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Lipoprotein (a) Cholesterol Quantification And Its Correlation With LDL Cholesterol And Lipoprotein Ratios In The Diagnostic Assessment Of Cardiovascular Disease In A Tertiary Care Hospital.

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ABSTRACT

Abnormalities of lipoprotein metabolism pose to be one of the biggest risk factors of atherosclerosis and cardiovascular disease in urbanized societies. The cardiovascular risk factors with their cut off is the target for lipid lowering therapy. Cardiovascular risk assessment between Lipoprotein (a), Total/HDL cholesterol ratio and LDL/HDL ratios was studied in the sample population. Baseline lipid profile and lipoprotein (a) estimation was done for the participants in a fasting sample. The assessment of coronary risk based on Lipoprotein (a) alone is not optimal and the lipoprotein ratios along with the estimation of lipoprotein (a) provides information as risk factors than the routine analysis in Clinical Practice.

Keywords: Lipoprotein (a), Cardiovascular risk, Atherogenic indices, Dyslipidemia

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INTRODUCTION

Lipids, as a part of structural component of the cells, play a very critical role and are essentially involved in various metabolic and hormonal pathways. Abnormalities of lipoprotein metabolism pose to be one of the biggest risk factors of atherosclerosis and cardiovascular disease [1] in urbanized societies.

Lipoprotein (a)is a variant of low-density lipoprotein with a protein called apolipoprotein(a) discovered by Kare Berg [2] in 1963. Lipoprotein (a) is like typical LDL particles at the surface of hepatic cell membranes. They are found to be existing in plasma [2-6]. The structure is like tissue plasminogen activator and is a competitor for plasminogen for its binding site which leads to fibrinolysis[7,8,9]. Lipoprotein (a) stimulates plasminogen activator1 secretion leading to thrombogenesis. It enhances the coagulation pathway by inhibiting tissue factor inhibitor [10-12]. Lipoprotein (a) binds the oxidized phospholipids which are pro-inflammatory and attracts the cells to vessel wall and stimulates smooth muscle cell proliferation .Lipoprotein (a) has also a part in tissue repair and wound healing by interaction with wall and extra cellular matrix [13,14].

The Castelli index or atherogenic index Total/HDL cholesterol and the LDL/HDL ratios are important risk indicators and have greater predictive value than the isolated value of the parameter. The atherogenic risk whether mild, moderate and higher degrees are best given by these ratios in a lipid profile. Though the lipid parameters appear to be within the normal range, these ratios provide the predictor risk almost accurately. Thus, various working groups including the Canadian have set the lipid ratio as a secondary goal for therapy. [15].

Any patient with a history of premature cardiovascular disease, hypercholesterolemia, family history of elevated Lipoprotein (a) are more prone for Recurrent cardiovascular disease resistant to statin treatment. The Apo protein (a) isoform may also be an important parameter [15]. Lipoprotein (a) levels are different in different population. It has been estimated that lipoprotein (a) is found to be elevated in 20 % of the population. There are genetic evidence supporting the causal relationship of CVA like MI and stroke. Lipoprotein is believed to facilitate healing of wounds and to control bleeding thereby helping in acquiring homeostasis during childbirth, the half-life is three to four days with renal clearance from plasma [16].

Helsinki Heart study also states hypertriglyceridemia along with these increased lipid ratios have a significant risk [17]. Women's health study also uses the lipid variables to assess n the severity of cardiovascular risk [18]. The correlation between the carotid intima media thickness and the Total/HDL cholesterol is found to be significant[19].These ratios should therefore be used to assess vascular risk and help in therapeutic intervention [20].

Aims and objectives

To estimate Lipoprotein (a) levels along with the lipid profile in fasting patients and compare the Cardiovascular risk assessment between Lipoprotein (a), Total/HDL cholesterol ratio and LDL/HDL ratios in those patients.

