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Lipid Profile Parameters and Coronary Artery Disease in Young Patients Undergoing Diagnostic Angiography

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Abstract

Introduction: It is vital to understand the association between lipid profile and the severity of coronary artery disease (CAD) in young patients with suspected CAD. The clinical presentation, lipid profile and severity of CAD may differ in patients who develop CAD at young age and those at older age. Friesinger (FR) index is an important tool to assess the extent and severity of coronary artery lesions.

Methods: This study was a single center retrospective study involving patients below 40 years who underwent diagnostic coronary angiography. Demographic variables, lipid profile and FR index were estimated. Patients were divided into four groups based on the FR index scores of 0, 1–4, 5–10 and 11-15, respectively.

Results: A total of 158 patients (Mean ± SD of age; 35.65 ± 3.81 years) were included in the study. Among demographic variables, gender ($P = 0.03$) and body mass index (BMI) ($P < 0.001$) were found to be associated with FR index. In addition, total cholesterol ($P < 0.001$), low density cholesterol (LDL) cholesterol ($P < 0.001$), non-high density cholesterol (non-HDL) ($P < 0.001$) and ratio of triglycerides (TG) /non-HDL cholesterol ($P = 0.004$) showed significant differences between the FR groups. Logistic regression analysis showed that only diabetes ($P = 0.02$) and BMI ($P = 0.004$) were significant predictors of the extent and severity of coronary artery lesions in terms of FR index.

Conclusions: A strong direct relationship was observed between total cholesterol, LDL and non HDL cholesterol while a negative correlation with the TG/non HDL ratio. Diabetes and BMI also play a very significant role.

INTRODUCTION

Coronary artery disease (CAD) is one of the leading causes of morbidity and mortality. It accounts for around 12 million deaths worldwide annually [1]. In particular, it is a major clinical concern in South Asia, as more than a half of the worldwide CAD risk burden is estimated to be borne by Indian subcontinent [2]. Reports have also suggested that the risk of developing CAD in Asian Indians is 3–4 times higher than that in white Americans, 6 times higher than that in Chinese, and 20 times higher than that in Japanese [3]. In addition to higher rate, it is also reported that Indian individuals may develop CAD at a very early age [4]. Onset of CAD before 40 years of age is considered as premature CAD [5, 6]. Although most studies reported that only about 3% of all CAD cases occur below 40 years of age, it should be considered as the 'tip of the iceberg' as young, asymptomatic patients usually do not undergo medical investigations [7, 8]. It has been noted that more than a half of death related to cardiovascular disease occurs in patients below the age of 50 years and one-fourth of patients with acute myocardial infarction are reported in patients under the age of 40 years in India [6]. It has also been noted that the clinical presentation, cardiovascular risk factors, lipid profile and severity of CAD may differ in patients who develop CAD at young age and those who develop CAD at an older age [6, 9-11].

In this this milieu, it is vital to understand the association between lipid levels and the extent or severity of coronary lesions in young patients with coronary artery disease. Friesinger (FR) index is an important tool to assess the extent and severity of coronary artery lesions [12]. A significant association between the FR index and lipid levels has been observed previously [13, 14]. However, such investigations in specifically young Indian population are not available in the literature. Hence, we conducted the present study to evaluate the association between certain lipid parameters and the extent of CAD, in terms of FR index, in young patients undergoing diagnostic coronary angiography. This will help us in focusing on early detection and treatment of abnormal lipid levels along with lifestyle changes in predisposed individuals.

MATERIALS AND METHODS

Study Design

This study was a single center retrospective study conducted at a tertiary care center in South India. All consecutive patients presenting with myocardial infarction (MI) or unstable angina (UA) below 40 years who underwent coronary angiography for diagnostic purposes at our hospital from 2009 to 2017 entered the study. However, patients with previous myocardial infarction, congenital heart disease, coronary artery anomaly, obstructive pulmonary illness and reported use of cholesterol-lowering drugs, history of percutaneous angioplasty and history of cardiac surgery were excluded. The protocol of the study was approved by the Institutional Ethics Committee and the study was conducted in accordance with the ethical standards of Good Clinical Practice and the Helsinki Declaration.

