COMPARISON OF LIPOPROTEIN (a) AND SERUM CHOLESTEROL IN OFFSPRING OF PATIENTS DIAGNOSED AS MYOCARDIAL INFARCTION

Salma Rahim, Abdus Sattar Khan, Rahim Bangash

Department of Biochemistry, Department of Chemistry and Department of Anatomy, Khyber Medical College, Peshawar and University of Peshawar.

ABSTRACT

Objective: The value of lipoprotein (a) [Lp(a)] in the prediction of coronary artery disease (CAD) or myocardial infarction (MI), is an established independent risk factor for premature MI. This study was conducted to diagnose offspring at risk.

Material and Methods: A total of 120 subjects were investigated. Serum Lp (a) and total serum cholesterol were measured by ELISA and serum cholesterol by enzymatic colorimetric (CHOD-PAD) method using standard kits from Spincreact, Spain.

Results: Differences in levels of total Lp (a) and cholesterol were found between patients and control. Both Lp (a) 16.23±1.99 mg/dL and cholesterol 175.0±7.63 mg/dL of patients were higher than the controls.

Conclusion: Lp (a) is a strong lipid variable predisposing to CAD.

Key words: Serum Lipoprotein (a), Serum Cholesterol.

INTRODUCTION

Coronary artery disease (CAD) is one of the genetic diseases attributed to numerous gene-environment interactions. Since the risk of heart disease is in large part inherited the inheritance of a gene from particular parent is generally a 50% chance situation due to separation and recombination of genes during meiosis[1].

It is now realized that the mode of action of certain genetic factors is through their interaction with environmental factor[2]. The genetic component is believed to be more predominant than the environmental when CAD is present early in life. Moreover, CAD tends to run in families, and hyperlipidaemia contributes largely[3].

With the recognition of the importance of genetic factors in the etiology of

premature CAD, several studies have come forward, highlighting the role of various risk factors and their association with inheritance[4-5]. Lp (a) levels prove to be valuable in the assessment of CAD risk early in life[6].

A significant positive relation was found between Lp (a) concentration and the number of parental risk factors. Children whose grand parents had history of CAD had Lp (a) concentration shifted towards higher values. Measurement of Lp (a) in children may help to identify those at an increased risk of CAD, especially when their parents have at least two relative risk factors. These include smoking, hyperlipidaemia, hypertension, obesity, type I and type II diabetes mellitus, post menopausal status[7].

For more than 25 years since the discovery of this abnormal lipoprotein by Berg in 1963, this has been the source of more intrigue than insight[8]. It is a cholesterol rich lipoprotein resembling low density lipoprotein (LDL) to which a large polymorphic glycoprotein, apo-lipoprotein (a) is covalently coupled, it exists as a free standing particle in normolipidaemic subjects, however it can associate covalently with triglyceride (TG) rich lipoprotein in hypertriglyceridaemic (HTG) subjects[9-11]. Several epidemiologic studies have shown that Lp (a) is a risk factor for cardiovascular disease[12].

In the present attempt we would like to study lipoprotein with serum cholesterol in offspring of patients diagnosed for MIs.

MATERIAL AND METHODS

One hundred and twenty (120) subjects were selected for the present study from the Cardiology Department, Lady Reading Hospital, Peshawar and Khyber Teaching Hospital, Peshawar. They were divided into four groups, A, B, C and D respectively. Group A (n=30) and group B (n=30) were comprising of patients and their off springs respectively, who had myocardial infarction (MI) (proven hospital record). They were cross matched with individuals, and their off springs having no personal or family history of hypercholesterolaemia or coronary artery disease, group C (n=30) D (n=30) respectively.

Information regarding various variables viz. age, sex, BMI, blood pressure, smoking habit, and family history of hypertension were recorded on a standard proforma. Those who had any endocrinological disorders were excluded from the study.

Fasting blood was drawn from the antecubetal vein of all the subjects and serum separated was stored at -20°C till further analysis.

Serum Lp(a) and cholesterol were determined by standard kit (Code No. 1107020 and 1001092 respectively) method procured from Spincreat, Spain.

RESULTS

The results of our analysis are discussed in Table-1. The mean ± SEM age among the patients and their offspring was found to be 55.30 ± 2.22 and 18.20 ± 1.03 years, whereas in controls and their offspring it was found to be 46.80 ± 1.63 and 17.5 ± 0.92 years respectively. Male to female ratio among the patients was 2:1 whereas in control this ratio was 1:1.7. Similarly male to female ratio among the offspring of the patients and controls was equal (1:1) respectively. Likewise body mass index (BMI) among the patients and their offspring was found to be 24.83 ± 1.00 and 21.40 ± 1.10 Kg/m^2, and in normal healthy individuals and their offspring it was noted to be 26.01 ± 1.37 and 22.52 ± 0.73 Kg/m^2 respectively. Among the patients 11 (36%) individuals were found to be smokers whereas in controls only 5

