

**EVALUATION OF LIPOPROTEIN (a) LEVELS IN YOUNG PATIENTS WITH MYOCARDIAL INFARCTION IN NORTH COASTAL ANDHRA REGION**Rajini P. V<sup>1</sup>, Kasi Babu A<sup>2</sup>**HOW TO CITE THIS ARTICLE:**

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**ABSTRACT: CONTEXT:** Coronary artery disease (CAD) is one of the leading causes of mortality in the developing countries. Various risk factors i.e., Conventional, modifiable and novel risk factors along with certain medical conditions may contribute to CAD. In India, due to rapid changes in life style towards sedentary and dietary habits, contribute to myocardial infarction (MI) in young individuals. Lp (a) – lipoprotein (a) is now recognized as an independent risk factor for CAD. It is also a genetic risk factor. **AIM:** to evaluate Lp (a) levels in young patients, of both sexes, with myocardial infarction. **STUDY DESIGN:** Fifty young patients with myocardial infarction, of both sexes, with cut off age 45 years. Values are compared with age and sex matched 25 controls. **METHODOLOGY:** Fasting samples are collected for sugar, creatinine, uric acid and particularly lipid profile and Lp (a) levels, using a fully automated analyzer and a turbid metric biochemistry analyzer. Statistical analysis is carried out by using student's t-test. **RESULTS:** The Lp (a) levels in patient cases were significantly higher, in comparison to controls (p value <0.001). The uric acid levels are increased at a mild rate in proportion to raised Lp (a) levels. The LDL cholesterol and triglycerides show a linear rise, being significant, with raised Lp (a) levels, whereas HDL-c showed an inverse relation. **CONCLUSIONS:** The study demonstrated that in young patients with myocardial infarction, there is a male predominance with more raised Lp (a) values, being lesser in females- may be due to estrogens' effect in them, Lp (a) level had been an important and independent risk factor for CAD. **KEYWORDS:** Coronary artery disease (CAD), Lp (a), Lipoprotein (a).

**INTRODUCTION:** Coronary artery disease (CAD) is one of the leading causes of mortality in the developing countries. Due to rapid changes in population statistics and life style towards sedentary consequent to economic rise, it is predicted that CAD might be the most prevalent disease in India in the coming few years. Acute myocardial infarction (MI) is the most important consequence of CAD. Although traditional risk factors i.e. conventional and modifiable risk factors<sup>(1)</sup> are useful in the diagnosis of MI Study of novel risk factors along with certain medical conditions would be valuable in identifying the persons who are at risk, especially in young patients with MI<sup>(2)</sup> Therefore, in the present study, much attention has been focussed on serum lipoprotein (a) and other lipids mainly because of their strong association with CAD, in these individuals.

Lipoprotein (a) is a complex lipoprotein consisting of a central core of LDL (low density lipoprotein), covalently linked by a single disulphide bond to a polypeptide chain of apoprotein (a) Many studies have shown a direct relationship between LP (a) and CAD<sup>(3)</sup> In India, the percentage is rising with multi-dimensional risk factors, along with expressed familial genetics. LP (a) has a half-life of about 3 to 4 days in circulation. High LP (a) predicts risk of early altherosclerosis similar to high LDL-c but in advanced altherosclerosis, LP (a) is an independent risk factor not dependent on LDL. In expressed familial genetical cases, MI may occur at a younger age, in Indian Population. Though there

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have been studies correlating the elevated LP (a) levels and severity of coronary heart disease<sup>(4)</sup> Still there is a need to probe for more studies to assess the role of LP (a) as a risk factor to MI, especially in young patients. The present study is designed to verify whether there will be an increase in the concentration of LP (a) and other lipids in young South Indians i.e. in the north Coastal Andhra region and for it, cut off age of forty five years has been used to define young onset of myocardial infarction.

**MATERIALS AND METHODS:** This case-control study was carried out on fifty patients of myocardial infarction admitted in medical wards and casualty of King George Hospital, Visakhapatnam which is a catchment area for north Coastal Andhra region. The mean age of subjects was between 30 and 45 years. Out of 50 cases, 36 were men and 14 were females. The study included 25 healthy control subjects that were age and sex matched and without ischemic heart disease.

A prior approval was obtained from local ethics committee. Informed consent was taken from patients and controls. The clinically diagnosed cases with signs and symptoms, ECG study and other parameter-by the physician, had been included in the case study. Patients with age greater than 45 years or with chronic renal parenchymal disease or nephrotic syndrome or with concomitant liver disease or with any disabling terminal disorders are excluded from the study.