METHODOLOGY

Present study included participants in total of 200 both men and women aged 25 to 55 years recruited randomly from a general population in a tertiary care hospital. Participants exclusion criteria were known cardiac patients, patients on statins or lipid lowering drugs, known history of dyslipidemia, smoker, and alcoholic. The study period was six months. Baseline lipid profile and lipoprotein (a) estimation was done for the participants in a fasting sample.

Statistical analysis

Quantitative variables were presented as mean ± SD and were compared using ANOVA test as it involves more than two variables. A p value of <0.01 was considered statistically significant. All data were entered in

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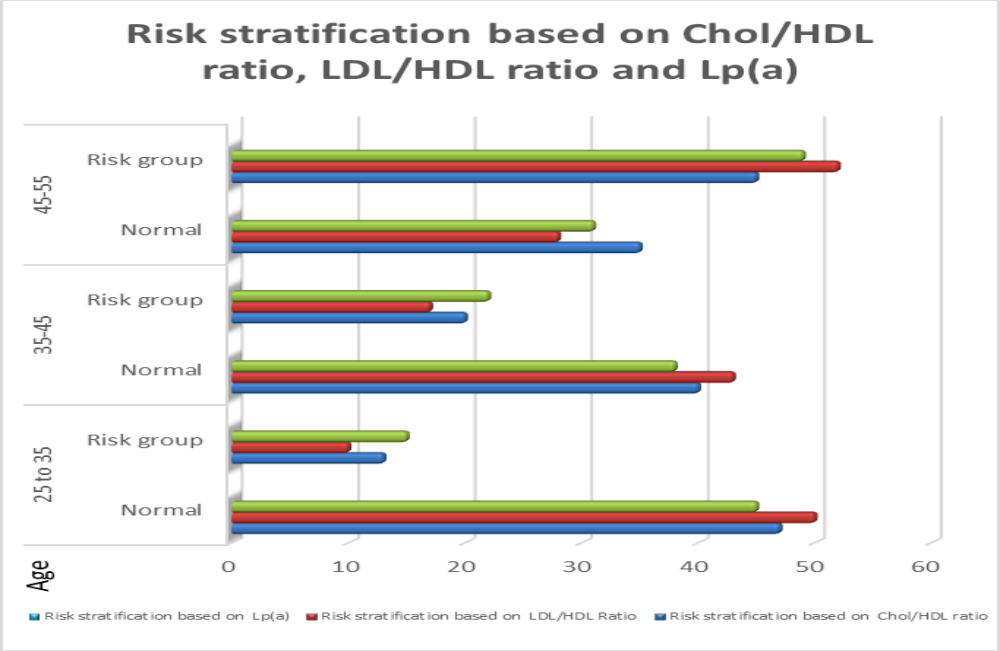
Microsoft excel spreadsheet and analysis was done using Statistical Package for Social Sciences (SPSS) version 22.0.

RESULTS AND DISCUSSION

All statistical analysis were performed using SPSS software version 22.

In Illustration.1,The risk stratification based on Cardiac risk ratios - Chol/HDL ratio, LDL/HDL Ratio and Lipoprotein(a)are almost same with minimal difference in the population stratification in all age groups.

Illustration.1: Risk stratification based on Chol/HDL ratio, LDL/HDL Ratio & Lipoprotein (a)



In Table 1, The Triglycerides levels are well within desirable limits in patients aged 25-35 years, whereas they are borderline high in patients aged 35-45 years and slightly high in patients aged 45-55 years. The total Cholesterol levels are within desirable limits in patients aged 25-35 years & 35-45 years, whereas they are borderline high in patients aged 45-55 years. The HDL levels are acceptable in patients aged 25-35 years & 35-45 years, whereas they are low in patients aged 45-55 years. Chol/HDL ratios, LDL/Chol ratios and Lipoprotein (a) are desirable in patients aged 25-35 years & 35-45 years but high in patients aged 45-55 years.