Data Collection

Data was obtained retrospectively from the review of medical records, including coronary angiography reports, at the hospital. For each patient, demographic data was collected including age, sex, height, weight, systemic arterial hypertension, diabetes mellitus, smoking habits and alcoholism. Body Mass Index (BMI) was calculated by weight divided by height squared. Blood pressure (BP) was recorded in the sitting position in the right arm with a mercury sphygmomanometer. Two readings were taken by a trained physician 5 minutes apart and the mean of the two was noted as the BP. Systemic arterial hypertension was defined as systolic blood pressure > 140 mmHg or diastolic blood pressure > 90 mmHg or by previous diagnosis or prior use of anti-hypertensive drugs [6]. Diabetes mellitus was defined by ≥ 126 mg/dL fasting blood sugar along with glycated hemoglobin (HbA1c) levels > 6.5%, or previous diagnosis or prior use of hypoglycemic drugs [6]. Patients were labelled as smokers or alcoholic if they gave history of its consumption within the last one year.

To analyze the lipid profile, a 5 mL venous blood sample was collected from each patient. Subsequently, total cholesterol (TC), triglycerides, high-density lipoprotein (HDL) cholesterol, low-density lipoprotein (LDL) cholesterol, very-low-density lipoprotein (VLDL) cholesterol and non-HDL cholesterol levels were calculated using standard methods. Lipid ratios of triglycerides to HDL cholesterol and triglycerides to non-HDL cholesterol as well as total cholesterol to HDL were also calculated. Patients with abnormal lipid levels were identified by cutoff points of > 200 mg/dL for total cholesterol, > 150 mg/dL for triglycerides, > 130 mg/dL for LDL cholesterol, ≤ 40 mg/dL for HDL cholesterol, ≤ 5 for total cholesterol/HDL ratio, > 4 for triglycerides/HDL cholesterol ratio and > 0.9 for triglycerides/ non-HDL cholesterol ratio [13].

For all patients, coronary angiography was performed either by radial or trans-femoral route by experienced cardiologists to detect significant CAD. Here, significant CAD was defined as ≥ 50% stenosis in the left main coronary artery, ≥ 70% stenosis in any other coronary artery, or both [15]. Based on the involvement of none, one, two, three vessels, patients were divided into those with normal coronaries, single vessel disease, double vessel disease and triple vessel disease, respectively. Additionally, the Friesinger index (FR) was used to assess the coronary artery disease burden. Each one of the three main coronary arteries was scored separately from zero to five. The scores were 0 for normal or no angiographic abnormality, 1 for luminal narrowing of less than 29%, 2 for localized luminal narrowing of 30-68%, 3 for multiple luminal narrowing of 30-68%, 4 for luminal narrowing of 69-100% without total occlusion of proximal segment and 5 for total obstruction of a proximal segment [14]. Finally total score comprising sum of the scores of the three coronary arteries for an individual were calculated. Accordingly, patients were classified into FR index groups comprising (a) patients with 0 score of FR index, (b) 1–4 score of FR index, (c) 5–10 score of FR index and (d) those with 11–15 FR index score.