Five ml of fasting various blood was collected from each subject with all aseptic precautions and allowed to clot at room temperature and then centrifuged for 15 minutes. The separated serum was stored at 20°C until used for estimation purposes. The blood sugar (GOD- POD method) lipid profile (standard enzymatic methods and calculation for LDL & VLDL) creatinine (Jaffe's kinetic) and uric acid (enzymatic) are estimated by a fully automated analyser (BS-300). Serum LP(a) was estimated by an immunoturbidimetric assay specific anti-lipoprotein (a) anti-bodies react with antigen in the sample to form antigen- antibody complex which is determined turbidimetrically in a biochemistry analyser (RA-50 Bayer diagnostics) with "Quantia" Reagents kit. The comparison of the values is carried out by using students't-test. The statistical analysis was performed by using SPSS statistics programme.

**RESULTS AND OBSERVATIONS:** The present study included fifty patients of clinically diagnosed male and female younger individuals (Fig.1). Higher lipoprotein (a) levels have been observed in twelve out of thirty six males with a value of more than 30 mgs/dl. A similar observation was made in the case of 30% of female patients in this study. Lipoprotein (a) has shown a mean value  $28.2 \pm 26.9$  mgs/dl. in case of patients compared to  $20 \pm 6.3$  mgs/dl. in case of controls (Fig. 2), that is a statistically significant difference was observed between the two groups ( $p$  value  $< .001$ ), suggesting LP (a) as an important predictor of coronary heart disease. The mean total cholesterol in these younger cases is 152 mgs/dl and raised LP (a) has not been dependent on this parameter. A rise in serum triglycerides and a concomitant decrease in HDL - cholesterol has been observed in some but not all the affected cases with raised LP(a) levels (Fig. 3 and Fig. 4). A direct proportionalship with LDL cholesterol was observed with raised LP (a) levels (Fig. 5). Table 1 shows the comparison of various biochemical parameters in cases and controls, with statistical significance.

**DISCUSSION:** Out of the fifty patient cases of MI studied, mainly for LP (a)- levels 29 showed a significant rise constituting 58% of the study population the males 22 out of 36 (66%) and females 7 out of 14 (50%) showed elevated LP (a) levels, compared to controls. This shows the gender

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difference that males are more commonly affected in younger age group with MI when compared to females, in this age group, which may be oestrogens effect in females. Age wise comparison of LP(a) has shown that 85% are in the age of 30-34 years and 40% are in the age of 35-39 years, the group that showed majorly elevated LP (a) levels and 24% are above 40 years of age.

In the present study, high triglyceride levels (80% of cases) and high LDL levels (74% of cases) are positively associated with increased LP (a) levels. A study by Garcia diaZ & Gasfer et al showed that LP(a) as a risk factor in cases of CAD in male patients of less than 45 years of age, than in female.<sup>(5)</sup> These results are in concordance agreeing with the present study.

