Original Article

Nepalese Heart Journal 2025; Vol 22(2), 53-57

Prevalence of Elevated Lipoprotein A (Lp(A)) in Nepalese Patients with Traditional Risk Factors of Atherosclerotic Cardiovascular Disease (ASCVD)

Suman Adhikari[1], Rajendra Poudel[1], Surya Bahadur Hamal Thakuri[1], Shankar Baral[1], Choodamani Nepal[1], Umesh Dhungana[1] , Arjun Kumar Budha[1], Gobind Rawat[1], Sunita Ghimire[2], Sandesh Devkota[3], Manju Sharma[4], Deen Dayalu Ghimire[4], Ravi Sahi[5], Vijay Yadav[6], Varsha Manandhar[7]

[1] Department of Internal medicine, Pokhara Academy of Health Sciences, Pokhara, Nepal.
[2] Department of Pediatrics, Pokhara Academy of Health Sciences, Pokhara, Nepal.
[3] Shishuwa Hospital, Pokhara, Nepal.
[4] Nepal Mediciti Hospital, Lalitpur, Nepal.
[5] Sahid Gangalal National Heart Centre, Kathmandu, Nepal.
[6] Department of Cardiology, Manmohan Cardiothoracic Vascular and Transplant Centre, Kathmandu, Nepal.
[7] Manipal College of Medical Sciences, Pokhara, Nepal.

Corresponding Author:
Suman Adhikari
Department of Internal Medicine,
Pokhara Academy of Health Sciences, Pokhara, Nepal.
Email: adhikari11613@gmail.com
ORCID ID NO: 0000-0001-8402-5325

Cite this article as: Adhikari S, Poudel R, Thakuri SBH, Baral S, Nepal C, Dhungana U, Budha AK, Rawat G, Ghimire S, Devkota S, Sharma M, Ghimire DD, Sahi R, Yadav V, Manandhar V. Prevalence of Elevated Lipoprotein(a) in Nepalese Patients with Traditional Risk Factors of Atherosclerotic Cardiovascular Disease (ASCVD). Nepalese Heart Journal. 2025;22(2):53–57.

Submission Date: 26 April, 2025
Acceptance date: 19 October, 2025

Submitted using Strobe checklist

Abstract

Background and aims: One important residual CVD risks is elevated level of lipoprotein a (Lp(a)). High Lp(a) level is atherogenic. It's higher prevalence in South Asian population is important because of a higher prevalence of premature coronary artery disease in younger population of this region. Lp(a) testing is underutilized. Knowing elevated levels in an individual may help address and control traditional risk factors of ASCVD in such patients.

Methods: This study was an observational, prospective study carried out in the department of internal medicine, Pokhara Academy of Health Sciences(POAHS), Nepal. The study was started on 17th September 2023 and completed on 16th March 2024. The details of history and the physical examination of cases were recorded in the proforma designated for the study. Baseline data were recorded including age, sex, presence of risk factors like diabetes mellitus(DM), hypertension(HTN), dyslipidemia, smoking, history of CAD (coronary artery disease) and coronary revascularization, family history of premature CAD, lab parameters like blood glucose, lipid profiles, Lp(a), ECG, echocardiography, coronary angiography. Statistical analysis was carried out with the help of the latest version of SPSS.

Results: The mean age was 48.52 years (SD=9.06). Majority were (56%) male patients. 42 cases (84%) were dyslipidemics and 26 (52%) were hypertensives, 10 cases (20%) had family history of coronary artery disease in first degree relatives, 10(20%) had coronary artery disease, eight (16%) had DM, two (4%) were smokers. Elevated Lp(a) (>/=50mg/dl) was found in 14(28%) of total cases. Of total cases, Lp(a) was <20mg/dl in 30 (60%), 20-49mg/dl in 6(12%) and thus Lp(a) >/=20 mg/dl was observed in 40% of cases.

Conclusion: The prevalence of elevated Lp(a) in Nepalese patients with traditional risk factors of ASCVD is high. These findings from our study may carry important implications for clinical practice in Nepal. Performing targeted screening in high-risk individuals may help redefine risk category and may help in aggressively managing traditional risk factors

Keywords: ASCVD, Coronary Artery Disease (CAD), Lp(a).

DOI: https://doi.org/10.3126/nhj.v22i2.85794

Introduction

Cardiovascular disease is the most important cause of mortality and morbidity worldwide. Inspite of significant development in the treatment of traditional risk factors of ASCVD, there is still a high burden of ASCVD among patients possibly because of the higher burden of residual cardiovascular disease (CVD) risk. One of the important residual CVD risks is elevated level of Lp(a). CAD is an important component of ASCVD. It's elevated prevalence in south Asian population is quite important due to the alarmingly higher prevalence of premature coronary artery disease in young population of this region. Because of this fact , the prevalence of CAD is also high in those residing in other parts of world like United States[1].