Statistical Analysis

Continuous variables were presented as mean and standard deviation while categorical variables presented as frequency and percentage. The Analysis of Variance (ANOVA) test was used to assess the significant differences between FR index groups for continuous demographic variables (e.g. age, height, weight, BMI) and lipid profile (e.g. total cholesterol, triglycerides, HDL cholesterol, LDL cholesterol, VLDL cholesterol, non-HDL cholesterol, total cholesterol/HDL cholesterol, triglycerides/HDL cholesterol and triglycerides/non-HDL cholesterol). Similarly, Pearson Chi-square test was used to assess the significant differences between FR index groups for categorical demographic variables (e.g. age groups, gender, BMI groups, hypertension, diabetes, smoking, alcohol) and for CAD severity (e.g. normal coronaries, single vessel disease, double vessel disease and triple vessel disease). Spearman's rho correlation test was used to assess the correlation between FR index and various lipid profile components with an estimation of correlation coefficient (r). Subsequently, the association between the severity of FR index and frequencies of patients classified according to the cut-off levels for each lipid variable was assessed using Pearson Chi-square test. In addition, we dichotomized the scale of FR index into binary, FR ≥ 5 as high coronary artery disease burden. binary logistic regression analysis with this cut-off was conducted to predict the extent and severity of coronary artery lesions, in terms of FR index, using lipid variables and demographic characteristics as predictors along with odds ratio and 95% confidence interval for regression coefficient (R). The Statistical Package for Social Sciences (SPSS for Windows version 20.0; Chicago, IL, USA) was used for statistical analysis. P value < 0.05 was considered to indicate statistical significance.

RESULTS

Baseline Demographics

This study included a total of 158 patients aged less than 40 years who underwent diagnostic coronary angiography during the study period at our center. The baseline characteristics of these patients are given in Table 1. The mean age of study population was 35.65±3.81 years. Of them, 129 (81.6%) were males and 29 (18.4%) females. Cardiovascular risk factors such as hypertension, diabetes, smoking habits and alcoholism were present in 41 (25.94%), 52 (32.91%), 37 (23.4%) and 7 (4.4%) patients, respectively.

Lipid profile analysis revealed that the mean total cholesterol level was 168.05 ± 52.03 mg/dL, mean triglycerides level 152.44 ± 101.79 mg/dL, mean HDL cholesterol level 38.72 ± 12.76 mg/dL, mean LDL cholesterol level 100.53 ± 44.07 mg/dL, mean VLDL cholesterol level 30.22 ± 0.37 mg/dL, mean non-HDL cholesterol level 129.33 ± 49.22 mg/dL, mean ratio of total cholesterol to HDL 4.94 ± 3.74, mean ratio of triglycerides to HDL ratio 4.46 ± 3.67 and mean ratio of triglycerides to non-HDL 0.64 ± 0.48.

Angiographic analysis revealed that 61 (38.6%), 68 (43.0%), 23 (14.6%) and 6 (3.8%) patients had normal coronaries, single vessel disease, double vessel disease and triple vessel disease, respectively. Further, the mean FR index was 3.77±4.14. Of them, 61 (38.6%) patients had score 0 of FR index, 41 (26.0%) score 1–4 of FR index, 41 (26.0%) score 5–10 of FR index and 15 (9.4%) score 11–15 of FR index.

Table 1. Demographic Characteristics of the Study Participants

Variable, n = 158	
Age (years)	35.65 ± 3.81
Males	129 (81.6)
Females	29 (18.4)
Body mass index (kg/m2)	24.66 ± 3.18
Smoking	37 (23.4)
Hypertension	41 (25.94)
Alcohol	7 (4.4)
Diabetes	52 (32.91)
Lipid Profile	
Total cholesterol, mg/dL	168.05 ± 51.03
Triglycerides, mg/dL	152.44 ± 101.79
HDL cholesterol, mg/dL	38.72 ± 12.76
LDL cholesterol, mg/dL	100.53 ± 44.07
VLDL cholesterol, mg/dL	30.22 ± 20.37
Non-HDL cholesterol, mg/dL	129.33 ± 49.22
Total Cholesterol/HDL	4.94 ± 3.74
Triglycerides/HDL cholesterol	4.46 ± 3.67
Triglycerides/non-HDL cholesterol	0.64 ± 0.48
Angiographic Diagnosis	
Normal Coronaries	61 (38.6)
Single vessel disease	68 (43.0)
Double vessel disease	23 (14.6)
Triple vessel disease	6 (3.8)
Freisinger Index	3.77 ± 4.14
0, n (%)	61 (38.6)
1–4, n (%)	41 (26.0)
5–10, n (%)	41 (26.0)
11–15, n (%)	15 (9.4)

