and IPD were enrolled in this study based on the inclusion and exclusion criteria. An informed consent was taken from all the participants, under study appraising them the nature and objective of the study. Total Cholesterol (TC), and the various subfractions; high density lipoprotein cholesterol (HDL-C), very low density lipoprotein (VLDL-C), low density lipoprotein Cholesterol (LDL-C) and triglyceride were determined by ERBA EM-360, fully automated clinical chemistry analyser (Transasia, UK) and FT3, FT4 & TSH were measured by Electrochemiluminescence immunoassay on COBAS e411 autoanalyzer (Roche Holding AG, Switzerland). AIP was derived by calculation method.

### STATISTICAL ANALYSIS

Statistical analysis was carried out using (SPSS) software statistical package for social sciences software. The mean, standard deviation differences between mean values tested by using independent simple student's t-test.

The association between study variables was assessed using Pearson's correlation analysis presented by correlation coefficient "r". Result considered significant or non significant when  $p < 0.05$  or  $> 0.05$ , respectively.

Coronary heart disease risk (CHD) can be calculated using total lipid profile as suggested by castelli et al, 1977 (Total Cholesterol/ HDL Cholesterol ratio and LDL-Cholesterol/HDL-Cholesterol ratio) (Tan MH et al., 2004) Atherogenic index of plasma (AIP), calculated as  $\log(TG/HDL-C)$ .

**RESULTS:****Table-1: Comparison Of Lipid Parameters**

PARAMETERS	CASES	CONTROLS	p-value
TC (mg/dl)	212.94 ±19.98	101.86 ±14.39	<0.05
TG (mg/dl)	185.11±90.39	127.36±76.67	<0.05
LDL-C (mg/dl)	109.98± 26.32	85.40± 20.20	<0.05
HDL-C (mg/dl)	41.20 ± 9.7	47.7± 14.2	<0.05
AIP	0.22± 0.02	0.05 ± 0.18	<0.05
TSH $\mu$ IU/ml	9.85± 2.8	3.5± 1.91	<0.05

**RESULT AND DISCUSSION:**

The mean values of total cholesterol in cases and controls were 212.94 ± 19.98 and 101.86±14.39 mg/dl respectively. There was a significant increase ( $P<0.05$ ) in cases when compared with controls.

Similarly the Triglycerides were significantly higher in cases ( $P<0.05$ ). HDL Cholesterol was significantly lower, thereby intuitively suggesting that LDL-Cholesterol were significantly higher ( $P<0.05$ ). Consecutively the AIP, TC/HDL-C ratio and LDL/HDL cholesterol ratio were found to be increased in postmenopausal women with subclinical hypothyroidism.

These observations further attest the finding of earlier worker Shabnam Niroumand et al., who stated that a significant increase in AIP is associated with increased TC, TG and LDL-C and decreased HDL-C. Further Njajou O at al., also reported that AIP plays a predictive value for atherosclerosis, and may be used as an indicator for assessing cardiovascular risk factors, and for predicting the acute coronary events. Present study shows similarity with Kavitha, et al., who found significant increase in TC, LDL-C, and significant lower level of HDL-C in postmenopausal women as compared to premenopausal women.

Stephen R. James et al., (2016) found a positive association of dyslipidemia and SH which indicates a need for regular screening of these patients to enable early diagnosis and treatment of dyslipidemia. Abnormalities found in conventional lipid profile as well as in lipid ratios and AIP imply SH to be risk factor for dyslipidemia and atherosclerosis.

**CONCLUSION:**

The present study indicates that AIP can be considered as a strong marker for predicting risk of CAD in postmenopausal women, especially those with subclinical hypothyroidism.

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