



ROLE OF NON HIGH DENSITY LIPOPROTEIN CHOLESTEROL (NON HDL-C) IN PREDICTING ACUTE CORONARY SYNDROME

Medical Science

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ABSTRACT

Background: CAD is the common cause of mortality and morbidity. The established marker for coronary artery disease (CAD), since many years is Low density lipoprotein cholesterol (LDL-C). But even with normal LDL-C, people are suffering from CAD. This indicates that along with LDL-C, triglycerides and other cholesterol except HDL-C should be considered to predict CAD. So, in recent years Non-HDL-C is considered as more important predictor of CAD. This study aims at establishing the role of non HDL-C in predicting Acute Coronary Syndrome. **Formula to calculate non HDL-C:** Non HDL-C = TOTAL CHOLESTROL – HDL-C. **Methods:** This is a case-control study, comprises total of 100 subjects which includes

KEYWORDS

Coronary Artery Disease CAD, Low density lipoprotein, High density lipoprotein, cholesterol, Triglycerides.

INTRODUCTION

Coronary artery disease is the most common causes of morbidity and mortality in both developing like India and developed countries, including all age groups and of both genders.

The conventional risk factors that cause CAD are divided into non-modifiable and modifiable risk factors. Modifiable risk factors- anthropometric parameters (obesity), metabolic derangements (diabetes mellitus (DM), smoking, dyslipidemia, hypertension), and sedentary lifestyle. 2) Non-modifiable risk factors- age, race/ethnicity, and familial/genetic predisposition.

The New risk factors are higher C-reactive protein, plasminogen activator inhibitor (PAI-1) and homocysteine levels, they are proven to be useful indicators in Indian population.

Non HDL-C as a risk factor for cardiovascular disease

Non HDL-C consist of cholesterol accumulated in all lipoproteins, except HDL. This consist chylomicrons, VLDL, IDL (Intermediate Density Lipoproteins), LDL (Low Density Lipoproteins), LP (Lipoprotein). Increased level of non HDL-C by 1 mg/dl increases the risk of death due to cardiovascular disease by 5%. So it is considered to be a better predictive indicator than the traditional lipid risk factors.

MATERIALS AND METHODS

This is a case-control study carried out over 4 months period (June 2022- September 2022) in patients of coronary artery disease who are admitted in Madras Medical College (MMC), Chennai, Tamil Nadu. The patients were recruited based on inclusion and exclusion criteria. Inclusion criteria are Patients diagnosed with coronary artery disease, with age more than 25 years, both sex with a history of acute chest pain based on reports of ECG, ECHO cardiogram and cardiac enzymes. Exclusion criteria are Patients with less than 25 years of age, Patients on statins, other lipid lowering agents, chronic kidney disease, chronic liver disease and thyroid patients. The study group (n=50) consists of patients diagnosed with CAD and control group (n=50) consists of patients without CAD who came to Cardiology Department. In study group, patients diagnosed with CAD were not on statins (cost factor or discontinuation).

Our sample size is limited due to this exclusion criteria. In control groups, subjects without CAD are chosen. Coronary Artery Disease was diagnosed based on clinical history and investigations like ECG changes, ECHO cardiogram and biochemical parameters. Lipid profile levels include Total Cholesterol (TC), Low Density Lipoprotein Cholesterol (LDL-C), Triglycerides (TGL), and High Density Lipoprotein Cholesterol (HDL-C). These parameters were performed in biochemistry laboratory of MMC, Chennai. Then IBM SPSS (windows-version 29.0) was used to do the statistical analysis.

The National Cholesterol Education Program Adult Treatment Panel III (NCEP ATP III) report suggested that non HDL-C should be a secondary target of lipid lowering therapy in persons with triglyceride

levels >200 mg/dl. Statistical analysis was performed by using SPSS version 29.0.

RESULTS

In total of 100 subjects participating in the study, males contributes about 78% of total sample population compared with females contributes 22% (as shown in Figure 1).

The age range of the total population was 25-75 years (as shown in figure 2). Patients were classified into 5 age groups out of which majority of CAD patients were found at the age of 40-65 years, followed by other age group (as shown in Figure 2). On comparing the risk factors like hypertension, diabetes, smoking and alcohol consumption in study group, the conclusion was majority of patients are non-diabetics, non-hypertensive, non smokers and non-alcoholics.

In our study, DM and HT plays less role as risk factors for CAD. But other risk factors non HDL-C plays a greater role in predicting CAD. This study is to be confirmed by other larger studies. In our study group, the lipid parameter analysis (as shown in Figure 3,4,5) shows that normal LDL-C levels (< 100 mg/dl) was seen in 34 out of 50 patients with CAD. But non HDL-C levels were raised (>130 mg/dl) in 38 out of 50 patients in study group.

As per previous studies, low LDL-C is associated with lower incidence of CAD. But in our study, we challenge this conditional theory, because 34 out of 50 patients in study group with CAD had LDL <100 mg/dl. Thus we suggest non HDL-C as better predictor for CAD than LDL-C.