Data in table are presented as No. (%) or Mean ± SD
HDL: high density cholesterol; LDL: low density cholesterol; VLDL: very low density cholesterol

Demographic Profile vis-à-vis FR Index Groups

The comparative analysis of demographic variables between FR index groups is given in Table 2. Severity of coronary artery disease showed a strong association with FR index (P < 0.001). In addition, gender and BMI showed significant role in the FR index, with trends suggesting more predominance of males (P = 0.03) and increase in BMI (P < 0.001) with increase in FR index.

Lipid Profile vis-à-vis FR Index

The comparative analysis of lipid profile between FR index groups is given in Table 3. Significant differences were observed between total cholesterol (P < 0.001), LDL cholesterol (P < 0.001), non-HDL cholesterol (P < 0.001) and triglycerides/non-HDL cholesterol (P = 0.004). Further, the analysis of correlation between FR index and various lipid profile components is given in Table 4. A significant positive correlation was observed between FR index and total cholesterol (r = 0.189; P = 0.018), LDL cholesterol (r = 0.222; P = 0.005), non-HDL cholesterol (r = 0.206; P = 0.009). Of note, a significant inverse correlation was observed between FR index and ratio of triglycerides to non-HDL cholesterol (r = -0.205; P = 0.010). Table 5 presents the comparative analysis of frequency of patients with abnormal lipid levels between FR index groups. With increase in FR index, there was a trend of increase in the frequency of patients with elevated total cholesterol levels (P = 0.009) and elevated LDL cholesterol levels (P = 0.029).

Logistic Regression of Demographic Profile and Lipid Profile vis-à-vis FR Index

The binary logistic regression analysis of lipid variables and demographic characteristics vis-à-vis FR index (FR ≥ 5 as high coronary artery disease burden) is given in Table 6. Among all variable, only diabetes (P = 0.023) and BMI (P = 0.004) were found to be significant predictors of the extent and severity of coronary artery lesions, in terms of FR index. Of note, gender and all lipid variables showed no statistical significance.

Table 2. Demographic Variables in Patients Based on Freisinger Index Classes

Variables	Freisinger Index				P value
	0 (n = 61)	1–4 (n = 41)	5–10 (n = 41)	11–15 (n = 15)	
Age (years)	35.07 ± 4.39	35.51 ± 3.82	36.27 ± 2.75	36.73 ± 3.61	0.09
Range					0.1
20–30 years [N = 17]	8 (47)	5 (29.4)	3 (17.6)	1 (5.9)	
31–40 years [N = 141]	53 (37.6)	36 (25.5)	38 (26.9)	14 (9.9)	
Sex					0.03
Males [n = 129]	43 (33.3)	36 (27.9)	37 (28.7)	13 (10)	
Females [N = 29]	18 (62)	5 (17.2)	4 (13.7)	2 (6.8)	
Height (cm)	164.25 ± 7.32	166.37 ± 5.54	166.83 ± 4.84	161.33 ± 9.54	0.1
Weight (cm)	64.21 ± 10.72	68.44 ± 9.48	70.15 ± 8.86	69.53 ± 8.55	0.04
BMI (kg/m2)	23.66 ± 3.13	24.68 ± 2.97	25.31 ± 3.13	26.87 ± 2.70	< 0.001
BMI					< 0.001
BMI ≤ 25 kg/m2 [N=101]	50 (49.5)	25 (24.7)	21 (20.8)	5 (4.9)	
BMI > 25 kg/m2 [N = 57]	11 (19.3)	16 (28)	20(35.0)	10 (17.5)	
Smoking [**N = 37**]	9 (24.3)	12 (32.4)	12 (32.4)	4 (10.8)	0.06
Hypertension [**N = 41**]	17 (41.4)	11 (26.8)	9 (21.9)	4 (9.7)	0.3
Alcohol [**N = 7**]	1(14.4)	3 (42.8)	3 (42.8)	0	0.3
Diabetes [**n = 52**]	18 (34.6)	10 (19.2)	18 (34.6)	6 (11.54)	0.08
Normal coronaries [**N = 61**]	61 (100)	0	0	0	< 0.001
Single vessel disease [N = 68]	0	37 (54.4)	28 (41.2)	3 (4.4)	
Double vessel disease [N = 23]	0	4 (17.4)	11 (47.8)	8 (34.7)	
Triple vessel disease [N = 6]	0	0	2 (33.3)	4 (66.7)	

