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Correlation of Lipid Sub-Fractions with Atherosclerosis in Indian Coronary Artery Disease Patients

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Abstract

Introduction: Few studies have been done to assess the correlation of lipid sub-fractions with atherosclerosis, taking carotid intima-media thickness as a surrogate marker. The correlation has been seen with LDL cholesterol, LDL-HDL ratio and apo-B and apo-A1 ratio; however, only one study has shown correlation with triglyceride and total cholesterol levels. Therefore, majority of physicians are giving paramount importance to LDL sub-fraction only. The present study was planned to find the correlation of all lipid sub-fractions with increased atherosclerosis with carotid-intima-media thickness (CIMT) as a surrogate marker.

Material and methods: Case records of the patients, fulfilling the criteria of Coronary Artery disease (CAD) and having details of lipid sub-fractions and CIMT were enrolled for the study. All the patients were divided into two groups, group I (young CAD) with age ≤ 40 years and group II (older CAD) with age > 40 years. Mean CIMT and lipid profile were tabulated in both the groups. Mean CIMT between the two groups was compared using unpaired t-test. Pearson correlation was used to find the correlation between mean CIMT and lipid sub fractions.

Results: Total 519 patients were included in the study. Group I comprised of 156 patients and group II comprised of 362 patients. The CIMT, as a surrogate marker for atherosclerosis, correlated significantly with triglyceride and total cholesterol levels, irrespective of age.

Conclusion: Both total cholesterol and triglyceride fractions should be considered important in atherosclerosis, irrespective of age. The treating physician should give due importance to these lipid sub-fractions also in planning the management of CAD patients.

Key words: Lipid, sub-fractions, atherosclerosis, correlation.

Introduction

Mortality and morbidity in cardiovascular disease (CVD) is associated primarily with atherosclerosis[1] and dyslipidaemia is the most important risk factor for atherosclerosis. It has been demonstrated from previous studies that low density lipoprotein (LDL) is the primary atherogenic lipoprotein[2] and high-density lipoprotein (HDL) is the predominant anti-atherosclerotic lipoprotein[3]. Recent studies have suggested that non-HDL cholesterol (non-HDL-C) is a better parameter for assessing CVD risk as compared to total cholesterol (TC) and HDL-C[4-7]. The lipid ratios, including TC/HDL-C and LDL-C/HDL-C ratios are risk factors with better predictive value for coronary atherosclerotic progression or regression than each lipid parameter used independently[8-11].

Carotid intima-media thickness (CIMT) has been extensively used as a non-invasive surrogate marker of atherosclerotic disease. Increased CIMT has consistently been shown to predict future vascular events[12]. Measurements of intima-media thickness (IMT) and plaque formation have been used as a sensitive indicator for the burden of atherosclerosis[13].

Few studies have been done to assess the correlation of lipid sub-fractions with atherosclerosis taking CIMT as a surrogate marker. The correlation has been seen with LDL cholesterol, LDL-HDL ratio and apo-B and apo-A1 ratio; however, only one study has shown correlation with triglyceride and total cholesterol levels. Therefore, majority of physicians are giving importance to LDL sub-fraction only. The present study was planned to find the correlation of all lipid sub-fractions with increased atherosclerosis, using CIMT as a surrogate marker.

Material and methods

This was a retrospective study, conducted in a tertiary care hospital over a period of one year. The data collected was based on the case records of admitted patients. The case records of patients with history of coronary artery disease or acute coronary syndrome were selected for the study. Those who had diabetes mellitus or uncontrolled hypertension, as per the records, were excluded. Total 519 patients were included, of which 156 (30.1%) were less

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than 40 years of age fulfilling the criteria of young CAD.The patients were divided into two groups, group I with CAD patients ≤ 40 years of age and group II with patients > 40 years of age. Anthropometric measurement in the form of waist and hip circumference were noted. Mean CIMT and lipid profile were noted as per records.

Statistical analysis

Mean CIMT and lipid sub-fractions between the two groups were compared using unpaired t-test. Pearson correlation test was used to find the correlation between mean CIMT and lipid sub-fractions.

Results

Total 519 patients were included in the study. Baseline characteristics and clinical parameters of patients are shown in Table I. Group I of young CAD patients comprised of 156 patients, of which 16 were females. Group II of older CAD patients comprised of 362 patients, of which 95 were females. Mean CIMT was significantly higher in group II. However, there was no significant difference in the lipid sub-fractions of the two groups (Table II).

Table I: Clinical characteristics of the whole group of CAD patients.

