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Research Article

NON-HDL CHOLESTEROL-A SURROGATE MARKER FOR LDL CHOLESTEROL IN DYSLIPIDEMIC PATIENTS

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ABSTRACT

Background: Dyslipidemia implies elevated LDL-C, triglycerides and decreased levels of HDL-C. In this study, we aimed to compare non-HDL-C with LDL-C and total Cholesterol as a predictor of cardiovascular risk in patients with Dyslipidemia.
Methods: Retrospective analysis of lipid profile in 1000 subjects having serum cholesterol ≥200mg/dl was done. As per the revised National Control Education Plan (NCEP)-Adult Treatment Panel (ATP) III Guidelines, subjects were divided into 5 groups according to their LDL-C levels. Total Cholesterol, HDL-C, and LDL-C were measured with the enzymatic method on Roche Modular P800 whereas non-HDL-C (Total Cholesterol minus HDL-C), LDL-C/HDL-C and TC/HDL-C ratios were calculated.
Results: Highly significant levels of non-HDL were seen in all the 5 groups. non-HDL-C significantly correlated with total Cholesterol (p-value <0.00001), LDL-C (p-value <0.05), TC/HDL-C ratio (p-value <0.00001) and LDL-C/HDL-C ratio (p-value <0.05) in all the groups.
Conclusion: Based on the findings of the present study it was observed that the measurement of non HDL, TC/HDL-C ratio, and LDL-C/HDL-C ratio can provide more relevant information to the Cardiovascular risk than LDL-C alone in Dyslipidemia.

INTRODUCTION

Dyslipidemia is an abnormal amount of lipids and lipoproteins in the blood. In developed countries, most of the dyslipidemias are hyperlipidemias that is often due to diet and lifestyle. The prolonged elevation of insulin levels in the blood can also lead to dyslipidemia.[1] Dyslipidemia is a major risk factor for coronary heart disease, the leading cause of death in the United States.[2] Prevalence of coronary heart disease in India is between 7-13% in urban areas and 2-7% in rural areas. [3] Dyslipidemia if get properly treated can reduce the risk of heart disease by 30% over a 5-year period.[2] Levels of LDL-C or non-HDL-C cholesterol both predict future coronary heart disease but which is the better predictor is a matter of dispute.[3] LDL-C is the main therapeutic target in the treatment of dyslipidemia but several epidemiological studies have shown that non-HDL-C is a better predictor of cardiovascular events than LDL-C.[4] The US National Cholesterol Education Program Adult Treatment Plan III has recommended such a use for non HDL-C, setting non-HDL-C goals to be achieved after achievement of LDL-C goals in patients with elevated plasma TG concentration. These goals are 30mg/dl higher than the well established LDL-C targets recommended by ATP III as the basis of Cardiovascular Heart Disease risk assessment and treatments.[4] In this study we aimed to compare non-HDL-C with LDL-C and total Cholesterol as a predictor of cardiovascular risk in patients with Dyslipidemia.

Aims & Objectives

To compare lipid parameters in dyslipidemic subjects when divided in 5 groups according to their LDL-C concentrations.[4] and to correlate values of non-HDL-C with LDL-C, total Cholesterol, LDL/HDL ratio and TC/HDL ratio in dyslipidemic subjects which are indicators of cardiovascular risk with greater predictive value than the isolated parameters used independently.

Inclusion Criteria

All the subjects with total serum cholesterol more than 200mg/dl.

All the patients above 18 years of age.

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MATERIALS AND METHODS

Retrospective analysis of lipid profile in 1000 subjects having cholesterol ≥200mg/dl was done. As per the revised National Control Education Plan (NCEP)-Adult Treatment Panel (ATP) III Guidelines, subjects were divided into 5 groups according to their LDL-C levels are as follows:

Groups	Target values	
Group I	<100	Optimal
Group II	100-129	Near optimal
Group III	130-159	Borderline high
Group IV	160-189	High
Group V	≥190	Very high

Total Cholesterol[5], HDL-C[5] and LDL-C[6] were measured with the enzymatic method on fully automated analyzer Roche Modular P800 whereas non-HDL-C (Total Cholesterol-HDL Cholesterol), LDL/HDL and TC/HDL ratios were calculated.

