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A Retrospective Analysis of Lipid profile of patients attending in a tertiary hospital, JNIMS and CVD implication.

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Abstract:

Introduction: *Cardiovascular diseases (CVD) are the major cause of morbidity and mortality worldwide. CVD is manifested in the form of coronary heart disease (CHD), myocardial infarction and stroke. A number of host factors have been associated with risk of CVD including hypertension, smoking, high blood cholesterol, diabetes etc. High blood cholesterol level is considered as one of the major determinants to assess the risk of CVD .*

The aim of the present study was to analysed lipid profile , to present the recent informations on the usage of non-HDL-C in the primary prevention of cardiovascular disease and to compare its diagnostic value to traditional and new CVD risk factors.

Material and subjects: *The data of the past 6 (January-June 2016) months was analysed to see the prevalence of abnormal lipid profile in patients attending in a tertiary hospital. A total of 333 subjects above the age of 18 years were collected to lipid profile analysis, including serum levels of total cholesterol (TC), triglycerides(TG), low density lipoprotein (LDL-C), high density lipoprotein (HDL-C) and very low density lipoproteins (VLDL-C) Statistical analysis were done using SPSS version 20. The study were considered significant if p<0.05.*

Results: *Out of the total 333 subjects, 33% (110) had LDL-C in Optimal level (<100 mg/dl), 31.4% (104) Near/Above optimal (100-129 mg/dl), 19.5% (65) Borderline high (130-159 mg/dl), 11.1% (37) High (160-189 mg/dl) and 5.1% (17) had Very High LDL-C level (>190 mg/dl). Univariate ANOVA shows Significance between subjects effects of HDL-C and LDL-C (df=1, f=56.2, P=.000).*

Conclusion: *Current Practice of interpretation of Lipid Profile will be more meaning full if we could implicate local factor in prediction of cardiovascular disease.*

Keywords: *Cardiovascular disease, lipid profile, non HDL-cholesterol.*

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I. Introduction

Low-density lipoprotein cholesterol (LDL-C) levels are currently recommended as the primary target for lipid lowering therapy for prevention of cardiovascular disease (CVD). The role of LDL in the development of atherosclerosis, the relation between blood LDL-C levels and risk of CVD, and the beneficial effects of LDL-C lowering therapy are well established. Similarly, it is well known that low levels of high-density lipoprotein cholesterol (HDL-C) are associated with an increased risk for CVD independent of LDL-C levels, and raising HDL-C has been shown to significantly lower cardiovascular risk.[1]

Cardiovascular diseases (CVD) is the leading cause of death and disability worldwide. World Health Organization(WHO) reported 17.9 million people died from CVDs in 2015. By 2030 more than 22.2 million people will die annually from CVDs. Populations in low and middle income countries now contribute 75% of the CVD deaths. CVD is manifested in the form of coronary heart disease (CHD), myocardial infarction and stroke.[2]

The main cause of CVD development is atherosclerosis which is a chronic inflammatory disease of the arteries. It is due by a complex interplay between lipoproteins, white blood cells (macrophages), the immune system and the natural elements of the arterial wall. Atherosclerotic plaques formation and pathological remodelling of vascular walls consequently lead to impaired tissue perfusion and ischemia. Cholesterol is one of the key component of atherosclerotic plaques, therefore hyperlipidemia is considered as an essential risk factor for atherosclerosis.[3]

Low density lipoprotein cholesterol (LDL-C) is the key factor for Atherosclerosis. LDL-C has become a primary goal of therapy in cardiovascular prevention. Recommendations regarding diet and drug therapy to lower cholesterol are most often based on the LDL-C level. LDL-C alone as risk predictor of CVD risk scores is shown its limitation.[2] LDL-C is not the only lipoprotein involved with the heart diseases ,VLDL, IDL, small dense LDL, ApoB lipoproteins are also atherogenic. Relying on LDL-C alone may be misleading of individuals with abdominal obesity, metabolic syndrome or diabetic dyslipidemia where they often have elevated triglycerides, low HDL-C, and relatively normal calculated LDL-C.