High Lp(a) levels are very atherogenic. It predisposes to atherosclerosis in coronary,cerebral and peripheral vessels,to make it even worse, prematurely in younger individuals. Lp(a) level is genetically determined[2–9].

In one study ,five times higher Lp(a) levels were found in patients with CAD in comparison to controls[10].

In other study Lp(a) levels were significantly higher in cases with angiographically proven CAD as compared to controls[11].

It is estimated that Lp(a) levels of >30 and >50 mg/dL are present in 35% - 40% and 24% -29% of the world population, respectively[12].

Inspite of recommendations from guidelines, Lp(a) testing still remains underutilized. The rate of testing is even low in United States, let alone the rates in developing countries[13].

Knowing elevated levels in an individual may help. We can aggressively address and control traditional risk factors of ASCVD in such patients.

The most important available Lp(a) lowering therapy is lipoprotein apheresis[14].

Lipid lowering agents like PCSK9 inhibitor like alirocumab is also effective which can lower Lp(a) by 25-30%[15].

So this study aims to figure out the prevalence of elevated levels of lipoprotein a (Lp(a)) in Nepalese patients with traditional risk factors of ASCVD.

Methods

This was a prospective, observational study. The study period was from 17th September 2023 to 16th March 2024. Because of lack of robust national data and financial constraint, the target sample size was calculated pragmatically. Prior to the main study, a feasibility assessment was conducted which provided 6-8 number of eligible patient in a month. Depending on this assessment and cost factor associated with the Lp(a) test, a sample size of 50 was set for a duration of six months. All consecutive patients with traditional risk factors of ASCVD (HTN, DM,dyslipidemia,smoking,family history of CAD) in the department of internal medicine of POAHS over a period of 6 months were included. Dyslipidemia was diagnosed when there was presence of any of the followings : patients on lipid lowering agents or total cholesterol >240 mg/dl, triglycerides (TG) >150 mg/dl, low-density lipoprotein >130 mg/dl, and high-density lipoproteins (HDL) <50 mg/dl females and <40mg/dl for males. All patients with traditional risk factors of ASCVD, with age more than 16 years were enrolled in this study. Consent in the written form was taken from the patients before enrolling them in the study. Thorough history was obtained. Detailed physical examination was performed after the consent. The details of history and the physical examination of cases were recorded in the proforma designated for the study. Baseline data were recorded, including age, sex, the presence of risk factors like diabetes mellitus , hypertension, dyslipidemia, smoking, history of coronary artery disease and coronary revascularization, the family history of premature CAD, lab parameters like blood glucose, lipid profiles, Lp(a) , ECG, echocardiography, coronary angiography. The diagnosis of elevated lipoprotein (Lp(a)>/= 50mg/dl) was done by serum immunoturbidimetry. This method uses antibodies specific for apolipoprotein (a) with very less crossreactivity with plasminogen. Blood samples were drawn from a peripheral vein and collected in a plain vial, irrespective of fasting status of the patients. Then serum samples were prepared and assays were run. Data collection from patients was performed with the help of questionnaires, the physical assessment, relevant laboratory parameters. Data entry and analysis were carried out with the help of an excel sheet and SPSS latest version. For continuous variable independent t-test and for categorical variables Fisher's Exact test were used. Ethical approval was obtained from institutional review committee(IRC) of Pokhara Academy Health Sciences.

Results

50 patients with traditional ASCVD risks were included in this study. The mean age of patients was 48.52 ± 9.06 years. Of total patients 28 (56%) were males and 22 (44%) were females. 42 cases (84%) were dyslipidemics and 26 (52%) were hypertensives,10 cases (20%) had a history of CAD in first degree relatives, 10(20%) had coronary artery disease, eight (16%) had DM, two (4%) were smokers. Three cases (6%) gave history of coronary revascularization in the past. Seven (14%) cases underwent coronary angiography in the past of which five (10% of total patients) had elevated serum Lp(a) (>/=50mg/dl). Four (8%) patients had left ventricular systolic dysfunction (LVSD).

Elevated Lp(a) (>/=50mg/dl) was found in 14(28%) of total cases.

