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Cardiology

Lipoprotein (A) in Acute Myocardial Infarction among Middle Aged Population with Coronary Angiographic Correlation- An Observational Study

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Abstract **Original Research Article**

Acute myocardial infarction (AMI) is one of the leading causes of mortality among coronary artery disease (CAD). Lipoprotein (a) Lp(a) may aggravate atherosclerosis by pro-thrombotic, pro-inflammatory and pro-atherogenic effects This observational study was conducted in 206 acute Myocardial Infarction patients of age less than 45 years of both sexes who underwent coronary angiogram in Department of Cardiology,Government Stanley Medical College for 6 months after getting informed consent. This study was performed to determine the levels of Lp(a) in acute myocardial infarction. Coronary angiogram was performed for all acute myocardial infarction patient and serum Lp(a) and LDL levels were analysed. In our study, the difference in Lp(a) values between obstructive CAD & non – obstructive CAD were not statistically significant (p value 0.863). Eight patients who had positive family history had high Lp(a) levels. Important findings in this study includes that the Lp(a) levels were independent of high LDL(Low density Lipoprotein) values and the level of Lp(a)is higher in women(67%) than in men (33%). With regard to management, this group of patients need a targeted approach apart from regular statins and they may have to be treated with extended release Niacin

Keywords: AMI Acute myocardial infarction, CAD coronary artery disease, Lp(a) Lipoprotein(a) LDL-C Low density Lipoprotein cholesterol.

INTRODUCTION

Acute myocardial infarction (AMI) is the most dreadful presentation in patients with coronary artery disease (CAD). It is one of the leading causes of mortality world-wide [1]. Lipoprotein (a) [Lp(a)] was described in 1963 by Berg K. It is a LDL-like lipoprotein in which a large glycoprotein and an apolipoprotein(a) are covalently bound to apolipoprotein B by a disulfide bridge The apo(a) chain consists of five cysteine-rich domains which are known as "kringles" [2]. The fourth kringle is homologous and has structural similarity to plasminogen. Thereby, Lp(a) interferes with fibrinolysis by competing with plasminogen binding to molecules and cells. This results in impairment of plasminogen activation, plasmin generation, and fibrinolysis [3, 4]. Lp(a) also aids g domain of plasminogen, a plasma protein that dissolves blood clots when activated. It aids in promoting foam cell formation and deposition of cholesterol in atherosclerotic plaques [5], as it binds to macrophages via a high-affinity receptor. The association of Lp(a) and CAD has been studied for many years for benefitting patients to prevent acute coronary syndromes .Lp(a) may aggravate atherosclerosis by pro-thrombotic,pro-inflammatory and pro-atherogenic effects. Elevated Lp(a) concentration is closely associated and found to be a causal and independent risk factor of CAD according to epidemiological, Mendelian randomization and genome wide association studies [6-8]. It was also found that elevated levels of Lp(a) are associated with coronary heart disease and early myocardial infarction [9, 10].

This study aimed to evaluate serum levels of Lp (a) and other contributing factors in patients diagnosed with myocardial infarction

AIMS AND OBJECTIVES

(i). To estimate serum levels of Lp (a) in acute Myocardial Infarction patients and to correlate with LDL cholesterol levels. (ii) To correlate the severity of obstruction in coronary angiogram with Lp(a) levels

MATERIALS AND METHODS

This observational study was done after obtaining the approval from institutional ethical committee. This Study comprised of 206 patients who underwent coronary angiogram for acute myocardial infarction between June 2019 to November 2019 in Department of Cardiology, Stanley Medical College, and Chennai. Informed consent was obtained from the patients.

