

# To Determine the Role of NON-HDL Levels as an Individual Risk Factor in Coronary Artery Disease in Rural Population

Sasthanathan<sup>1</sup>, Prabhu<sup>2</sup>, Jagadesh<sup>3</sup>

## ABSTRACT

**Introduction:** Coronary artery disease (CAD) is the most common causes of mortality and morbidity in both developed and developing countries in all age groups of both genders which contribute to the biggest economic burden. Various modifiable and non modifiable risk factors contribute to the development of CAD. Our aim of the study was to determine the role of non HDL level as an individual risk factor in coronary artery disease.

**Material and methods:** observational study done in all patients admitted with diagnosis suggestive of coronary artery disease (STEMI, NSTEMI, Unstable angina, Stable angina etc) with age more than 18 years both men and women were included in the study. Patients with previous diagnosis of dyslipidemia, patients who are on statins and other lipid lowering agent, malignancy and less than 18 years were excluded from the study. Age and sex matched control group who have been admitted to the institution with other diagnosis who were accepting to participate in the study. Non HDL -C = TOTAL CHOLESTROL - HDL-C this is the conventional formula used to calculate non HDL-C.

**Results:** In our study the role played by the risk factors non HDL-C could be playing a greater role in causation of CAD. In the present study mean non HDL-C concentrations of study group was  $138.41 \pm 51.25$  and control group was  $116.16 \pm 35.89$  respectively.

**Conclusion:** In the present study done in rural population it was found non HDL-C and LDL-C was statically significantly increased in patients admitted with CAD.

**Keywords:** Non HDL, Coronary Artery Disease

## INTRODUCTION

Coronary artery disease (CAD) is the most common causes of mortality and morbidity in both developed and developing countries in all age groups of both genders which contribute to the biggest economic burden. In India coronary artery is the leading cause of mortality, and it's important that it has a rising pattern: the number of deaths due to CAD in 1985 is expected to have doubled by 2015.<sup>1</sup> According to reports from the National Commission on Macroeconomics and Health, 62 million people in India will have CAD by 2015, with 23 million of these below 40 years of age.<sup>2</sup> The conventional risk factors which are noted to cause CAD are divided into non-modifiable and modifiable risk factors. The non modifiable risk factors include age, sex and family history, while the non modifiable risk factors include diabetes mellitus (DM), smoking, dyslipidemia, hypertension and obesity. The modifiable risk factors have its own variability and importance due to its variable pattern among different race and population. Since different population and race

have their individual pattern the risk factors for different population has to be identified separately. In Asian Indian population the increasing incidence of coronary artery disease cannot be attributed to the risk factor of the same. As we emerge into the modern era of population where less physical activity and changing food habits recently, a number of newer cardiovascular risk factors have been identified, as more than 60% of the Indians with coronary artery disease are unexplained by conventional modifiable risk factors. The various newer risk factors such as higher C-reactive protein, plasminogen activator inhibitor (PAI-1) and homocysteine levels<sup>3</sup> are proven to be useful indicators in Indian native population. The incidence of CAD is likely to increase further because of rapid ruralisation and its accompanying lifestyle changes, including changes in diet, physical inactivity, drug and alcohol intake, as well as an increase in the prevalence of DM.<sup>4,5</sup>

## What is Non HDL Cholesterol?

Non HDL-C is calculated by subtracting HDL-C from TC and therefore includes not only LDL-C but also cholesterol contained in all other apoB containing potentially atherogenic lipoproteins in blood, including cholesterol in lipoprotein (a) {Lp(a)}, intermediate density lipoprotein (IDL), very low density lipoprotein (VLDL-C) and cholesterol-enriched remnant lipoproteins. Experimental evidence supports a more important role for apolipoprotein B (apoB) and Apo B- containing lipoproteins than for LDL-C content in mediating atherogenesis. Lipoproteins containing apoB must first enter the arterial wall and undergo oxidative modification before they can contribute to atherogenesis. This modification affects the structure of the apoB molecule or the phospholipid membrane of these lipoproteins, yielding ligands for the scavenger receptors of macrophages in the arterial wall.<sup>6</sup> Subsequently, cholesterol accumulation and crystallization in macrophage cytoplasm leads to the