Despite their normal LDL-C, these patients produce highly atherogenic lipoproteins such as VLDL and IDL (intermediate density lipoprotein) as well as small dense LDL particles.[1]

The National Cholesterol Education Program guidelines recommend measuring non–HDL-C, calculated by subtracting the protective HDL-C from the total cholesterol (TC). Non–HDL-C is thus the cholesterol concentration of atherogenic lipoproteins and has been recommended as a target especially among subjects with high triglyceride (TG) levels.[4]

The latest recommendations of European and American Cardiological Associations emphasize the role of non-high density lipoproteins cholesterol (non-HDL-C) in evaluating the risk of CVD.[5]

The impact of elevated TG levels in the calculation of LDL-C with the Friedewald formula suggests that non-HDL-C is beneficial in determining the risk of atherosclerosis and CVD in patients with hypertriglyceridemia.[6]

A more reliable yet calculated value is the non-HDL-C which measures cholesterol content of all the atherogenic lipoproteins, including LDL -C are better risk predictor of CVD risk than LDL-C. Recently, non-HDL cholesterol (non-HDL-C) has become a commonly used marker for a blood lipid pattern associated with increased risk of heart disease.[7]

There is a strong relation between dyslipidemia and CVD implication, so we have take up the present study to analyse lipid profile and to find out number of study subjects with abnormal LDL-C and to calculate non-HDL-C in patients attending a tertiary hospital. To established role of non HDL-C in predicting cardiovascular disease risk score.

II. Material And Methods

Study Design: The study was a Retrospective analysis.
Study location: The study was conducted at Department of Biochemistry, in the tertiary hospital, Jawaharlal Nehru Institute of Medical Sciences (JNIMS), Porompat, Manipur.
Study Duration: January 2016 to June 2016.
Inclusion criteria: The data of 333 subjects above the age of 18 years who were attending the tertiary hospital for lipid profile analysis over a period of 6 months (January 2016 to June 2016) as a part of various CVD risk were the study group.
Exclusion criteria:
1. Patients suffering from carcinoma, chronic kidney disease, liver disease and any chronic systemic diseases
2. Patient with genetic disorders.
3. Patients on treatment with lipid lowering drugs.
4. Patient taking cincurrent corticosteroids or hormone replacement therapy.
5. Patients with a history of drug or alcohol abuse.

The study was done after getting approval from Institutional Ethics Committee. A written informed consent of the patients or their relatives was taken prior to inclusion.

Sample collection and preparation:
The sample of serum was taken after 12–14 hours of fasting**.** Venous blood was taken as sample and the usual precautions was observed while collecting venipuncture samples. Five millilitre of venous blood will be collected in a plain redtop venipuncture tube without additive or gel barrier. The blood will be allowed to clot and centrifuged to separate the serum from the cells.

Assessment and analysis of lipid profile includes:
1. Serum levels of total cholesterol (TC)
2. Triglycerides (TG).
3. Low density lipoprotein cholesterol (LDL-C)
4. High density lipoprotein cholesterol (HDL-C)
5. Very low density lipoproteins cholesterol (VLDL-C)

Lipid profile analysis were done by Enzymatic Colorimetric Method.
The Total cholesterol was determined after enzymatic hydrolysis and oxidation. The indicator quinoneimine is formed from hydrogen peroxide and 4- aminophenazone in the presence of phenol and peroxidase.[8]
The Triglycerides was determined after enzymatic hydrolysis with lipases. Indicator is quinoneimine formed from hydrogen peroxide. 4-aminophenazone and 4-chlorophenol under the catalytic influence of proxidase.[9]
Enzymatic determination of high density lipoprotein fractions was prepared by precipitation technique.[10]
LDL- cholesterol and VLDL-cholesterol values in mg/dl are indirectly calculated values using the following formulae of Friedwald.[11]

a) LDL-Cholesterol = Total cholesterol – (HDL-Chol + TG/5) mg/dl
b) VLDL- Cholesterol = TG/5 mg/dl.

Non-HDL-C were then calculated as total cholesterol minus HDL-C.