Mean non HDL-C concentrations of study group and control patients were 158.3 ± 45.15 and 140.2 ± 31.18 respectively. Comparing the study group and control, LDL-C ($p=0.0369$) and non HDL-C ($p=0.0217$), triglyceride ($p=0.0005$), were found to be statistically significant whereas total cholesterol ($p=0.347$), HDL-C (0.173) and were found to be statistically non-significant. As per previous studies, low LDL-C is associated with lower incidence of CAD. But in our study, we challenge this conditional theory, because 34 out of 50 patients in study group with CAD had LDL <100 mg/dl. Thus we suggest non HDL-C as better predictor for CAD than LDL-C.

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DISCUSSION

The total number of patients included in the study were 100, consisting of 50 in each group, study group (n=50) and control (n=50). Among 50 patients in study group, 36 were male and 14 were female, and majority of CAD diagnosed patients were in the age group of 56-

75 years followed by other age groups. Though diabetes, hypertension, smoking and alcohol consumption are risk factors for CAD, in our study smoking and alcohol consumption were the major and common risk factors than diabetes and hypertension.

The elevated levels of LDL-C remains a better predictor for coronary artery disease. However, our present study patients diagnosed with CAD had less number of LDL-C elevated patients and more number of non HDL-C elevated patients. On comparing these LDL-C and HDL-C levels in the study group, we found that non HDL-C is a better risk predictor than LDL-C in assessing CAD.

Few studies have proven that, the predictive value of non HDL-C and its superiority over LDL-C in causing CAD. A study by Arsenault *et al* states that non HDL-C could still predicts the CAD risk even at low LDL-C levels.

Limitations of our study are number of patients included and study duration. If the study was conducted for longer duration, more significant results would have been obtained. We did not compare the results with a younger population, so, we could not evaluate the effect of age on non- HDL-C levels.

CONCLUSION

Our study concludes that non HDL-C is having better predictive value than LDL-C for atherosclerosis, especially in patients with TGL levels > 150 mg/dl. Non HDL-C levels should be considered while evaluating the risk of CAD. It should be included in the routine lipid profile parameters. Non HDL-C is advantageous over LDL-C as it does not requires fasting blood samples. So far there is no specific drug to lower the non HDL cholesterol levels. But there are few drugs which aid to decrease non HDL-C. levels such as statins, fibrates, niacin and omega -3 rich fatty acid foods.

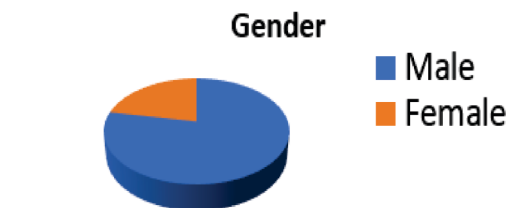


Figure 1: Gender distribution.

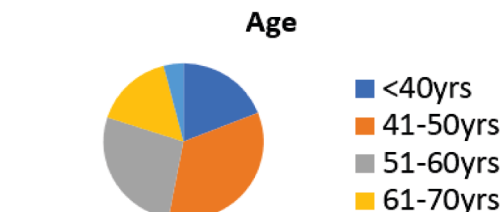


Figure 2 : Age distribution

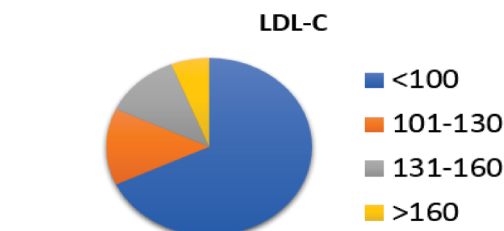


Figure 3 : LDL in study population



Figure 4:

Table 1 :

RISK FACTOR	CASE(50)	CONTROL (50)	PERCENTAGE (%)
Diabetic	16	8	24.0%
Non-diabetic	34	42	76.0%
Hypertensive	12	4	16.0%
Non-hypertensive	38	46	84.0%
Smoker	27	12	39.0%
Non-smoker	23	38	61.0%
Alcoholic	26	10	36.0%
Non-alcoholic	24	40	64.0%

Table 2:

	Cases(CAD)	Controls	p-Value
Age (years)	51.0+ 12.4	50.8+ 9.4	0.921
Total cholesterol (mg/dl)	208.8+ 50.2	200.0+ 43.6	0.347
HDL-C (mg/dl)	49.2+ 7.4	51.2+ 7.0	0.173
LDL-C (mg/dl)	122.1+ 46.12	103.8+ 40.19	0.0369
Triglyceride (mg/dl)	219.8+ 89.2	151.1+ 27.1	0.0005
Non-HDL-C (mg/dl)	158.3+ 45.15	140.2+31.18	0.0217

Table : 3

LIPID PARAMETERS		CASE	CONTROL	PERCENTAGE
LDL	<100	34	27	61
	101-130	7	13	20
	131-160	6	8	14
	>160	3	2	5
	<130	12	20	32
NON HDL	131-160	9	12	21
	161-190	13	10	23
	>190	16	8	24
TG	<150	20	26	46
	>150	30	24	54

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