Table 1:Baseline characteristics

Baseline characteristics of the patients	
Characteristics	**Total(n=50)(%)**
Number of pts	50(100%)
Mean age(years+/-SD)	48.52 ± 9.06
Male	28 (56%)
Female	22 (44%)
Dyslipidemia	42(84%)
HTN	26 (52%)
Family history of CAD	10(20%)
History of CAD	10 (20%)
DM	8(16%)
Underwent CAG	7(14%)
History of coronary revasularization	3 (6%)
Elevated Lp(a) >/=50mg/dl	14(28%)
Mean Lp(a) level	39.50mg/dl
Smoking	2(4%)
LVSD	4(8%)

Table 2: Table comparing baseline characteristics between those with high Lp(a)>/=50mg/dl with those having Lp(a) <50mg/dl

Characteristics	Lp(a)<50mg/dl (n=36)	Lp(a)>/=50mg/dl (n=14)	P-value
Age	48.33+/-9.06	49.00+/-8.66	0.821
Male	18(50%)	10(71.4%)	0.214
Dyslipidemia	29(80.6%)	13(92.9%)	0.422
Hypertension (HTN)	17(47.2%)	9(64.3%)	0.347
(Diabetes Mellitus) DM	5(13.9%)	3(21.4%)	0.667
Smoking	2(5.6%)	0	0.99
Prior CAD	5(13.9%)	5(35.7%)	0.117
Family history of CAD	6(16.7%)	4(28.6%)	0.434
History of prior revascularization	1(2.8%)	2(14.3%)	0.191

Table 3: Lp(a) levels in serum

As in table 3, of total cases, Lp(a) was <20mg/dl in 30 (60%), 20-49mg/dl in 6(12%) and >/=50mg/dl in 14(28%) cases respectively.

Lp(a) levels	Total (n=50)(%)
<20mg/dl	30 (60%)
20-49mg/dl	6(12%)
>/=50mg/dl	14(28%)

Table 4:Coronary angiographic pattern in those with elevated Lp (a),who underwent CAG

CAG pattern in the individuals with elevated Lp(a)>/=50mg/dl	Total
(n=5)	
Normal coronary arteries	2
Instent restenosis (ISR)	1
Single vessel disease (SVD)	1
Minor CAD	1

Out of five (35.71%) cases with elevated Lp(a)>/=50mg/dl, one (20%) had the history of ISR, one (20%) had single vessel disease and, one (20%) had minor CAD .

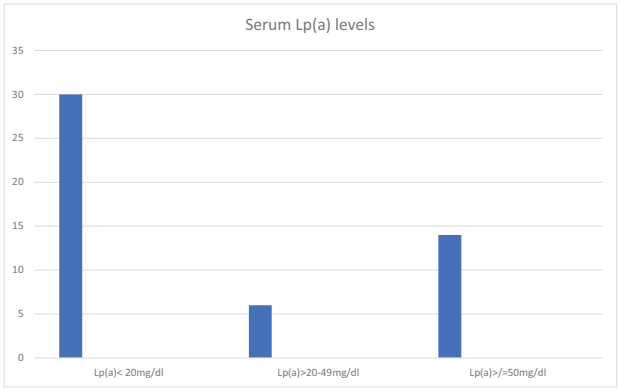

Figure 1: *Serum Lp(a) levels*

DISCUSSION

A study which compared Lp(a) levels in Americans of African, Asian Indian, and Caucasian origin women respectively showed that Asian Indian Americans had higher levels of Lp(a) than the African Americans[16].

Another study comparing Lp(a) levels in 47 women from South Asian region with those from America showed higher levels of Lp(a) in South Asian women (median level: 50.7 nmol/l versus 18.3 nmol/l , $p < 0.012$)[17].

Anand et al compared Lp(a) levels in North Americans and found that Lp(a) levels in North Americans of South Asian origin were higher than those in North Americans of Caucasian origin. His findings revealed that the mean Lp(a) concentration was significantly higher in South Asians (20.2 mg/dL) compared with Caucasian Americans (16.3 mg/dL, $P < 0.002$)[18].

Similar to these previous studies, our study showed a higher mean Lp(a) level in the Nepalese population akin to other South Asian populations , suggesting that Nepalese may carry a higher burden of residual CV risk beyond the traditional ones.

As far as the prevalence of elevated Lp(a) level in Nepalese population is concerned, the data are limited. So the best literatures available for this topic concerned are available from our neighbouring South Asian countries. The prevalence of elevated Lp(a) level in South Asians is about 25%[19]. In a Nepalese study conducted by Tamang HK et al , the mean serum Lp(a) level in patients with MI was 38.45 mcg/dl as compared to the mean value of 39.5 mg/dl in our study[20]. Concordant with them, we too have a higher prevalence of elevated Lp(a) levels (28%) in our population as per the findings from our study.