<sup>1</sup>Assistant Professor, Department of Medicine, Sri Venkateswaraa Medical College Hospital and Research Center, <sup>2</sup>Associate Professor, Department of Medicine, Sri Venkateswaraa Medical College Hospital and Research Center, <sup>3</sup>Junior Resident, Department of medicine, Sri Venkateswaraa Medical College Hospital and Research Center, India

**Corresponding author:** Dr. Sasthanathan, No.27, Melapalayam Road, Panruti 607106, Cuddalore Dist. Tamilnadu, India

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formation of foam cells and progression to atherosclerotic plaque.<sup>7</sup> Interestingly, measured apoB and non HDL-C have been found to be highly correlated in a number of studies.<sup>8,9</sup> Since neither TC nor HDL-C is significantly affected by food intake, non HDL-C can be measured irrespective of diet status where fasting of eight hours not mandatory. Since the normal VLDL-C should be below 30 mg/dl (on the basis of a normal TG being below 150 mg/dl and  $VLDL-C = TG / 5$ ), the therapeutic goals for non HDL-C were set 30 mg/dl higher than for LDL-C in the Adult Treatment Panel (ATP) III guidelines.<sup>10</sup> Indian diabetics have atherogenic dyslipidemia typically characterized by high triglycerides (TG), VLDL-C, sd-LDL-C and Apo B levels with low HDL-C levels.<sup>11</sup> This high TG resulting in higher VLDL particles leads to high non HDL and Apo B levels. Considering the higher incidence of CVD in Indians, it has been suggested that the treatment has to be more aggressive and should begin at a lower threshold than is recommended for Western populations.<sup>12</sup>

The present study was thus aimed to identify the future risk factor, non HDL -C in CAD from various age groups, consuming different diet in rural population. Since minimal data are available on this aspect this study was chosen to prove the facts on non HDL-C levels.

## MATERIAL AND METHODS

The study is an observational case control study which is conducted in a 750 bedded tertiary health care centre in south India which serves the rural population between June 2018 to April 2019. Aim of the study is to determine the role of non HDL level as an individual risk factor in coronary artery disease. All patients admitted to Sri Venkateshwaraa medical college and hospital with diagnosis suggestive of coronary artery disease (STEMI, NSTEMI, Unstable angina, Stable angina etc) with age more than 18 years both men and women were included in the study. Patients with previous diagnosis of dyslipidemia, patients who are on statins and other lipid lowering agent, malignancy and less than 18 years were excluded from the study. Age and sex matched control group who have been admitted to the institution with other diagnosis who are accepting and cooperate to participate in the study.

After obtaining informed consent a detail history which includes demographic details, previous medical history and detail clinical examination were obtained. All routine investigation along with fasting lipid profile values was collected. After collecting all the data it was compiled, tabulated and statistically analysis was performed. Statistical analyzed data results which were obtained were presented as mean  $\pm$  Standard deviation (SD) and with 95% confidence intervals. The independent Student 't' test was used to compare the means of various blood parameters between the study and control groups. Significant levels in the data was considered only at  $p < 0.05$ . Statistical analysis was analyzed using SPSS 22 version.

Non HDL -C = TOTAL CHOLESTROL - HDL-C this is the conventional formula used to calculate non HDL-C levels of the subjects participating the study. Non HDL-C levels

in the subjects with less than 130 mg/ dl were considered as normal range.<sup>13</sup> According to National Cholesterol Education Program Adult Treatment Panel III (NCEP-ATP III) (NCEP-ATP III) guidelines hypercholesterolemia was defined as Total Cholesterol (TC) more than 200 mg/dl and LDL-C as more than 100 mg/dl. As per documentation report of The National Cholesterol Education Program Adult Treatment Panel III (NCEP ATP III), non HDL-C should be considered as a secondary target of lipid lowering therapy in patients whose triglyceride levels were more than 200 mg/dl.<sup>14</sup>

## RESULTS

In a total of 102 subjects participating in the study, males constituted about 59% (60) of total study population compared with females constituting 41% (42). The age distribution of the subject's ranged between 20-70 years of age. Patients were further statically analysed in 5 age groups out of which more number of CAD patients were found at the age of >61 years, followed by 41-50 years and other age groups. In the present study the mean of the study group and control were  $51.12 \pm 10.97$  and  $44.66 \pm 10.13$ . The mean BMI of the study group and control were  $24.51 \pm 4.97$  and  $22.67 \pm 3.45$ . In the present study acute STEMI and NSTEMI accounts to almost 50% of the study subjects. In comparing the study and the control group the coexistence of type 2 dm and systemic hypertension was more in study group. In our study the role played by the risk factors non HDL-C could be playing a greater role in causation of CAD. In the present study mean non HDL-C concentrations of study group was  $138.41 \pm 51.25$  and control group was  $116.16 \pm 35.89$