Variables	Mean ± SD
Age (years)	46.31 ± 13.05
Male: female	4:1
Waist (cms)	89.07 ± 11.96
WHR	0.96 ± 0.09
SBP (mmHg)	127.44 ± 24.24
DBP (mmHg)	81.51 ± 14.43
FBS (mg/dl)	113.59 ± 46.25
PPBS (mg/dl)	160.35 ± 64.20
TC (mg/dl)	156.59 ± 41.69
TG (mg/dl)	143.46 ± 83.84
HDL (mg/dl)	35.81 ± 9.25
LDL (mg/dl)	91.64 ± 33.24
CIMT (mm)	0.68 ± 0.16

WHR: waist hip ratio; SBP: systolic blood pressure; DBP: diastolic blood pressure; FBS: fasting blood sugar; PPBS: post-prandial blood sugar; TC: total cholesterol; TG: triglycerides; HDL: high density lipoprotein; LDL: low density lipoprotein; CIMT: carotid intima-media thickness.

On testing correlation of mean CIMT with lipid sub-fractions, it correlated significantly with triglyceride and total cholesterol levels, irrespective of age (Table III).

Table II: Comparison of lipid sub-fractions and CIMT in group I (young CAD) and group II (older CAD).

	Young CAD group (≤ 40 years) (n = 156)	Older CAD group (> 40 years) (n = 362)	p value
	Mean ± SD	Mean ± SD	
Mean CIMT (mm)	0.60 ± 0.13	0.72 ± 0.16	< 0.001
TC (mg/dl)	160.45 ± 45.0	154.8 ± 40.04	0.22
HDL (mg/dl)	35.62 ± 07.75	35.97 ± 9.89	0.78
LDL (mg/dl)	94.24 ± 38.04	90.65 ± 30.93	0.38
TG (mg/dl)	144.11 ± 87.37	143.32 ± 82.44	0.93
TC /HDL ratio	04.38 ± 01.88	04.34 ± 01.61	0.84
HDL /LDL ratio	0.46 ± 0.21	0.49 ± 0.40	0.46

TC: total cholesterol; TG: triglycerides; HDL: high density lipoprotein; LDL: low density lipoprotein; CIMT: carotid intima-media thickness; CAD: coronary artery disease.

Table III: Correlation of mean CIMT with lipid sub-fractions.

		Total CAD (n = 519)	Young CAD (≤ 40 years) (n = 156)	Older CAD (> 40 years) (n = 362)
TC	Pearson correlation	- 0.057	0.182*	- 0.135*
	Sig. (2-tailed)	0.257	0.037	0.027
HDL	Pearson correlation	0.018	- 0.019	0.029
	Sig. (2-tailed)	0.733	0.840	0.645
LDL	Pearson correlation	- 0.052	0.077	- 0.096
	Sig. (2-tailed)	0.320	0.420	0.133
TG	Pearson correlation	0.024	0.397*	- 0.121*
	Sig. (2-tailed)	0.635	0.000	0.050
TC-HDL ratio	Pearson correlation	0.021	0.112	- 0.016
	Sig. (2-tailed)	0.690	0.228	0.802
HDL-LDL ratio	Pearson correlation	- 0.056	- 0.101	- 0.063
	Sig. (2-tailed)	0.290	0.291	0.325

TC: total cholesterol; TG: triglycerides; HDL: high density lipoprotein; LDL: low density lipoprotein; CIMT: carotid intima-media thickness; CAD: coronary artery disease.

** Correlation was significant at the 0.05 level (2-tailed).*

Discussion

The present study demonstrated that mean CIMT was significantly correlated with the total cholesterol, as well as triglyceride levels in both the groups, i.e., young as well as older CAD patients. However, no correlation was seen between mean CIMT and other lipid sub-fractions and ratios.

The study done by Yang *et al* showed a positive correlation of CIMT with LDL cholesterol, HDL and LDL cholesterol ratio; however, no significant correlation was seen with triglycerides, HDL-C levels, and TC/HDL-C ratio[14]. Another study done by Jadhav *et al*, also showed the association of LDL-C and ApoB: ApoA-1 ratio > 1 with increased CIMT[15]. The present study is in agreement with the study done by Sengupta *et al* which showed strong positive correlation of CIMT with total cholesterol, LDL: HDL ratio, and triglyceride[16].

There was no significant correlation between the lipid parameters of the two groups. The lipid parameters are modifiable risk factors and had influence of other factors as smoking and diabetes mellitus, although both the groups were matched for diabetes, smoking could have acted as a confounding factor.

The present study however has some limitations as it is a cross-sectional study, and there can be confounding factors as the groups were not matched for various parameters like central obesity, body mass index, smoking, statin use, etc.

In the present study, all the patients had coronary artery disease as per the definition. They were grouped into young and older coronary artery disease and it was seen that in these patients, the CIMT, as a surrogate marker for atherosclerosis, correlated significantly with triglyceride and total cholesterol levels.

Both total cholesterol and triglyceride fractions should be considered important in atherosclerosis, irrespective of age. The treating physician should give due importance to these sub-fractions, apart from the traditional LDL sub-fraction, in planning management.

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