e-ISSN: 0975-1556, p-ISSN:2820-2643

Available online on www.ijpcr.com

International Journal of Pharmaceutical and Clinical Research 2023; 15 (3); 1313-1317

Original Research Article

Assessment of Lipoprotein (A) in Acute Coronary Syndrome Patients Admitted Intensive Cardiac Care Unit of Tripura Medical College: A Clinical Study to Compare with Lipoprotein (A) Level in Normal Healthy Persons of Tripura

Tapan Debnath[1], Arpita Das[2], Aparna Debbarma[3], Debina Sarkar[4], Sankar Roy[5]

[1]Associate Professor, Department of Biochemistry, Tripura Medical College and Dr. B.R.A.M. Teaching Hospital, Hapania, Agartala, Tripura, India

[2]Assistant Professor, Department of Biochemistry, Tripura Medical College and Dr. B.R.A.M. Teaching Hospital, Hapania, Agartala, Tripura, India

[3]Assistant Professor, Department of Physiology, Tripura Medical College and Dr. B.R.A.M. Teaching Hospital, Hapania, Agartala, Tripura, India

[4]Assistant Professor, Department of Biochemistry, Tripura Medical College and Dr. B.R.A.M. Teaching Hospital, Hapania, Agartala, Tripura, India

[5]Professor And Head, Department of Biochemistry, Tripura Medical College and Dr. B.R.A.M. Teaching Hospital, Hapania, Agartala, Tripura, India

Received: 25-01-2023 / Revised: 25-02-2023 / Accepted: 25-03-2023

Corresponding author: Dr. Arpita Das

Conflict of interest: Nil

Abstract

Lipoprotein (a) is a low-density lipoprotein containing apolipoprotein(a) and identified as a risk factor for and its related diseases, such as and stroke. Lipoprotein(a)was discovered in 1963 by Kåre Berg. It is a thrombogenic and atherogenic molecule. Due to lack of data from the north eastern part of the country, a case control study was done with the aim of finding an association and to estimate the serum levels of lipoprotein (a) in patients with Coronary artery disease patients admitted in Intensive Cardiac Care Unit. Lp(a) was quantified by immunoturbidiometric method. The serum lipoprotein (a) levels were significantly elevated ($p< 0.0001$) in cases (80±30 mg/dl) as compared to controls (30±20 mg//dl). Lipoprotein(a) levels with routine lipid profile testing were assessed. So it is suggested to make LP(a) serum level determination test as a routine laboratory test for identification of risk factor for AMI.

Introduction

Hyperlipidaemia is one of the major risk factors for coronary artery disease associated with increased levels of low-density lipoprotein cholesterol (LDL-C). Many studies have shown to have residual cardiovascular risk and suffer from Acute Myocardial infarction despite significant LDL-C lowering process. [1] Therefore it is very likely that other factors influencing atherosclerosis of which lipoprotein (a)-[Lp(a)], is a likely candidate. Lp(a) consists of an LDL-like particle and specific apolipoprotein(a), which is bound covalently to apoB contained in the outer shell of the particle.

Apo(a) is a homologue of plasminogen, containing multiple copies of plasminogen

kringle 4, a single copy of plasminogen kringle 5, and inactive protease domain [2]

Lipoprotein(a) was discovered in 1963 by [3] The gene encoding apolipoprotein (a) was successfully cloned in 1987 [4] The structure of apolipoprotein (a) competes with plasminogen for its binding site, leading to reduced and stimulates secretion of PAI-1, leading to thrombogenesis. [5]

Lp (a) binds to atherogenic pro-inflammatory oxidised phospholipids as a preferential carrier of oxidised phospholipids in human plasma. [6] which attracts inflammatory cells to vessel walls and leads to smooth muscle cell proliferation and contributing to atherogenesis. [7] [8]

Lipoprotein(a) - Lp(a) [9]

Desirable: <14 mg/dl (<35 nmol/L)

Borderline risk: 14–30 mg/dl (35–75 nmol/L)

High risk: 31–50 mg/dl (75–125 nmol/L)

Very high risk: >50 mg/dl (>125 nmol/L)

Aims and Objectives:

1. To estimate the serum levels of lipoprotein (a) in patients with coronary artery disease patients admitted in Intensive Cardiac Care Unit.
2. To find an association of Lipoprotein (a) with Acute Myocardial infarction.
3. To assess Lipoprotein(a) levels with routine lipid profile testing.

Materials & Methods: Patients: 50 patients with acute myocardial infarction were selected from a series of consecutive patients admitting the Intensive coronary care unit (CCU) of Tripura Medical College and DR. BRAM Teaching Hospital, Hapania, Agartala, Tripura (West) who had complete data of family history, laboratory findings and clinical information.