OBSERVATIONS AND RESULTS

Table No. 1 Comparison of Lipids and Lipoproteins in different Groups (Mean±SD)

parameter (mg/dl)	<100 (n=59)	100-129 (n=298)	130-159 (n=400)	160-189 (n=174)	≥190 (n=69)
Cholesterol	229.4±44.9	217.2±19.3	231.3±21.7	257.1±25.4	315.7±61.1
HDL-C	68.0±22.4	63.4±15.2	57.6±13.5	58.4±14.1	60.4±16
LDL-C	81.2± 8.9	117.4±7.9	143.9±8.4	171.5±8.1	221±33.5
non HDL-C	159.7±55	153.1±24.3	173.7±21.2	198.7±22.3	255.2±56.9
TC/HDL ratio	3.8±1.8	3.6±0.8	4.2±1.3	4.5±0.9	5.4±1.4
LDL/HDL ratio	1.3±0.5	1.9±0.4	2.6±0.8	3.0±0.7	3.8±1.1

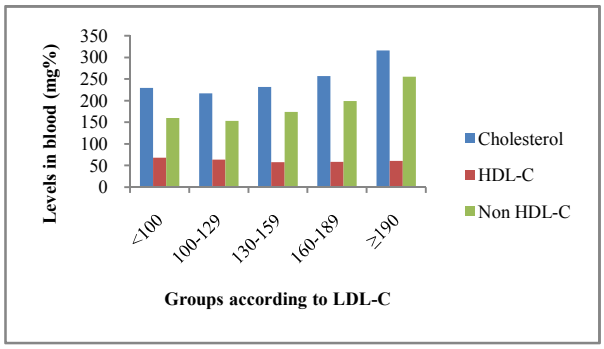
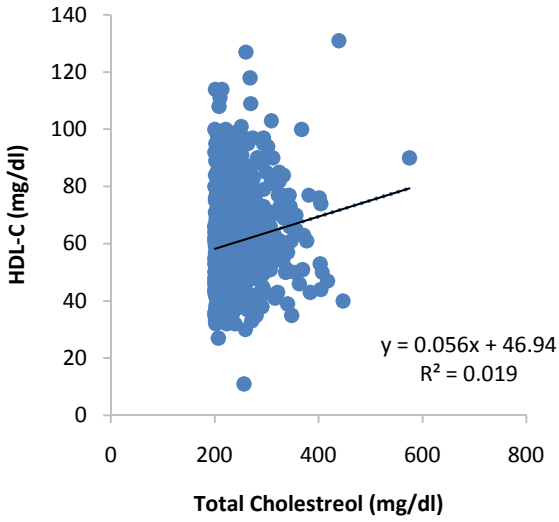
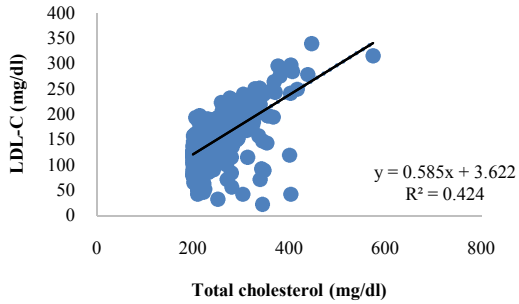


Figure 1 Comparison of lipid parameters in different groups.





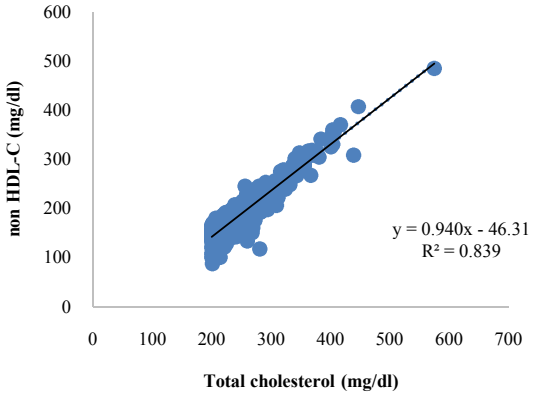
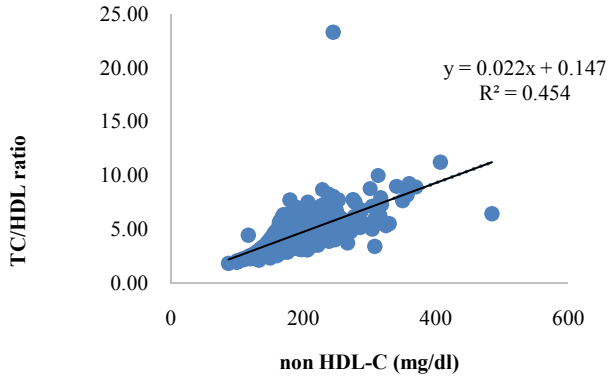


Figure 2 Correlation of total cholesterol with HDL-C (2a), LDL-C (2b) and non HDL-C (2c).