Inclusion Criteria

Acute myocardial infarction patients with age less than 45 years of both sexes who underwent coronary angiogram

Exclusion criteria

Nephrotic syndrome, acute or chronic renal failure, thyroid disorders, acute infections, stroke, diabetic ketoacidosis and acute myocardial infarction patients who did not undergo coronary angiogram and patients aged more than 45 years

METHODS

Coronary angiogram was performed for all acute myocardial infarction patients during the study period irrespective of thrombolysis state who met the inclusion criteria. In coronary angiogram, obstructive CAD is defined as the presence of at least a > 70% stenosis of major coronary arteries (left anterior descending, left circumflex, or right coronary arteries) or their major branches (diagonal, obtuse marginal, posterior descending, or posterior left ventricular arteries).

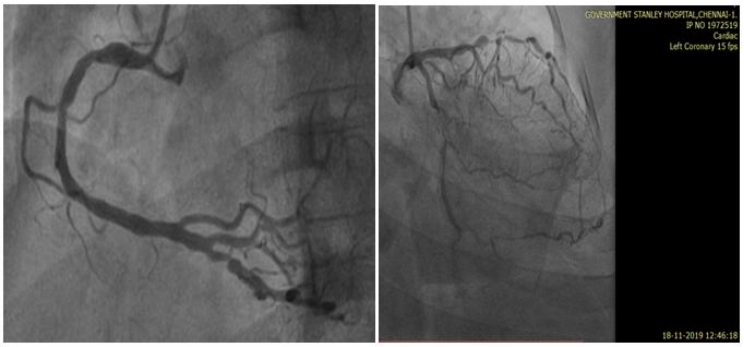

Fig-1: Coronary angiogram: Rt coronary artery Left circumflex & Left anterior descending artery

Biochemical analysis

Fasting blood samples were collected in serum tubes, centrifuged at 3000 rpm for 10 min. Serum Lp(a) was measured by immunoturbidimetry, LDL-C were analysed using automated biochemical analyser.

STATISTICAL ANALYSIS

Data were analysed by SPSS software 16 version using Fisher exact test (2 x2)contingency table

Table-1: Comparison of Lp(a) levels and baseline characters

Baseline characters		Lp(a)Normal <30mg/dL	Lp(a)High >30mg/dL	p value
Age	< 30 yrs	10(48%)	11(52%)	0.09
	31-45 yrs	123(66%)	62(34%)	
Sex	Male	129(66.4%)	65(33.6%)	0.02*
	Female	4(33%)	8(67%)	
Lifestyle	Alcohol	94(63%)	55(37%)	0.47
	Sedentary	34(68%)	18(32%)	
BMI kg/m^2(WHO recommendation)	Underweight(<18.5)	6(67%)	3(33%)	0.107
	Normal(18.5-25)	79(72%)	31(28%)	
	Overweight(25-30)	39(54%)	33(46%)	
	Obese(>30)	9(60%)	6(40%)	
Diabetes Mellitus	Yes	15(60%)	10(40%)	0.611
	No	118(65%)	63(35%)	
Hypertension	Yes	13(54%)	10(46%)	0.25
	No	120(66%)	63(34%)	
High LDL (>130mg/dL)	yes	16(57%)	12(43%)	0.377
	No	117(66%)	61(44%)	
Smoking	yes	90(65%)	49(35%)	0.936
	No	43(64%)	24(36%)	
Alcoholic	yes	41(68%)	19(32%)	0.468
	No	92(62%)	54(37%)	

* p value <0.05 statistically significant

Table-2: Comparison of baseline characters between obstructive CAD & Non-obstructive CAD:

Baseline characters		Obstructive CAD (159)	Non-obstructive CAD (47)	p value
Age	<30 yrs	76(71%)	31(29%)	0.03*
	31- 45 yrs	83(86%)	16(14%)	
Sex	Male	147(76%)	47(24%)	0.072
	Female	12(100%)	0	
Diabetes Mellitus	yes	25(100%)	0	0.0016
	No	134(74%)	47(26%)	
Hypertension	yes	20(83%)	4(17%)	0.606
	No	139(75%)	43(24%)	
LDL more than 130mg/dL	yes	25(89%)	3(11%)	0.144
	No	134(75%)	44(25%)	
Smoker	yes	102(73%)	37(27%)	0.076
	No	57(85%)	10(15%)	
Alcoholic	yes	45(75%)	15(25%)	0.715
	No	114(78%)	32(22%)	
Lp(a)	Normal(<30 mg/dL)	102(77%)	31(23%)	0.863
	High (>30 mg/dL)	57(78%)	16(22%)	