The average age of cases in our study was 48.52 ± 9.06 years reflecting that mostly young individuals had been enrolled to ensure the importance of elevated Lp(a) levels in such individuals in the causation of premature CAD highlighting the importance of adequate control of traditional risk factors in them.

Regarding the cut off value of elevated Lp(a) in South Asians, majority of studies from India have found that with Lp(a) >/=20mg/dl, elevated CV risk exists but European atherosclerosis society 2010 recommended the cut off value of 50mg/dl[19,21]. The prevalence of Lp(a) >/=20 mg/dl in our study was 40%. This shows that Nepalese population is somehow is at higher risk of ASCVD similar to other South Asian populations.

There appears to be a wide knowledge gap among health care providers in Nepal in relation to the Lp(a) value, its measurement, indications for screening and treatment strategies. So this prevalence study, though seems simple, can lay a foundation stone for future studies related to Lp(a) levels in Nepalese population. Clinicians should offer targeted testing to the Nepalese individuals who are high risk individuals for CV events, for e.g, personal or family history of premature ASCVD, familial hypercholesterolemia, recurrent CV events. But to offer a single test to each and every individual in his or her lifetime may not be feasible in our part of world because of high cost of the testing. So to have clinical evaluation first and then to add this test on it by individualizing may be more cost effective in Nepalese context.

CONCLUSION

Findings from our study shows higher prevalence of elevated Lp(a) in Nepalese patients with traditional risk factors of ASCVD. As Nepalese population contributes to a significant proportion of South Asian ancestry in which genetic predisposition for high Lp(a) remains high, these findings from our study may carry important implications for clinical practice in Nepal. Performing targeted screening in high-risk individuals may help redefine risk category and may help in aggressively managing traditional risk factors in such individuals e.g, optimal control of HTN,DM and dyslipidemia.

LIMITATIONS OF THE STUDY

- The main limitation of this study is small sample size and short time period. Small sample size limits the statistical power to detect strong associations,
- This is a single centre study.
- The population enrolled in this study may not represent otherwise healthy population who donot have traditional CV risk factors.

Acknowledgment

I would like to thank Professor Dr. Ratna Mani Gajurel and Dr. Chandra Mani Poudel for their continuous support and guidance.

REFERENCES

1. Bilen O, Kamal A, Virani SS. Lipoprotein abnormalities in south Asians and its association with cardiovascular disease: current state and future directions. World J Cardiol. 2016; 8 (3): 247-57. https://doi.org/10.4330/wjc.v8.i3.247 PMid:27022456 PMCid:PMC4807313
2. 2. Enas EA, Chacko V, Senthilkumar A, Puthumana N, Mohan V. Elevated lipoprotein (a)-a genetic risk factor for premature vascular disease in people with and without standard risk factors: a review. Dis Mon. 2006;52(1):5-50. https://doi.org/10.1016/j.disamonth.2006.01.002 PMid:16549089
3. 3. Luc G, Bard JM, Arveiler D, Ferrieres J, Evans A, Amouyel P, et al. Lipoprotein (a) as a predictor of coronary heart disease: the PRIME Study. Atherosclerosis. 2002;163(2):377-84. https://doi.org/10.1016/S0021-9150(02)00026-6 PMid:12052486
4. 4. Nguyen TT, Ellefson RD, Hodge DO, Bailey KR, Kottke TE, Abu-Lebdeh HS. Predictive Value of Electrophoretically Detected Lipoprotein(a) for Coronary Heart Disease and Cerebrovascular Disease in a Community-Based Cohort of 9936 Men and Women. Circulation. 1997 Sep 2;96(5):1390-7. https://doi.org/10.1161/01.CIR.96.5.1390 PMid:9315522
5. Mooser V, Scheer D, Marcovina SM, Wang J, Guerra R, Cohen J, et al. The Apo (a) gene is the major determinant of variation in plasma Lp (a) levels in African Americans. Am J Hum Genet. 1997;61(2):402-17. https://doi.org/10.1086/514851 PMid:9311746 PMCid:PMC1715889
6. Wilcken DE, Wang XL, Greenwood J, Lynch J. Lipoprotein (a) and apolipoproteins B and A-1 in children and coronary vascular events in their grandparents. J Pediatr. 1993;123(4):519-26. https://doi.org/10.1016/S0022-3476(05)80944-8 PMid:8410502
7. Boerwinkle E, Leffert CC, Lin J, Lackner C, Chiesa G, Hobbs HH. Apolipoprotein (a) gene accounts for greater than 90% of the variation in plasma lipoprotein (a) concentrations. J Clin Invest. 1992;90(1):52-60. https://doi.org/10.1172/JCI115855 PMid:1386087 PMCid:PMC443062
8. Durrington PN, Hunt L, Ishola M, Arrol S, Bhatnagar D. Apolipoproteins (a), AI, and B and parental history in men with early onset ischaemic heart disease. The Lancet. 1988;331(8594):1070-3. https://doi.org/10.1016/S0140-6736(88)91895-8 PMid:2896911
9. Kostner GM, Czinner A, Pfeiffer KH, Bihari-Varga M. Lipoprotein (a) concentrations as risk indicators for atherosclerosis. Arch Dis Child. 1991;66(9):1054-6. https://doi.org/10.1136/adc.66.9.1054 PMid:1929512 PMCid:PMC1793056
10. Chopra V, Vasisht S, Gulati S, Manchanda SC. Serum levels of lipoprotein (a) and other lipids in angiographically defined coronary artery disease patients and healthy blood bank donors. Indian J Med Sci. 2000;54(7):284-9.
11. Gambhir JK, Kaur H, Gambhir DS, Prabhu KM. Lipoprotein (a) as an independent risk factor for coronary artery disease in patients below 40 years of age. Indian Heart J. 2000;52(4):411-5.
12. Varvel S, McConnell JP, Tsimikas S. Prevalence of Elevated Lp(a) Mass Levels and Patient Thresholds in 532 359 Patients in the United States. Arterioscler Thromb Vasc Biol. 2016 Nov;36(11):2239-45. https://doi.org/10.1161/ATVBAHA.116.308011 PMid:27659098
13. Bhatia HS, Hurst S, Desai P, Zhu W, Yeang C. Lipoprotein(a) Testing Trends in a Large Academic Health System in the United States. J Am Heart Assoc. 2023 Sep 19;12(18):e031255. https://doi.org/10.1161/JAHA.123.031255 PMid:37702041 PMCid:PMC10547299
14. Kroon AA, van't Hof MA, Demacker PN, Stalenhoef AF. The rebound of lipoproteins after LDL-apheresis. Kinetics and estimation of mean lipoprotein levels. Atherosclerosis. 2000;152(2):519-26. https://doi.org/10.1016/S0021-9150(00)00371-3 PMid:10998482
15. Bittner VA, Szarek M, Aylward PE, Bhatt DL, Diaz R, Edelberg JM, et al. Effect of Alirocumab on Lipoprotein(a) and