Table 1: Mean+SD values of the lipid profile parameters in the Study Population

	25-35 years	35-45 years	45-55 years
T.Chol	158+37.4	195.7+46.6	227.3+38.5
TAG	138.7+70.5	170.7+67.3	200.4+79.8
HDL	46.4+6.5	44.1+5.6	39.4+2.7
LDL	99.7+19.5	105.4+29.3	115.0+22.5
Non - HDL	145.5+38.8	151.7+47.5	188+38.5
VLDL	30.7+14.1	34.1+13.5	39.5+16
Chol/ HDL	4.4+1.3	4.93+1.4	5.8+1.0
LDL/ HDL	2.2+0.5	2.9+0.8	3.9+0.6
Lp(a)	17.7+8.0	28.2+8.3	32.1+8.0

In Table 2, Chol/HDL ratio, LDL shows a positive correlation with Lipoprotein (a),whereas and Cholesterol levels have a weak association with Lipoprotein (a) in all the age groups. HDL Values show a weak but negative association with Lipoprotein (a) in all the age groups. Cholesterol and triglycerides have weak association with Lipoprotein (a)in patients aged 25-35 years & 35-45 years, whereas they have strong association in patients aged 45-55 years.

Table 2: Pearson Correlation of Lp(a) with Chol/HDL ratio, LDL/HDL ratio, LDL,HDL, Cholesterol & Triglycerides

	Pearson Correlation of Lp(a) Vs					
Age in years	**Chol/HDL ratio**	**LDL/HDL ratio**	**LDL**	**HDL**	**Cholesterol**	**Triglycerides**
25-35	0.026	0.39	0.48	0.01	0.10	0.04
35-45	0.092	0.58	0.60	-0.24	0.02	0.09
45-55	0.05	0.65	0.67	-0.09	0.49	0.40

In Tables 3,4,5, The ANOVA test results showed a significant difference in the mean values of Lipoprotein (a), Chol/HDL ratio, LDL/HDL ratio, LDL and Total Cholesterol and there cannot be linear relationship between these parameters among all the age groups suggesting the measurement of the Lipoprotein(a) along with atherogenic risk ratios and other lipid profile parameters in predicting the Cardiovascular risk.

Table 3: ANOVA test results in patients aged 25-35years

ANOVA test results - 25-35years					
Source	df	SS	MS	F	**p-value**
Regression	7	1190.5222	170.0746	3.3703	0.0049
Residual Error	52	2624.0778	50.463		
Total	59	3814.6	64.6512		

Table 4: ANOVA test results in patients aged 35-45years

ANOVA test results 35-45years					
Source	df	SS	MS	F	**p-value**
Regression	10	10517.5043	1051.7504	20.9489	0
Residual Error	69	3464.1832	50.2056		
Total	79	13891.6875	176.9834		

Table 5: ANOVA test results in patients aged 45-55years

ANOVA test results 45-55years					
Source	df	SS	MS	F	**p-value**
Regression	7	1860.3019	265.7874	7.622	0
Residual Error	52	1813.0891	34.8673		
Total	59	3673.4	62.261		

Jesús Millán et al proposed that total/HDL cholesterol and LDL/HDL cholesterol ratios are risk indicators with greater predictive value than isolated parameters used independently [15]. Dyslipidemia and lipid oxidation are thought to be important determinants of atherosclerosis that leads to CVD [21]. Complete

evaluation and management including lipid parameters and Lp(a) should be the utmost task in general population to identify the risk factors [22].

CONCLUSION

From this study, we conclude that estimation of lipoprotein (a) and lipoprotein ratios helps in optimizing the predictive capacity of cardiovascular risk and rationale in using these lipoprotein ratios to set targets for lipid lowering therapy. The individual lipid parameters or Lipoprotein (a) alone could not predict the Cardiovascular risk in the study population. Hence atherogenic indices can be emphasized in Clinical practice for detecting atherogenic risk.

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