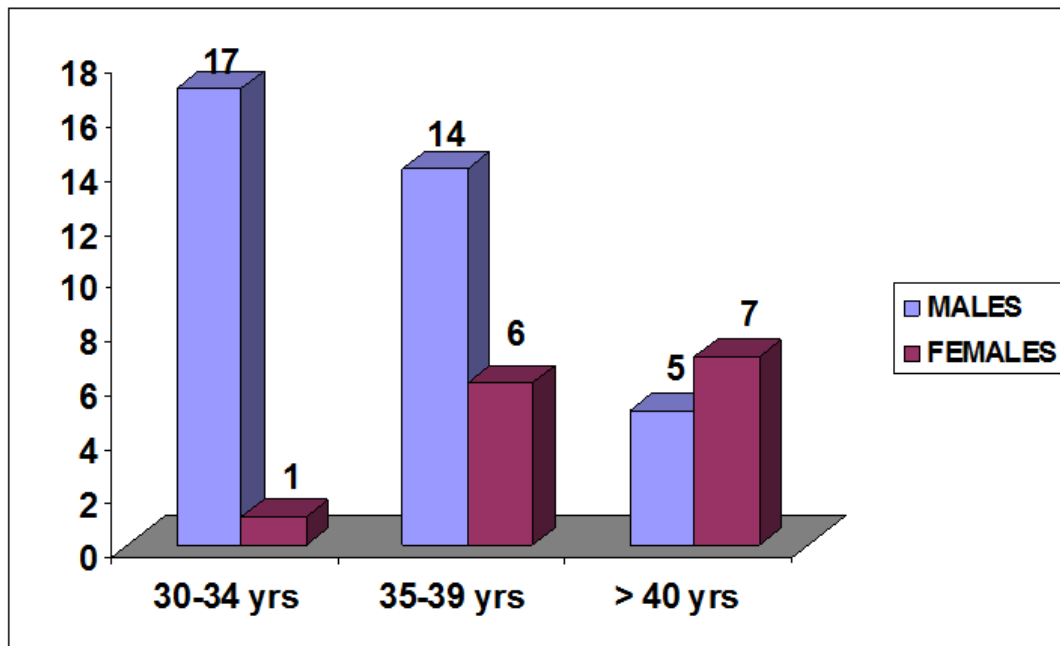
LP (a) has many properties in common with LDL-c, but contains a unique protein apo (a) which is structurally different from other lipoproteins. This apo (a) influences the major metabolic paths of LP (a).<sup>(6)</sup> There is an inverse relationship between apo (a) size and LP(a) levels. In a study of Rosby & Berg<sup>(7)</sup> it is suggested that small apo (a) isoform size (<22 knigle IV repeats) is associated with vascular flow mediated changes regardless of plasma LP(a) concentrations LP(a), is homologous with fibrin binding domain of plasminogen, a plasma protein that dissolves blood clots when activated.<sup>(8)</sup> Thus LP (a) acts as competitive inhibitor for the action of plasminogen and prevents fibrinolysis. LP (a) is regarded as an important inherited risk factor for atherosclerosis.<sup>(9)</sup> The LDL receptors found on the macrophages can bind and mediate the catabolism of LP (a) by endocytosis with consequent degradation, which may lead to lipid accumulation and plaque formation. Alternatively, recruitment of monocytes to the vessel wall and binding to macrophages by enhancement of expression of intracellular adhesion molecule I, may enhance the role of LP (a) the plaque formation and thereby cause MI in patients.<sup>(10)</sup>

All these data show that LP (a) could play a major role independently, in the progression of the disease in young individuals also.<sup>(11)</sup> In some patient having serum total cholesterol level less than 200 mgs/dl but increased LP (a) levels may trigger the disease condition. This means LP (a) could be an independent risk factor for myocardial infarction in young patients.<sup>(12)</sup> The proposed mechanism of LP(a) action in these young individuals is poorly understood, but it has been demonstrated that LP(a) is present in the arterial wall at the sites of atherosclerotic lesions and that it accumulates at these sites to an extent that is proportional to serum LP(a) concentrations.<sup>(13)</sup>

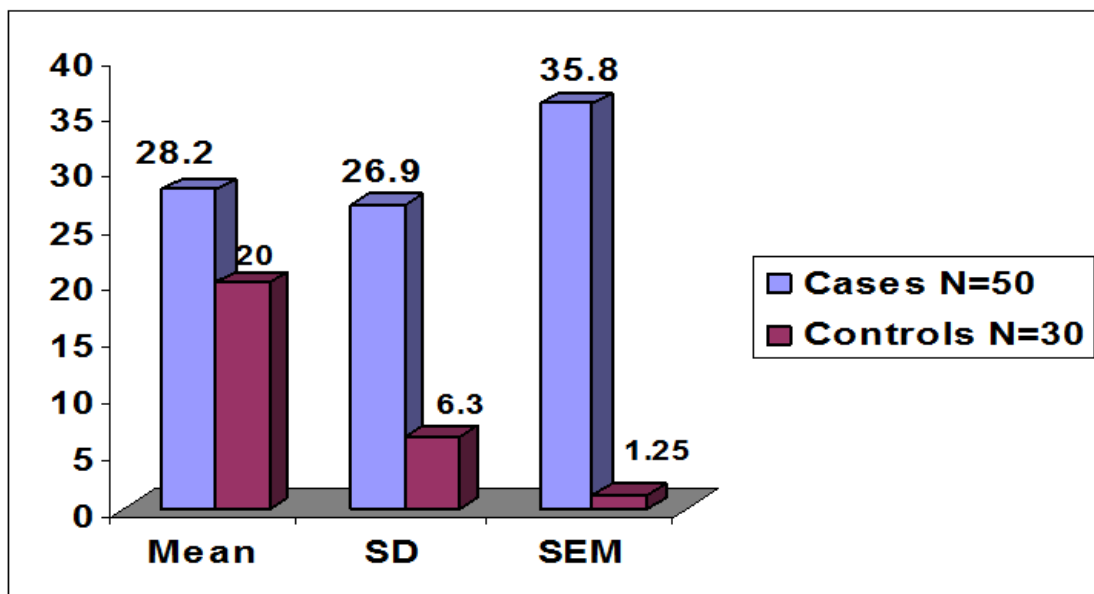
**CONCLUSION:** Lipoprotein (a)-LP (a) levels are found to be increased in both men and women, with myocardial infarction in younger ages and showed a statistically significant degree of difference compared to controls. In women, lesser affliction might be due to protection by estrogens, in this age group. Men of age group 35-39 years showed more raised values of LP (a). Thus, in young patients with MI, there was a male predominance in the raised values of LP (a). Serum LP (a) level is not dependent on serum total cholesterol level and thus LP (a) had been an independent risk factor for the young patients with MI. Though, there have been studies correlating the elevated LP (a) levels and severity of coronary artery disease<sup>(14)</sup> still there is a need to probe for more studies to assess the role of LP (a) as a risk factor to MI, especially in young patients. The measurement of LP (a) could be useful in informing the treatment of patients at high risk for ischemic heart disease and defining a suitable clinical target for LP (a) reduction.