Age (in yrs.)	Study group (with CAD)	Control	Percentage (%)
20-30	06	04	9.8
31-40	10	06	15.68
41-50	18	07	24.5
51-60	10	07	16.6
>61	24	10	33.33
Total	68	34	100

Table-1: Age Wise Distribution

	Study group	Control group
Age (years)	$51.12 \pm 10.97$	$44.66 \pm 10.13$
BMI	$24.51 \pm 4.97$	$22.67 \pm 3.45$
T2DM	N-18 (28.12%)	N-8 (23.52%)
HTN	N-28 (43.75%)	N-12(35.29%)
T2DM+HTN	N-8 (12.5%)	N-4(11.76%)

Table-2: Clinical profile of both group

Type of CAD	Number of subjects	Percentage %
STEMI	14	21.87
NSTEMI	17	26.56
Unstable angina	21	32.81
Stable angina	11	17.18
Others	1	1.56
Total	64	100

Table-3: Pattern of distribution in CAD

	Patient group (with CAD)	Control group	P-value
Age (years)	51.12 ± 10.97	44.66 ± 10.13	<0.001
Total cholesterol (mg/dl)	157.42 ± 42.14	146.10 ± 23.46	0.196
HDL-C (mg/dl)	40.50 ± 4.761	33.82 ± 3.42	0.642
LDL-C (mg/dl)	111.84 ± 39.52	99.56 ± 37.89	0.034
Triglyceride (mg/dl)	131.56 ± 32.57	125.49 ± 27.58	0.1266
Non-HDL-C (mg/dl)	138.41 ± 51.25	116.16 ± 35.89	0.0127

**Table-4:** Statistical Analysis of Lipid Parameters

respectively. Compared to study group and control, LDL-C (p=0.034) and non HDL-C (p=0.0127) were observed to be statistically significant where as considering total cholesterol (p=0.196), HDL-C (0.642) and triglyceride (p=0.1266) were found to be statistically non-significant.

## DISCUSSION

A total number of 102 patients were included in the study consisting of both study group (n=68) and control (n=34). Out of 68 patients in study group, 38 were male patients and 30 were female patients where male dominated the incidence as supported by previous literature, and majority of CAD diagnosed patients in our study were in the age group of >61 years. It is a well-known fact from the previous literature that elevated levels of LDL-C remains a better predictor for coronary artery disease<sup>15</sup> and also targeted treatment to have significant lower levels of LDL-C were followed. However, in our present study we observed a significant difference of more subjects with elevated non HDL-C levels when compared with LDL-C levels in the study group. 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 which was statically significant with our data. There are only few studies that have proved the predictive value of non HDL-C and its superiority over LDL-C in risk assessment for development of cardiovascular diseases.<sup>16,17</sup> A study by Arsenault *et al* encounters that non HDL-C could still predicts the CAD risk even at low LDL-C levels.<sup>18</sup> In another study, it postulates that non HDL-C was proposed to be a good predictor independent of LDL-C levels in initial CAD.<sup>19</sup> A meta-analysis of relationship between non HDL-C reduction and CAD risk reported that non HDL-C is an important target of therapy for CAD prevention.<sup>20</sup> A recent epoch of data combines from 68 studies, non HDL-C was established as the best predictor among all cholesterol measures both for CAD events and strokes.<sup>21</sup>

## CONCLUSION

In the present study done in rural population it was found non HDL-C and LDL-C was statically significantly increased in patients admitted with CAD. Though non HDL -C had a better predictive p-value when compared to LDL-C it needs a multi centric and a larger population to establish a better results.

## ABBREVIATIONS

CAD: coronary artery disease

HDL: High Density Lipoprotein

HDL-C: High Density Lipoprotein Cholesterol

LDL- Low Density Lipoprotein

LDL-C - Low Density Lipoprotein Cholesterol

TGL – Triglycerides

TC – Total Cholesterol

VLDL –Very Low Density Lipoprotein

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