LDL -C levels of risk categories according to NCEP-ATP-III guideline[12]:
- 190 mg/dL -considered very high risk
- 160 – 189 mg/dL - considered high risk
- 130 – 159 mg/dL - borderline high
- 100 – 129 mg/dL near ideal
- < 100 mg/dL - ideal for people at risk of heart disease
- < 70 mg/dL - ideal for people at very high risk of heart disease

Non-HDL-C levels of risk categoriesacording to NCEP-ATP-III guideline[12]:

- 220 mg/dL -considered very high risk
- 190 – 219 mg/dL - considered high risk
- 160– 189 mg/dL - borderline high
- 130 – 159 mg/dL - near ideal
- < 130 mg/dL - ideal for people at risk of heart disease
- < 100 mg/dL - ideal for people at very high risk of heart disease

Statistical analysis:
Statistical analysis was done by using SPSS version 20. Univariate ANOVA analysis and chi-square test was done. The results were expressed as mean (SD). The study were considered significant if $p<0.05$.

III. Results

Out of the total 333 subjects, Male Subjects were 181 (54.4%) and Female subjects were 152 (45.6%).
LDL-C category based upon CVDs risk assignment found to have 33% (110) subjects with LDL-C in Optimal level (<100 mg/dl), 31.4% (104) Near/Above optimal (100-129 mg/dl), 19.5% (65) Borderline high (130-159 mg/dl), 11.1% (37) High (160-189 mg/dl) and 5.1% (17) had Very High LDLc level (>190 mg/dl) **(Table-2)**
Calculated non-HDL-C according to risk stratification in the study subjects were 32 (9.6%) had non HDL-C < 100 mg/dl which is Ideal for people at very high risk of heart disease, 61 (18.3%) had non-HDLc-C< 130 mg/dl Ideal for people at risk of heart disease, 101 (30.3%) had near ideal non-HDL-C as 130-159 mg/dl , 76 (22.8%) had borderline high non-HDL-C between 160-189 mg/dl , 33 (9.9%) had high non-HDL-C between 190-219 mg/dl and 30 (9%) had Very High non-HDL-C > 220 mg/dl. (Table-2)

Figure-1: Gender distribution

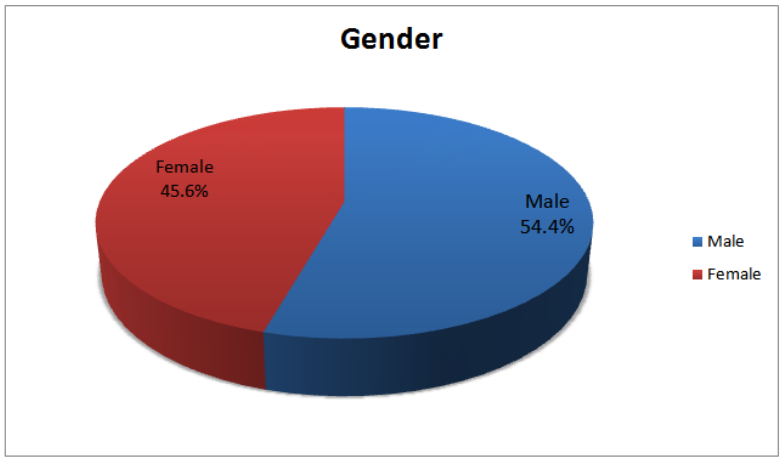
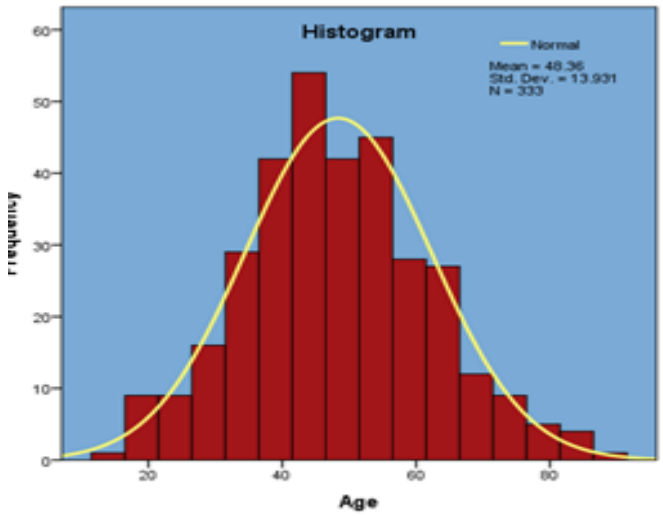


Figure-2: Calculated Mean age were 48 years in the study subjects.



