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LIPID TETRAD INDEX-A NEW RISK CALCULATOR FOR ST ELEVATION MYOCARDIAL INFARCTION

Cardiology

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ABSTRACT

Introduction Cardiovascular disease is the commonest cause of mortality globally, accounting annually for nearly 12 million deaths, with coronary artery disease (CAD) being the major contributor. Hence, the present study is to compare the serum lipid patterns in "ST Elevation Myocardial Infarction" patients and healthy controls and to evaluate the importance of Lipid Tetrad Index (LTI)" **Methodology** This is an observational study conducted in Coronary Care Unit at a tertiary care center in Chennai from January to June 2022. 100 ST elevation myocardial infarction patients admitted in Coronary Care Unit and 100 age and sex-matched healthy subjects. Fasting venous samples were collected and sent for lipid profile and lipoprotein(a) estimation. Lipid Tetrad Index is calculated using the following formula

Lipid tetrad index = Total cholesterol*Triglycerides*Lipoprotein (a) / High density lipoprotein

Ethical approval obtained from Institutional ethics committee. Data was entered and analysed using IBM SPSS software Version 21. **Results** The mean HDL is significantly higher among controls as compared to cases. Lipid parameters like Lpa, TC, TGL and LDL is significantly higher in cases. The compound parameter Lipid Tetrad Index is significantly higher among cases (Table 2).

KEYWORDS

Lipid tetrad Index, Coronary artery disease. Cardiovascular disease.

INTRODUCTION

"Cardiovascular disease is the commonest cause of mortality globally, accounting annually for nearly 12 million deaths, with coronary artery disease (CAD) being the major contributor. There is a steady increase in the prevalence of CAD due to rapid changes in demography and lifestyle consequent to economic development"[1].

"Conventional risk factors such as hypertension, diabetes mellitus, and smoking are increased in Indians due to urbanization and Western acculturation. Non-conventional factors such as hyperinsulinemia, insulin resistance, and lipoprotein(a) (Lp[a]) are determined by genes, and their high prevalence among Indians probably explains the precocious nature of CAD that typically affects Indians.

These multiplicative effects of conventional and emerging risk factors appear to provide an explanation for excess burden of CAD among Indians. The increased concentration of atherogenic lipoproteins plays an important role in the development of atherosclerosis leading to premature myocardial infarction and stroke. Lp(a) is an atherothrombogenic lipoprotein that is inherited as a genetic quantitative trait and Is an important emerging risk factor for premature coronary heart disease (CHD)"[2-6].

"Lipoprotein-a (Lp-a) has evolved as a genetically linked risk factor in thrombosis. High levels of Lp-a have been identified within the atherosclerotic plaque and may represent an important link between atherogenesis and thrombogenesis. Higher Lp-a levels are associated with a 2-3-fold risk of CAD which increases exponentially with concomitant presence of low HDL cholesterol, high total cholesterol/HDL cholesterol ratio or high homocysteine; all of which are common among Asian Indians, a race known to bear the burden of premature CAD"[7-10].

"Hence, the present study is on simultaneous measurement of several lipid biomarkers and calculation of lipid tetrad index (LTI). The LTI is derived by multiplying three lipids which are directly associated with CAD and dividing the product by high-density lipoprotein (HDL) which is inversely associated with CAD".

Lipid tetrad index = Total cholesterol*Triglycerides*Lipoprotein (a) / High density lipoprotein

AIMS AND OBJECTIVES

"To compare the serum lipid patterns in "ST Elevation Myocardial Infarction" patients and healthy controls and to evaluate the importance of Lipid Tetrad Index (LTI)"

MATERIALS AND METHODS

Setting: Coronary Care Unit, Cardiology Department, at a tertiary care center in Chennai from January to June 2022.

Inclusion criteria:
Patients admitted with ST Elevation Myocardial infarction

Exclusion criteria:
Patients with/on Diabetes Mellitus, Hypothyroidism, Chronic Renal failure, Nephrotic Syndrome, Hormone Replacement therapy, Hypolipidemic drugs.

Design Of Study
Observational study.

Period Of Study
6 Months from January 2022 to June 2022

PARTICIPANTS

100 ST elevation myocardial infarction patients admitted in Coronary Care Unit at a tertiary center in Chennai and 100 age and sex-matched healthy subjects.

METHOD

100 patients admitted in Coronary Care unit with primary diagnosis are selected based on the inclusion/exclusion criteria & 100 normal subjects taken. Fasting venous samples were collected and sent for lipid profile and lipoprotein(a) estimation. Lipid Tetrad Index is calculated using the following formula

LTI= TOTAL CHOLESTEROL*TRIGLYCERIDES*LIPOPROTEIN A / HIGH DENSITY LIPOPROTEIN

Ethical approval obtained from Institutional ethics committee. Data was entered and analysed using IBM SPSS software Version 21.