Data in table are presented as No. (%) or Mean ± SD
BMI: Body mass index

Table 3. Lipid Levels in Patients Based on Freisinger Index Classes

Variables	Freisinger Index				P value
	0 (n = 61)	1–4 (n = 41)	5–10 (n = 41)	11–15 (n = 15)	
Total cholesterol, mg/dL	171.05 ± 41.44	149.78 ± 49.81	163.51 ± 46.36	218.20 ± 69.65	< 0.001
Triglycerides, mg/dL	158.41 ± 121.26	153.61 ± 103.05	143.93 ± 74.50	148.20 ± 81.15	0.6
HDL cholesterol, mg/dL	39.77 ± 13.78	39.15 ± 13.36	36.59 ± 10.55	39.13 ± 12.83	0.6
LDL cholesterol, mg/dL	102.73 ± 32.88	81.63 ± 41.60	98.29 ± 40.13	149.33 ± 63.05	< 0.001
VLDL cholesterol, mg/dL	31.574 ± 24.33	30.737 ± 20.61	28.493 ± 14.95	28.027 ± 15.63	0.4
Non-HDL cholesterol, mg/dL	131.28 ± 37.533	110.63 ± 50.43	126.93 ± 43.63	179.07 ± 68.75	< 0.001
Total Cholesterol/HDL	4.58 ± 1.41	5.38 ± 6.88	4.72 ± 1.46	5.84 ± 2.20	0.3
Triglycerides/HDL cholesterol	4.628 ± 4.60	4.482 ± 3.43	4.319 ± 2.61	4.139 ± 2.62	0.6
Triglycerides/non-HDL cholesterol	0.70 ± 0.46	0.71 ± 0.46	0.59 ± 0.50	0.33 ± 0.49	0.004

Data in table are presented as Mean ± SD
HDL: high density cholesterol; LDL: low density cholesterol; VLDL: very low density cholesterol

Table 4. Correlation between Freisinger Index and Lipid Variables

Variables	Correlation with FR Index (Pearson's Correlation)	
	Correlation Coefficient	P value
Total Cholesterol (mg/dL)	0.189	0.01
Triglyceride (mg/dL)	-0.035	0.6
HDL (mg/dL)	-0.042	0.6
LDL (mg/dL)	0.222	0.005
VLDL (mg/dL)	-0.050	0.5
Non HDL (mg/dL)	0.206	0.009
Total Cholesterol/HDL	0.087	0.2
Triglyceride/HDL	-0.036	0.6
Triglyceride/Non HDL	-0.205	0.01

Data in table are presented as No. (%) or Mean ± SD
HDL: high density cholesterol; LDL: low density cholesterol; VLDL: very low density cholesterol

Table 5. Frequency of Patients According to the Cut-off Lipid Levels between Freisinger Index Groups