RESULTS

Out of 206 patients, 194 were males, & 12 were females. 8 patients had positive family history & 198 patients had negative family history of myocardial infarction. In our study, the difference in Lp(a) values between obstructive CAD & non – obstructive CAD was not statistically significant (p value 0.863)(Fig 2). There were significant differences between Lp(a) values of male and female (p value 0.02*) implying that young females with elevated Lp(a) are prone for coronary artery disease. There were no significant difference between Lp(a) values with respect to Diabetes Mellitus, Hypertension, LDL, smoking and alcoholism in our study(Tab 1).

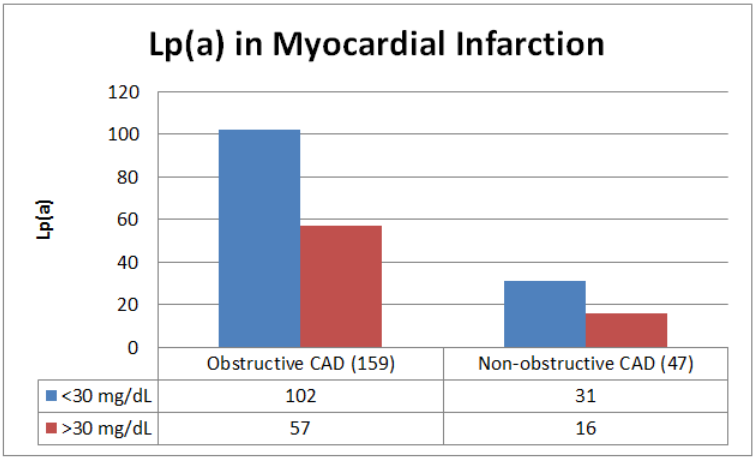

Fig-2: Shows relation between Lp (a) levels in Obstructive CAD & Non-obstructive CAD

DISCUSSION

Plasma Lp(a) was reported to be associated with cardiovascular risk in many prospective cohort studies [11,12]. In this study, even though all patients had succumbed to myocardial infarction, Lp (a) levels did not correlate with severity of coronary obstruction.In a study of patients with recent acute coronary syndrome and receiving statin therapy, Lp(a) was not associated with CVEs [13]. Hence,a larger multicentric studies are needed to analyse the impact of Lp(a) in patients with CAD might be needed. Canadian Cardiovascular Society (CCS) Guidelines for the Management of Dyslipidemia has recommended to add Lp(a) in the risk assessment in subjects with medium CVD risk according to Framingham Risk Score or when there was a family history of premature CAD [14]. Important findings in this study includes that the Lp(a) levels were independent of high LDL values and the level of Lpa is higher in women(67%) than in men (33%).

Currently, according to the European Society of Cardiology/European Atherosclerosis Society (ESC/EAS), measurement of Lp(a) is recommended in patients with intermediate or high risk of CVD, particularly in those with premature CVD, familial hypercholesterolemia, a family history of premature CVD, and/ or elevated Lp(a) [15], which correlated in

our study that 8 patients who had positive family history had high Lp(a) levels.

LIMITATIONS

We measured Lp(a) only at baseline, and the follow-up levels of Lp(a) were not done which may also be clinically significant. The study included only a limited sample size.

CONCLUSION

Even though high Lp(a) levels did not directly correlate with severity of obstruction in coronary angiogram, it assumes significance in certain subsets of myocardial infarction viz. women in the menstruating age group, young men and also in individuals with positive family history of CAD and premature death.

With regard to management these group of patients need a targeted approach apart from regular statins and they may have to be treated with extended release Niacin. Further multicentric research with large number of patients and regular follow up data is required to throw light in this complex population.

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