Histogram of age distribution

Table 1. Mean level of lipid parameters**.**

Lipid parameters	Mean ± SD (mg/dl)
Total cholesterol	204.98 ± 51.45
LDL-C	120.6 ± 45.0
HDL-C	48.87 ± 11.5
Non HDL-C	156.12 ± 50.36

Table 2. Crosstabulation between LDL-C Category and Non-HDL Category

Cross tabulation		Non HDL category						Total
		0	1	2	3	4	5	
LDL-C category	0	29	48	25	8	0	0	110
	1	2	12	67	20	12	5	104
	2	0	1	9	38	12	5	65
	3	0	0	0	10	17	10	37
	4	1	0	0	0	1	15	17
Total		32	61	101	76	33	30	333

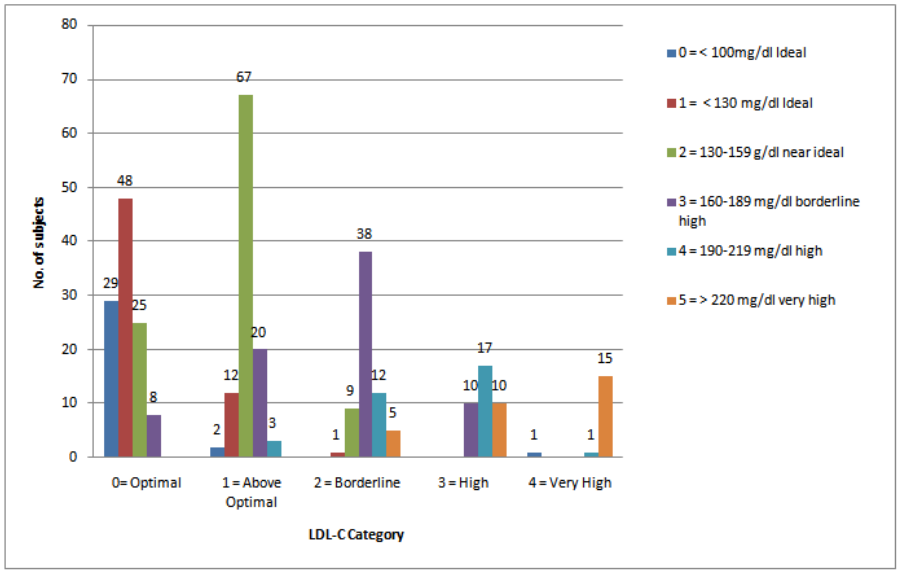
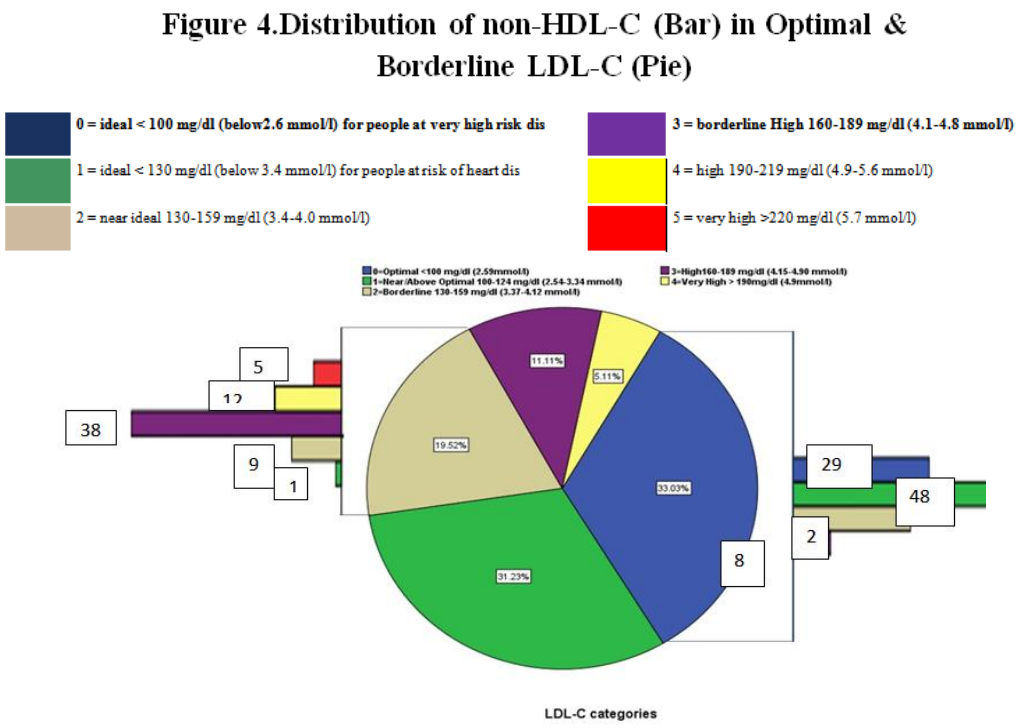