Cut-off level	Freisinger Index				P value
	0 (n = 61)	1–4 (n = 41)	5–10 (n = 41)	11–15 (n = 15)	
TC					0.009 *
≤ 200 mg/dL [N = 120]	49 (40.8)	34 (28.3)	31 (25.8)	6 (5)	
> 200 mg/dL [N = 38]	12 (31.6)	7 (18.4)	10 (26.3)	9 (23.7)	
HDL					0.3
≤ 40 mg/dL [N = 103]	39 (37.8)	27 (26.2)	26 (25.2)	11 (10.6)	
> 40 mg/dL [N = 55]	22 (40)	14 (25.5)	15 (27.2)	4 (7.2)	
LDL					0.02 *
≤ 130 mg/dL [N = 122]	48 (39.3)	36 (29.5)	31 (25.4)	7 (5.7)	
> 130 mg/dL [N = 36]	13 (36.1)	5 (13.8)	10 (27.7)	8 (22.2)	
TG					0.5
≤ 150 mg/dL[N = 99]	39 (39.4)	24 (24.2)	27 (27.3)	9 (9.1)	
> 150 mg/dL [N = 59]	22 (37.3)	17 (28.8)	14 (23.7)	6 (10.1)	
Non HDL					0.1
≤ 160 mg/dL [N = 117]	44 (37.6)	35 (29.9)	31 (26.5)	7 (5.9)	
> 160 mg/dL [N = 41]	17 (41.5)	6 (14.6)	10 (24.4)	8 (19.5)	
TC/HDL					0.07
≤ 5 [N = 102]	41 (40.2)	30 (29.4)	24 (23.5)	7 (6.8)	
> 5 [N = 56]	20 (35.7)	11 (19.6)	17 (30.3)	8 (14.2)	
TG/HDL					0.3
≤ 4 [N = 91]	38(41.7)	22 (24.4)	22 (24.4)	9 (10)	
> 4 [N = 67]	23 (34.3)	19 (28.4)	19 (28.4)	6 (8.9)	
TG/Non HDL					0.006 *
≤ 0.9 [N = 57]	18 (31.6)	12 (21)	17 (29.8)	10 (17.5)	
> 0.9 [N = 101]	43 (42.5)	29 (28.7)	24 (23.8)	5 (4.9)	

Data in table are presented as No. (%)

TC: Total Cholesterol; HDL: high density cholesterol; LDL: low density cholesterol; TG: Triglyceride

Table 6. Logistic Regression Analysis for Demographic and Lipid Variables vs. the Friesinger Index

Variable	Regression Coefficient	Odds ratio	95 % Confidence Interval		P value
Diabetes	-0.891	0.410	0.191	0.884	0.02
BMI	0.175	1.191	1.056	1.344	0.004
Sex	-0.020	0.345	0.118	1.012	0.05
TC	0.005	0.980	0.949	1.012	0.2
LDL	-1.063	1.028	0.991	1.066	0.1
HDL	0.063	1.005	0.960	1.053	0.8
TG/Non-HDL	0.028	1.065	0.596	1.901	0.8

BMI: body mass index; TC: Total Cholesterol; HDL: high density cholesterol; LDL: low density cholesterol; TG: Triglyceride

DISCUSSION

The present study compared the lipid profile and angiographic extent of coronary artery lesions in 158 young patients undergoing diagnostic coronary angiography. We observed significant CAD in 71.4% of patients. Among demographic variables, gender and BMI were found to be associated with FR index, which indicates the extent and severity of CAD. In addition, total cholesterol, LDL cholesterol and non-HDL cholesterol showed significant differences between FR groups. We believe that these findings may help in decision-making of management strategy in young patients with CAD.

According to the National Commission on Macroeconomics and health estimate, patients with CAD in India have increased from 29.8 to 61.5 million from 2004 to 2015 and the mortality rate has increased from 1.3 to 2.946 million [16]. Numerous studies have shown that high levels of LDL cholesterol are directly related to coronary artery disease [17, 18] and low level of HDL cholesterol has been considered as one of the strongest and most independent risk factors for the coronary artery disease [19, 20]. It is also established that small increases in triglyceride levels may lead to rapid progression of coronary artery disease along with increased risk of new coronary artery lesions formation [21-23]. Further, several lipid ratios like ratio of triglycerides to HDL cholesterol has shown a very promising surrogate marker for the atherosclerosis [24]. However, previous studies have shown that most patients with acute ST segment elevation myocardial infarction and less than 40 years of age had low HDL levels, normal LDL levels, marginally elevated mean triglyceride levels and normal total cholesterol levels [11]. Conversely, very few studies have been performed to show a significant association between lipid levels and severity of coronary lesions, despite the association between lipid profile abnormality and coronary artery disease is very well known [25].