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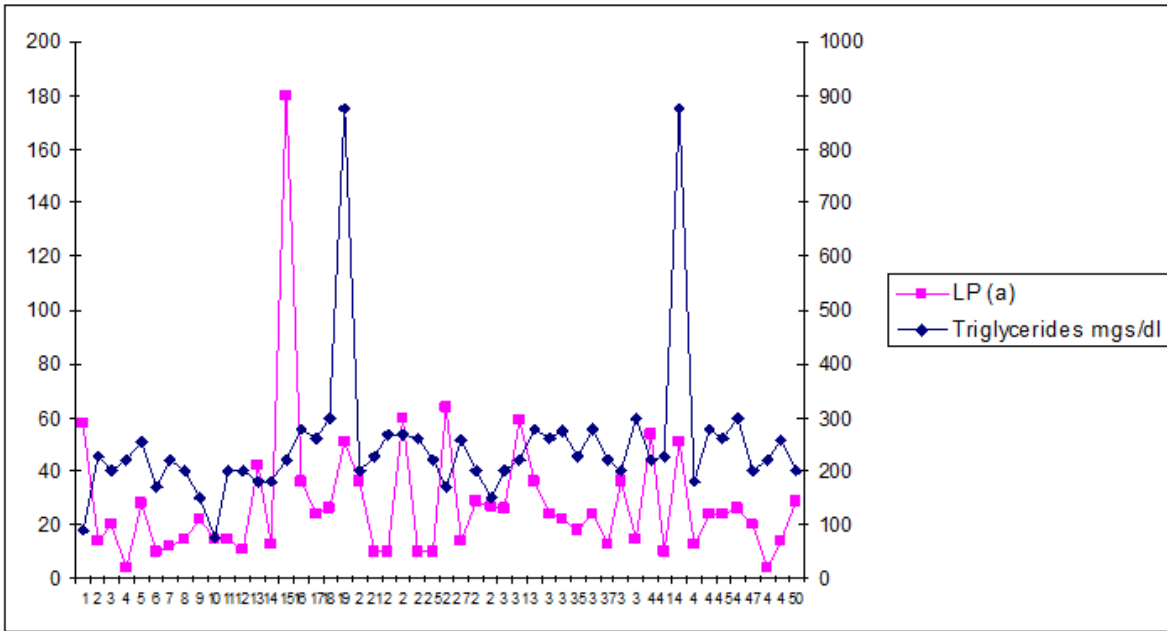