All patients and control were older than 35 years old and the controls were the ones who did routine laboratory examinations. Inclusion criteria: absence of a history of smoking, cardiovascular disease and and the age over 35 years old. Exclusion criteria: 1) Patients below 35 years of age 2) Patients taking high dose of vitamin B-complex and statins groups of drugs.

Blood sampling and assay: Fasting venous blood sample from all patients and controls were collected. Blood was centrifuged for 10 minutes and the serum stored at -20°c until analyzed. Lp(a) was quantified by immunoturbidiometric method (CRM Diagnostic system, imported and manufactured by Sirus Biocare pvt. Ltd., p-25, Kalindi Housing Scheme, Kolkata-700089, West Bengal). Total cholesterol, HDL–cholesterol, serum Triglyceride, LDL – cholesterol level were determined by enzymatic methods (by Beckman Coultier, AU-480 Auto analyser).

Lp(a) level of acute MI patients with those of age and sex–matched controls were compared. Lp(a) > 30 mg / dl is the threshold value linked to its pathologic effects and designated as those with high Lp(a) and > 50 mg /dl as very high LP(a). Continuous variables were reported as Mean ±1 standard deviation.

Ethical approval and consent to participate: The present study was performed in the Department of Biochemistry, Tripura Medical College & Dr. B.R.A.M Teaching hospital, Hapania, Agartala, in accordance with the Department of Medicine, Department of Biochemistry, Tripura Medical College & Dr. B.R.A.M Teaching hospital, Hapania, Agartala. Informed consent was obtained from all the subjects. Subjects were worked-up as per the predesigned proforma.

Statistical analysis: Data analyzed with the help of computer software SPSS 10.0 for Windows. Qualitative variables were analyzed and ratio of cases and controls with females and males were performed.

Mean±SD for cases and controls of parameters were analyzed and p-value of < .05 was considered as statistically significant.

Results:

Serum LP(a) in control group is (30±20mg/dl with maximum 130mg/dl). In cases (both male & female patients) mean LP(a) concentration is 78±20 mg/dl with maximum value 485mg/dl) and with significant statistical difference between the two groups (p< 0.005). In case group (AMI patients 35/50 = 70%) with high LP(a) level (LP(a) > 50 mg/ dl) and control group (40/50 =80%) with LP(a)level equal to (30 ± 20) mg/dl are statistically significant (p value < 0.05). The female case group has very high LP(a) concentration (14/18= 77.77%, LP(a) level > 50 mg/ dl) and male case group (10/24 = 23.80%) group has very high LP(a) level > 50 mg/ dl) (19.1mg/dl- 438 mg/dl), which is statistically significant.

Table 1: Demographic data of patients and controls

Age and Sex	Cases	Controls
No.	50	50
Age (Mean)	51	55
Female/Male	18/50	24/50

Table 2: Summary of lipid profile in patients and controls

Parameters	Cases (Mean±SD)	Controls (Mean±SD)
LP(a)	80±30	30±20
Total Cholesterol	180±32	150±30
LDL-C	100±20	90±20
HDL-C	40±10	50±10
Triglyceride	125±20	110±70

Discussion

In this study serum lipoprotein(a) LP-(a) concentration were compared with Acute Coronary syndrome patients and healthy normal subjects. The results showed that in average LP-(a) concentration level in patients (case group) with Acute Myocardial infarction (AMI) is higher than the control group. The result also showed that LP(a) level in women patients are higher than male group patients. The LP-(a) level in blood is independent of lipid profile of blood.

David j. Moliterno et. al showed that elevated plasma concentration of LP-(a) are associated with coronary artery atherosclerosis in Caucasians.(10) Nogues X et al suggested a discriminant cut off of LP(a) concentration equal to 20 mg/dl or 30mg/dl in enzyme immunoassay so that in the future there may be therapeutic method to reduce LP(a) levels which maybe proven to be useful in preventing myocardial infarction.(9) In one South Indian study Rajasekhar et al on 2004 suggested that Lp(a) level > 25mg/dl is risk factor for CHD. Zhimiao Wang et al suggested that despite attaining the target low-lipid profile, a number of CAD patients remain at risk for cardiovascular which could predict worse clinical outcomes even for patients with CAD who achieved target lipid level. Therefore, future studies are warranted to evaluate whether lowering lipoprotein (a) level can offer cardiovascular benefits in patients with CAD). [11]