DISTRIBUTION OF PATIENTS AND CONTROL BASED ON DIFFERENT CHARACTERISTICS

	Parents		Control Off springs	
Characteristics	Group A	Group C	Group B	Group D
Age (Years)	55.30±2.22	46.80±1.63	18.20±1.03	17.50±0.92
Male/Female	20/10	15/15	11/19	15/15
BMI (Kg/m^2)	24.83±1.00	26.01±1.37	21.4±1.1	22.52±0.73
Systolic BP	137.33±2.99	126±2.09	110	100
Diastolic BP	87.00±1.58	80.66I±1.143	80	75
Smoking habit	11 (36%)	5 (17%)	NIL	NIL
FH HTN	23 (77%)	16 (53%)	NIL	NIL

BMI = Body Mass Index
FH HTN = Family History of Hypertension
Group A: Abnormal Parents
Group B: Off sping of A
Group C: Normal Parents
Group D: Off sping of C

TABLE – 1

(17%) were found to be smokers. Similarly 23 (77%) individuals among the patients were reported to have a strong family history of hypertension whereas 16 (53%) control individuals were found without strong family history of hypertension (Table 1).

Table-2 regarding chemical analysis shows that total serum cholesterol among the patients (Group A) was 216.30 ± 16.91 mg/dL whereas in normal healthy (Group C) individuals it was noted to be 17346 ± 10.63.19 mg/dL. In the same way it was found to be 175.00 ± 1.99 and 149.56 ± 7.63 mg/dL for their offsprings respectively.

SERUM CHOLESTEROL AND LIPOPROTEIN (a) LEVEL IN PARENTS AND OFF SPRINGS OF THE PATIENTS SUFFERING FROM CAD AND CONTROL

Group	T. Cholesterol (mg/dL)	LP (a) (mg/dL)
A	216.30±16.91	23.86±2.58
C	173.46±10.63	11.80±1.26
P value	<0.005	<0.01
B	175.0±1.99	16.23±1.99
D	149.56±7.63	7.17±1.6
P value	<0.05	<0.01

TABLE – 2

Lp(a) for patients was noted to be 23.86±2.58mg/dL and in controls it found to be 11.80 ± 1.26 mg/dL while Lp(a) among the offsprings of patients and controls was found to be 16.23 ± 1.99 and 7.17 ± 1.6 mg/dL respectively (Table 2).

DISCUSSION

Coronary artery disease (CAD) is a condition of diverse aetiology, all ending in disturbance between oxygen supply and demand[13]. Elevated level of cholesterol have a high incidence of atherosclerosis, many studies published since 1950's have shown that plasma cholesterol is strongly and independently related to the development of CAD and that there is a gradient of risk from lowest to highest plasma cholesterol[14-16]. CAD in the elderly is likely to depend not only on the concentration of cholesterol at an older age but the length of life time exposed to an increased cholesterol level[17].

The importance of early detection of hyperlipidaemia lies in the possibility of delaying or arresting the progression of early

atherosclerotic lesions by lowering cholesterol level. A strong and consistent difference of cholesterol concentration was observed between cases and control (53%) in the studies conducted by Rallidis and coworkers (1998)[4] and Backer *et al.* The present work is in accordance with the above-cited studies ($P<0.01$).

Lipoprotein (a) is the only major lipid risk factor whose levels generally remain fairly constant throughout our life, but are presumably modulated by sex hormones[18] and it shows a strong heritability[4]. Lp (a) concentration greater than 30 mg/dL has been reported to be associated with two folds increased risk for developing CAD[19]. High plasma concentration of Lp (a) is now considered a major risk factor for atherosclerosis and cardiovascular disease[20-21].

A significant positive relation was found between Lp (a) concentration and the number of parental risk factors, children whose grand parents had a history of CAD had Lp (a) concentration shifted towards high values[7, 21]. Craig and co-workers (1998) reporting on the meta-analysis of prospective studies have documented that Lp (a) is an independent prospective risk factor for CAD and that its measurement may be useful to guide management of individuals with a family history of CAD[22]. Elevated levels of Lp (a) have been reported in children with familial hypercholesterolaemia[23-24]. They further suggested that Lp (a) is not only an important risk factor for CAD but is also more strongly related to the risk of CAD than are HDL-c and LDL-c.

The present study provides information regarding Lp(a), TC, in offspring and examines the relation of Lp (a) levels and cholesterol levels to parental myocardial infarction. It was further concluded from the present study that there is a strong positive evidence of higher Lp (a) and cholesterol levels in the offspring of parents with premature myocardial infarction than the normal healthy individuals, suggesting that Lp (a) is a strong lipid variable predisposing to CAD. The familial environment may account for this but the genetic predisposition is stronger as Lp (a) levels are strongly and genetically determined.

CONCLUSION

As Lp (a) levels are primarily under genetic control and do not respond measurably to diet or drug treatment, so persons found to have high Lp(a) levels should focus on controlling the known modifiable risk factors for heart disease, especially smoking, hypercholesterolaemia, hypertension, obesity, diabetes and sedentary life style.

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Address for Correspondence:
Dr. Salma Rahim,
H. No. 13,
Street No. 13,
Tajabad, Peshawar.
Email: raheem_bangash@hotmail.com