Cardiovascular Risk After Acute Coronary Syndrome. J Am Coll Cardiol. 2020 Jan;75(2):133-44. https://doi.org/10.1016/j.jacc.2019.10.057 PMid:31948641

16. Palaniappan L, Anthony MN, Mahesh C, Elliott M, Killeen A, Giacherio D, et al. Cardiovascular risk factors in ethnic minority women aged≤ 30 years. Am J Cardiol. 2002;89(5):524-9. https://doi.org/10.1016/S0002-9149(01)02291-3 PMid:11867035

17. Kamath SK, Hussain EA, Amin D, Mortillaro E, West B, Peterson CT, et al. Cardiovascular disease risk factors in 2 distinct ethnic groups: Indian and Pakistani compared with American premenopausal women. Am J Clin Nutr. 1999;69(4):621-31. https://doi.org/10.1093/ajcn/69.4.621 PMid:10197563

18. Anand SS, Enas EA, Pogue J, Haffner S, Pearson T, Yusuf S. Elevated lipoprotein (a) levels in South Asians in North America. Metabolism. 1998;47(2):182-4. https://doi.org/10.1016/S0026-0495(98)90217-7 PMid:9472967

19. Enas EA, Varkey B, Dharmarajan TS, Pare G, Bahl VK. Lipoprotein (a): An underrecognized genetic risk factor for malignant coronary artery disease in young Indians. Indian Heart J. 2019;71(3):184-98. https://doi.org/10.1016/j.ihj.2019.04.007 PMid:31543191 PMCid:PMC6796644

20. Tamang HK, Timilsina U, Singh KP, Shrestha R, Bist K, Maharjan L, Shakya S. Serum lipoprotein (a) concentration is a better predictor of myocardial infarction than traditional lipid profile and lipid ratios. International Journal of Applied Sciences and Biotechnology. 2013 Sep 25;1(3):106-9. https://doi.org/10.3126/ijasbt.v1i3.8583

21. Nordestgaard BG, Chapman MJ, Ray K, Borén J, Andreotti F, Watts GF, et al. Lipoprotein (a) as a cardiovascular risk factor: current status. Eur Heart J.2010;31(23):2844-53.https://doi.org/10.1093/eurheartj/ehq386 PMid:20965889 PMCid:PMC3295201