The study results shows the values of Lp(a) in cases is higher in females and it is also evident from the studies of Ashfaq et al which also reported higher Lp(a) values in 270 patients of CAD as compared to 90 controls without CAD. [12] The Copenhagen City Heart Study showed that there was a stepwise increase in MI risk and absolute 10-year cardiovascular risk

with increasing Lp(a) levels in a large Danish general population. [13] At Lp (a) > 95th percentile (≥120 mg/dl) there was a 3–4-fold increase in risk of AMI. Lp(a) likely increases AMI risk and CAD severity through its inhibition of fibrinolysis, and owing to prothrombotic, proatherogenic and pro-inflammatory effects that lead to plaque instability. [14]

Limitations:

Firstly, this is a hospital-based case-control study, which could not identify the causal association between Lp(a) concentrations and risk of AMI in participants with normal LDL-C levels. Multi-center and prospective study design should be carried out. Secondly, the Lp(a) levels in our study were detected as mass concentration but not particle concentration, which might lead to the discrepancy of measurements. Thirdly, more numbers of cases and controls could not be collected because of time duration which could have provided with many other aspects and impacts of risk factors association with Lp(a).

Conclusion

An elevated Lp(a) concentration is associated AMI and a risk factor for AMI suggesting that Lp(a) may play an important role in the genesis of thrombotic coronary occlusion and the occurrence of AMI. So, it is suggested to make LP(a) serum level determination test as a routine laboratory test for identification of risk factor for AMI and proper follow up eventually.

Acknowledgement: We thank all our colleagues at the Department of Biochemistry, Tripura Medical College & Dr. B.R.A.M Teaching hospital, Hapania, Agartala.

References

1. Nordestgaard BG et al. Lipoprotein(a) as a cardiovascular risk factor: current status. Eur. Heart J. 31(23): 2844–53.
2. McLean JW et al. cDNA sequence of human apolipoprotein(a) is homologous to plasminogen. Nature. 1987; 330(6144): 132–7.
3. Berg K. A new serum type system in man-the Lp system. Acta Pathol Microbiol Scand. 1963;59(3): 369–82.
4. Utermann G et al (). Lp(a) glycoprotein phenotypes. Inheritance and relation to Lp(a)-lipoprotein concentrations in plasma. J. Clin. Invest. August 1987; 80(2): 458–65.
5. Paultre F et al. High levels of Lp(a) with a small apo(a) isoform are associated with coronary artery disease in African American and white men. Arterioscler. Thromb. Vasc. Biol. 2000; 20(12): 2619–24.
6. Brilakis ES et al. Oxidized phospholipids, Lp(a) lipoprotein, and coronary artery disease. The New England Journal of Medicine. July 2005; 353(1): 46-57.
7. Gouni-Berthold I, Berthold HK. Lipoprotein(a): current perspectives. Curr Vasc Pharmacol. November 2011; 9(6): 682–92.
8. Tsimikas S, Witztum JL., The role of oxidized phospholipids in mediating lipoprotein (a) atherogenicity. Curr. Opin. Lipidol. August 2008; 19(4): 369–77.
9. Ryan, George M; Julius Torelli. Beyond cholesterol: 7 life-saving heart disease tests that your doctor may not give you. New York: St. Martin's Griffin. 2005; 91. 978-0-312-34863-27.
10. Klausen IC, Sjøl A, Hansen PS, Gerdes LU, Møller L, Lemming L, Schroll M, Faergeman O. Apolipoprotein(a) isoforms and coronary heart disease in 13 men: a nested case-control study. Atherosclerosis. July 1997; 132 (1): 77–84.
11. Konishi H, Miyauchi K, Kasai T, Tsuboi S, Ogita M, Naito R, Sai E, Fukushima Y, Katoh Y, Okai I, et al. Impact of lipoprotein(a) as residual risk on long-term outcomes in patients after percutaneous coronary

intervention. Am J Cardiol. 2015;11: 5(2):157–160.
12. Ashfaq F, Goel PK, Sethi R, Khan MI, Ali W, Idris MZ. Lipoprotein (a) Levels in Relation to Severity of Coronary Artery Disease in North Indian Patients. Heart Views. 2013. Jan;14(1):12–6.
13. Kamstrup PR, Benn M, Tybjærg-Hansen A, Nordestgaard BG. Extreme lipoprotein(a) levels and risk of myocardial infarction in the general population: the Copenhagen City Heart Study. Circulation. 2008; 117(2):176-184.
14. Tamubango Kitoko H., Marqueurs de définition du statut martial néonatal. Journal of Medical Research and Health Sciences, 2023; 6(2): 2441–2449.