Earlier, Agarwal et al. evaluated the correlation between lipid levels and the extent or severity of coronary lesions in 566 patients (mean ± SD of age; 56.17 ± 9.99 years) with suspected coronary artery disease using FR index (FR). The mean FR index was 5.40 ± 3.78. They demonstrated a significantly positive correlation between FR index and total cholesterol, triglycerides, VLDL cholesterol, non-HDL cholesterol, triglycerides/HDL cholesterol ratio and triglycerides/non-HDL cholesterol ratio. In addition, a negative correlation was observed between FR index and HDL cholesterol. Among demographic variables, age or gender did not alter the FR index severity but BMI, hypertension, diabetes and smoking showed significant association with FR index (13). Similarly, we divided our 158 young patients who aged <40 years into four groups based on FR index scores of 0, 1–4, 5–10 and 11-15 respectively. We observed that total cholesterol, LDL cholesterol, non-HDL cholesterol, triglycerides/non-HDL cholesterol ratio as well as BMI, weight and male gender had a significant correlation with severity of FR index in our patients. According to the cut-off lipid levels, total cholesterol (> 200mg/dl) and LDL cholesterol (< 130 mg/dl) showed a direct association while triglyceride/non-HDL cholesterol (> 0.9) showed an inverse association with FR index. High levels of lipid profiles showed a direct impact on the severity of coronary artery disease. Higher BMI was also associated with higher FR index, which was also suggestive of increased BMI associated with CAD burden. Further, males with higher FR index showed higher prevalence of CAD compared to females. However, logistic regression analysis showed that only diabetes and BMI had strong association with the FR index. The main difference between our study and Agarwal et al. is that triglyceride/non-HDL cholesterol ratio had a contradictory correlation in both studies. Patients with dyslipidemia were excluded in the study.

In another study, Luz et al. studied the association between lipid levels, specifically triglycerides/HDL cholesterol and the extent of coronary disease in 374 high-risk patients. They found that the association between the extent of coronary disease (dichotomized by a FR index of 5) and lipid levels (normal vs. abnormal) was statistically significant for triglycerides, HDL cholesterol and triglycerides/HDL cholesterol. However, the association was not significant between the extent of coronary disease and total cholesterol or LDL cholesterol [14]. According to a study by Flowers et al. triglycerides/HDL cholesterol ratio in Indian population was very useful in predicting clinical outcomes in apparently healthy people who had a risk of developing type 2 diabetes mellitus, cardiovascular disease along with metabolic syndrome [26].

Overall, we suggest that young patients may be predisposed at CAD and hence, emphasis should be given on diagnosis and management of dyslipidemia, which is a major modifiable risk factor for the primary and secondary prevention of coronary artery disease and subsequent cardiovascular events.

Study Limitations

We only considered lipid variables and did not take the current use of medication into account. The use of Angiotensin inhibitors or Angiotensin II receptor blockers may alter the association between lipid variables and FR index. Our study population included patients who underwent coronary angiography for diagnostic purposes and hence the findings might not be applicable to general population.

CONCLUSIONS

Our study showed a significant association between different lipid parameters and the coronary artery disease burden. A strong direct association was observed between total cholesterol, LDL and non HDL cholesterol while a negative correlation with TG/non HDL ratio. Diabetes and BMI also play a very significant role. However, our study clearly demonstrated that there was no statistically significant association between TG/HDL ratio and coronary artery disease burden.

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The authors report no financial relationships or conflicts of interest regarding the content herein.

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