OBSERVATION & RESULTS

Table 1: Distribution Of Lipid Parameters

AGE	years	CASES	CONTROL
	<30	14	11
	30 - 40	43	46
	>40	43	43
HDL	mg/dl		
	<30	16	0
	30 – 40	51	24
	>40	33	76

LPA	mg/dl		
	<30	20	97
	30 – 40	46	3
	>40	34	0
TC	mg/dl		
	<200	62	96
	>200	38	4
TGL	mg/dl		
	<200	64	100
	>200	36	0
LDL	mg/dl		
	<100	6	41
	>100	94	59
LTI			
	<20000	24	100
	20000-30000	60	0
	>40000	16	0

Table 1 shows the distribution of lipid parameters among cases and controls. The mean HDL is significantly higher among controls as compared to cases. Lipid parameters like Lpa, TC, TGL and LDL is significantly higher in cases. The compound parameter Lipid Tetrad Index is significantly higher among cases (Table 2).

Table 2: Comparison Of Lipid Parameters

VARIABLE	CASES (mean±SD)	CONTROLS (mean±SD)	P VALUE
MEAN AGE	38.32±6.334	38.19±5.904	0.881
MEAN HDL	36.62±7.90	43.69±4.06	<0.001
MEAN LPa	37.25±10.95	18.73±6.25	<0.001
MEAN TC	192.81±20.694	176.15±19.16	<0.001
MEAN TGL	182.16±31.29	144.71±14.807	<0.001
MEAN LDL	130.74±16.434	101.54±13.723	<0.001
MEAN LTI	24094.53±8389.73	5582.09±2525.885	<0.001

DISCUSSION

Incidence of CAD has been increasing steadily in India. Elevated lipoprotein(a) level is associated with atherothrombogenesis and may be the link between lipids and CAD occurrence. It is a well-known fact that Indians are developing CAD at much lower TC and LDL cholesterol levels[2,3]. In fact,81% of our patients with proven CAD had a total serum cholesterol level of less than 200 mg/dl. This raises a possibility that other risk factors play a greater role in the occurrence of CAD in Indian patients, including genetic predisposition[6,7].

"The mean cholesterol level in the study group is higher than the control group which is statistically significant".

"The mean HDL level in the study group is lower than the control group which is statistically significant". This is well demonstrated by various studies that as HDL levels increase, the risk of CAD decreases. Mean HDL cholesterol in Asian Indian men on an average is 5 mg/dl lower than in white men, and 15 mg/dl lower than in the black and Japanese men.

In the study group, "mean TGL level is higher than the control group which is statistically significant"". Hypertriglyceridemia has been observed to be a vital factor underlying the pathogenesis of CAD because of its association with high plasma levels of tissue plasminogen activator inhibitor. High TG levels in our patients appear to contribute to CAD risk more relative to LDL cholesterol and TC levels.

Mean LDL cholesterol levels were significantly higher in study group than in controls which is statistically significant. "The mean plasma Lp(a) of study group is higher than the control group which is statistically significant". Higher mean plasma Lp(a) levels in study group correlated with mean Lp(a) levels in CAD group was observed by Rajasekhar *et al*.15 and Isser *et* al."Lp(a) is categorized as an emerging lipid risk factor by Adult Treatment Panel III of National Cholesterol Education Programme, elevated Lp(a) level, increases the individual risk to a higher level. High levels of Lp(a) correlate with prematurity, severity, extent, and progression of coronary atherosclerosis as well as occurrence and recurrence of myocardial infarction among Asian Indians. The risk for CAD increases 3-fold in the absence of other risk factors, increases 8-fold with low HDL, 12-fold with high LDL, 16-fold with diabetes, 25-fold with high TC/HDL ratio ,17 when associated with increase in plasma Lp(a) levels".

Lipoprotein (a), , is a strong risk factor for atherosclerotic coronary artery disease; "the relative cardiovascular risk is significantly increased when elevated Lp-(a) levels are associated with high levels of LDL or low value of high density lipoprotein (HDL). The effect of various lipid parameters as well as Lp-a on the atherogenicity is not additive but multiplicative which is well demonstrated by the lipid tetrad index. The mean lipid tetrad index of the patients with CAD was significantly higher than the patients without CAD". This study has its own limitation. The number of patients in this study is small. Hence generalizations of results of the study have to be made with caution. The study population involved patients seeking medical care in our hospital which is a tertiary care center and hence they may not represent the general population. Study with large sample size needs to be conducted to confirm the findings of our present study.

CONCLUSION

"This study on evaluation of LTI in ACS shows that it is a promising atherogenic index in risk factor assessment when compared to other lipid parameters. LTI facilitates in early identification of individuals with high risk for premature CAD as a result of their genetic predisposition. Since no well-established Lp(a) lowering drugs are available at present, there is a need to create awareness for early detection and modification of other risk factors in young individuals. Early intervention like lipid lowering drugs helps preventing the progression of atherosclerosis and in reducing the morbidity and mortality from ACS".

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