**BAR DIAGRAM 1: AGE DISTRIBUTION IN MALES AND FEMALES**

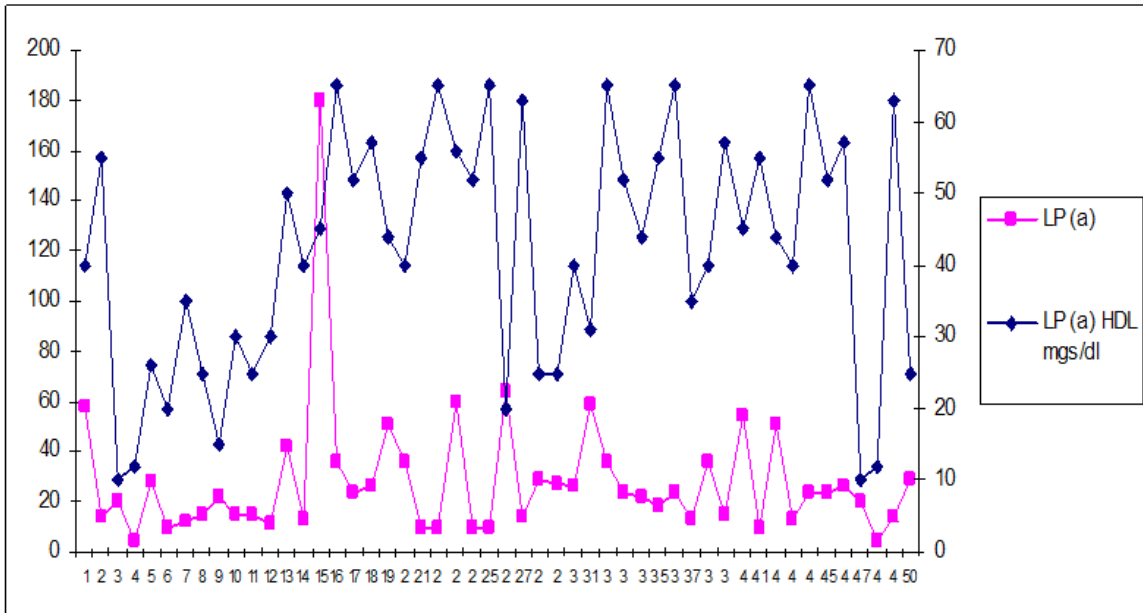


**BAR DIAGRAM 2: LIPOPROTEIN 'a' LEVELS IN CASES AND CONTROLS**

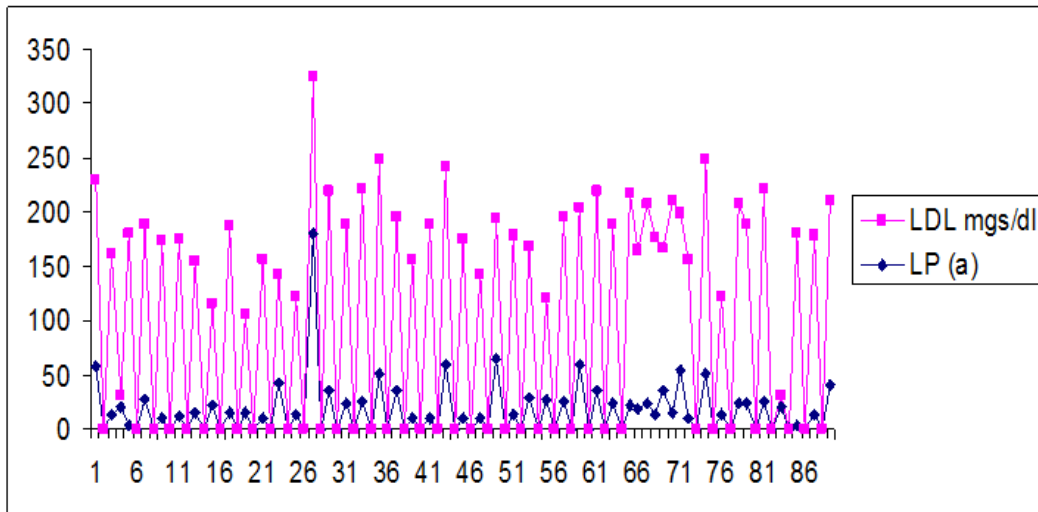
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**LINE DIAGRAM 1: COMPARISON BETWEEN LIPOPROTEIN 'a' AND TRIGLYCERIDES**



**LINE DIAGRAM 2: COMPARISON BETWEEN LIPOPROTEIN 'a' AND HDL**



**LINE DIAGRAM 3: COMPARISON BETWEEN LIPOPROTEIN 'a' AND LDL**

Parameter	Mean values		t value	b-value
	Cases	Control		
Serum LP (a) level	28.2	20	.09	<0.001
S. Total Cholesterol	152	154	1.23	<0.001
S. Trigly cerides	150	151	1.43	<0.001
S.LDL-C	152	153	-1.12	<0.0128
S.HDL-C	42	46	1.88	<0.0061

**Table 1: LP (a) & Lipid profile in cases and controls**

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