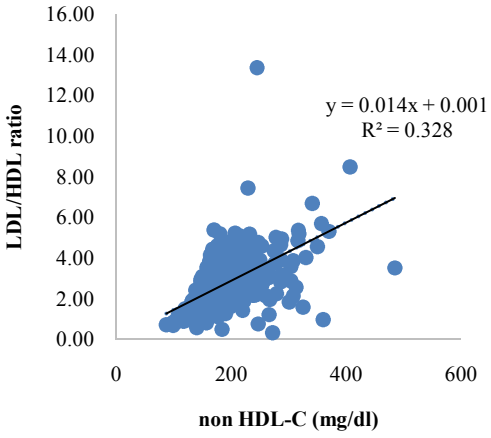


Figure 3 Correlation of non HDL-C with TC/HDL ratio (3a) and LDL/HDL ratio(3b)

RESULTS

The data of 1000 subjects was included in the study. Their distribution into the different groups is depicted in Table no.1. It also shows the mean Cholesterol, HDL-C, LDL-C and non-

HDL-C levels in different groups. Ratios like TC/HDL ratio and LDL/HDL ratio are also presented in Table 1. Fig 1. shows the comparison of lipid parameters in different groups which were divided according to LDL-C. The correlation between total cholesterol to HDL-C, LDL-C and non-HDL-C has been shown in Fig 2(a)(b)(c). Correlation between Total cholesterol and non-HDL-C was highly significant (p-value <0.00001) than with LDL-C (p-value <0.05). As depicted in Figure 3(a)(b) non-HDL-C positively correlated with TC/HDL ratio (p-value <0.00001) and LDL/HDL ratio (p-value <0.05)

DISCUSSION

Patients with hyperlipidemia are at high risk and have a higher mortality from coronary heart disease.[4] Although the major focus on the concentrations to dyslipidemias is on LDL-C, recent studies have shown that non-HDL-C concentration is similar to or better than LDL-C alone in the prediction of CVD incidence and mortality.[7] LDL-C concentration reflects only the amount of cholesterol contained in LDL particles but does not provide information about their number and structure. In addition, LDL-C does not include the participation of other lipoprotein fractions (Lipoprotein a and VLDL) that are essential in the development of atherosclerosis.[8] Modern laboratory diagnosis of lipid disorders and cardiovascular risk should be based on the use of indicators which present full impact of all plasma lipid components involved in atherogenesis.[9] non HDL-C is the sum of cholesterol accumulated in all lipoproteins, except HDL, such as: chylomicrons, VLDL and their remnants, IDL, LDL and Lipoprotein(a) and it can be used as a predictor of Coronary Heart Disease in individuals with and without high triglyceride levels.[10]

In our study elevated levels of non-HDL-C were seen in all the 5 groups even in which LDL-C levels were normal or slightly raised. non-HDL-C significantly correlated with total Cholesterol, LDL-C, TC/HDL ratio and LDL/HDL ratio in all the groups. Similar results were obtained in a study conducted by Sugimoto *et al*.[4] non-HDL-C has been proposed as a good estimator of the atherogenic potential in patients with high Triglyceride levels.[11] NCEP guidelines state that the LDL-C level is not a valid basis for therapeutic decisions when the triglyceride levels are over 200 mg/dL, instead non-HDL-C is the therapeutic target. So non HDL-C, the elevated level of which signifies increased CVD risk, can be used as a part of lipid profile.[12]

In our study, we found that non-HDL-C is a better parameter than LDL-C. To measure HDL-C or non-HDL-C we do not need fasting blood sample whereas to measure LDL-C fasting blood sample is needed. So we can analyse random blood for HDL-C and non-HDL-C rather than waiting for fasting sample to measure LDL-C. Ercan *et al* also suggest in their study that non-HDL-C levels are better risk markers than LDL-C levels and non-HDL-C levels should be taken into consideration when evaluating the risk of CAD.[13] The findings of Cui *et al* has also demonstrated non-HDL-C as a better predictor of CVD mortality than LDL-C during an average follow-up of 19 years in 4462 dyslipidemic patients.[14] In a study done by Puri *et al*, it was concluded that non-HDL-C levels were more closely associated with coronary atheroma progression than LDL-C. Plaque progression was associated with achieved TGs, but only above levels of 200 mg/dL. These observations supported a more prominent role for non-HDL-C in combating residual cardiovascular risk.[15] But on the other hand, According to Kilgore *et al*, Substantial discordance exists between non-HDL-C and high LDL-C among US adults. Reliance on either single measure could result in failure to classify cardiovascular heart disease risk appropriately.[16]

CONCLUSION

Based on the findings of the present study it was observed that the measurement of non HDL-C, TC/HDL ratio and LDL/HDL ratio can provide more relevant information to the Cardiovascular risk than LDL alone in Dyslipidemia. As non-HDL-C was representative of all atherogenic lipoproteins and LDL/HDL ratio was a significant predictor of atherosclerosis, more emphasis should be placed on considering non HDL-C, LDL/HDL ratio as markers of dyslipidemia and cardiovascular risk markers than LDL-C alone. These parameters are cost effective and affordable comparative to some new markers in assessing cardiovascular risk in dyslipidemic patients.

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