Figure-3: Bar diagram showing LDL category along with non-HDL-C.

Figure 4. distribution of non-HDL-C(Bar) in Optimal & Borderline LDL-C (Pie)



LDL-C Category (Pie Chart) as per CVD risk

IV. Discussion

The present study, Mean total cholesterol was 204.98 mg/dl (SD 51.45), mean of LDL--C was120.6 mg/dl (SD 45), mean of HDL-C 48.87 (SD 11.5) and mean of non HDL-C was 156.12 (SD 50.36). It was found that even at Optimal level of LDL--C 8 subjects had Borderline High non-HDL-C defining a subset of subjects with underlying risk of CVDs which cannot be rule out despite achieving optimal LDL-C target defined by Framingham criteria. In Borderline LDL-C category, 5 subjects had Very High >220 mg/dl non-HDL-C level.(Figure-4)

Llu j *et al* (2006) have similar finding that non-HDL-C estimation has better advantage over estimation of LDL-C alone in the management of CVDs.[13]

Ruminska et al. evaluated the usefulness of non-HDL-C in the lipid disorders in children and adolescents with simple obesity. Patients with elevated non-HDL-C (> 123 mg /dL) had significantly higher values of waist circumference and serum TC, LDL-C, TG, TC: HDL-C, TG: HDL-C and lower HDL- C.[14]

Non-HDL-D has been shown to be a better marker of risk in both primary and secondary prevention studies. In a recent analysis of data combined from various studies, non-HDL-C was the best risk predictor of all cholesterol measures, both for CAD events and for strokes.[15]

The Health Professionals Follow-up Study showed that non-HDL-C was more strongly associated with coronary heart disease risk than LDL-C .[16] Similarly, the Framingham Heart Study showed that at every non-HDL-C level, the concentration of LDL-C was not associated with the risk for coronary heart disease.[17] On the contrary, at every LDL-C level, a strong positive and graded association between non-HDL-C and risk of coronary heart disease was observed .[18] As the non-HDL-C can be simply calculated by subtracting HDL-C from total cholesterol, therefore, measurement of non-HDL-C incurs no additional cost.[19]

Our findings support the recommendations from the international atherosclerosis society and national institute of health and care excellence (NICE) which favour the use of non-HDL-C over LDL-C as targets of therapy .These results suggest that non–HDL-C level is found better than, LDL-C level as a predictor of CVD mortality. Furthermore, non–HDL-C level could be used in adults to aid in their CVD risk assessment.[20]

V. Conclusion

Our study suggested that non HDL-C have preferably better predictive value than LDL-C for atherosclerosis. Non- HDL-C level should be taken into consideration while evaluating the risk CVD and should be included in every routine lipid profile study as it incurs no additional cost. Non–HDL-C level is a somewhat better predictor of CVD mortality than LDL-C level. Screening for non–HDL-C level may be useful for CVD risk assessment. The adoption of non–HDL-C level as a fundamental CVD risk factor that is more inclusive of plasma lipoprotein-related risk than is LDL-C level may lead to a more effective approach to risk reduction.

References

[1]. Pischon T, Girman CJ, Sacks FM, Rifai N, et al. Non–High-Density Lipoprotein Cholesterol and Apolipoprotein B in the Prediction of Coronary Heart Disease in Men. Circulation 2005;112:3375-83.

[2]. Van Staa T-P, Gulliford M, Ng ES-W, Goldacre B, Smeeth L. Prediction of Cardiovascular Risk Using Framingham, ASSIGN and QRISK2: How Well Do They Predict Individual Rather than Population Risk? PLoS ONE 2014;9(10): e106455. doi:10.1371/journal.pone.0106455.

[3]. Boyle JJ. Macrophage activation in atherosclerosis: pathogenesis and pharmacology of plaque rupture. Curr Vasc Pharmacol 2005;3:63-68.

[4]. National Cholesterol Education Program, Second report of the Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel II). Circulation 1994;891329:1445.

[5]. Graham I, Atar D, Borch-Johnsen K et al. European guidelines on cardiovascular disease prevention in clinical practice: full text. Fourth Joint Task Force of the European Society of Cardiology and other societies on cardiovascular disease prevention in clinical practice (constituted by representatives of nine societies and by invited experts). Eur J Cardiovasc Prev Rehabil 2007;14(2):1-113.

[6]. Fukuyama N, Homma K, Wakana N, et al. Validation of the Friedewald equation for evaluation of plasma LDL-cholesterol. J Clin Biochem Nutr 2008;43(1):1-5.

[7]. Cui Y, Blumenthal RS, Flaws JA, et al. Non–High-Density Lipoprotein Cholesterol Level as a Predictor of Cardiovascular Disease Mortality. Arch Intern Med 2001;161(11):1413-1419. doi:10.1001/archinte.161.11.1413

[8]. Allain CC, Poon LS, Chan SS, Richmond W, Paul CF. Enzymatic Determination of Total Serum Cholesterol, Clin Chem 1974;20: 470-5.

[9]. Bucolo G, Harold D. Quantitative determination of serum triglycerides by the use of enzymes, Clin Chem 1973;19(5):476-82.

[10]. Steele BW, Kocher DF, Azar MM, Blas Z, Kpwaski PT. High density lipoprotein fractions, prepared by precipitation technique. Clin Chem 1976; 22(1): 98-101.

[11]. Friedwald T, Fredickson DS, Dey RI. Estimation of the concentration of low density cholesterol in plasma; without use of preparative ultracentrifuge Clin Chem 1972;18:499-504.

[12]. http://www.nhlbi.nih.gov/health-pro/guidelines/current/cholesterol-guidelines/ quick -desk-reference-html.

[13]. Llu j et al. Non-high-density lipoprotein and very-low-density lipoprotein cholesterol and their risk predictive values in coronary heart disease. Is non-HDL-cholesterol a better predictor of long-term outcome in patients after acute myocardial infarction compared to LDL-cholesterol? : a retrospective study.

[14]. Ruminska M, Czerwonogrodzka A, Pyrzak B, et al. Evaluation of usefulness of non-HDL-C in children and adolescents with abdominal obesity. Ped Pol 2010, 1.

[15]. Bittner V. Non-HDL cholesterol – measurement, interpretation and significance. Adv Stud Med 2007;7(1):8-11.

[16]. Cui Y, Blumenthal RS, Flaws JA, Whiteman MK, Langenberg P, Bachorik PS, Bush TL. Non-high-density lipoprotein cholesterol level as a predictor of cardiovascular disease mortality. Arch Intern Med. 2001;161(11):1413–9.

[17]. Wongcharoen W, Sutthiwutthichai S, Gunaparn S , Arintaya Phrommintik. Is non-hdl-cholesterol a better predictor of long-term outcome in patients after acute myocardial infarction compared to ldl-cholesterol? : a retrospective study. (http://creativecommons.org/licenses/by/4.0/)

[18]. Expert Dyslipidemia Panel of the International Atherosclerosis Society. An International Atherosclerosis Society Position Paper: global recommendations for the management of dyslipidemia—full report. J Clin Lipidol 2014;8(1):29–60.

[19]. Rabar S, Harker M, O'Flynn N, Wierzbicki AS. Lipid modification and cardiovascular risk assessment for the primary and secondary prevention of cardiovascular disease: summary of updated NICE guidance. BMJ. 2014;349:g4356.

[20]. Frost PHHavel RJ Rationale for use of non–high-density lipoprotein cholesterol rather than low-density lipoprotein cholesterol as a tool for lipoprotein cholesterol screening and assessment of risk and therapy. Am J Cardiol. 1998;8126B- 31B