



Original Research Article

Studying atherogenic index of plasma and lipoprotein (A) for better cardiac risk stratification in public health

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ARTICLE INFO

Article history:

Received 09-10-2019

Accepted 28-11-2019

Available online 13-03-2020

Keywords:

High Density Lipoprotein (HDL)

Atherogenic Index of Plasma (AIP)

Lipoprotein(a) [Lp(a)]

ABSTRACT

Aim: The aim of the study is to correlate Atherogenic Index of Plasma {AIP = $\log(TGL/HDL)$ } and with Lipoprotein(a) concentrations in diabetic patients compared to healthy subjects.

Materials and Methods: The study included 30 non-diabetic subjects and 30 diabetic patients. Lipoprotein(a) [Lp (a)] was estimated by Immunoturbidimetry and the parameters Triglyceride and High Density Lipoprotein (HDL) by their respective methods in Biochemistry Auto-analyzer.

Results: It was found that, there is a positive correlation of Lp(a) with the AIP.

Conclusion: It is summarized that, the lipoprotein ratio like AIP shall be accepted as a better indicator of cardio-vascular risk other than taking into account one of the lipoproteins as such. Estimating Lipoprotein(a) is costlier compared to the other lipoproteins, which makes it an objectionable parameter by the patients themselves. In the future, we would thereby, insist the rationale behind estimating the lipoprotein ratios as better markers of assessing cardio-vascular risks.

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1. Introduction

The most important risk factors for Cardio-vascular disease (CVD) consist of dyslipidemia, hypertension, obesity and physical inactivity. Dyslipidemia being is the major predictor for CVD.¹ By 2020, global CVD prevalence will rise by 75% in developing countries.²

Hyperlipidemia is the most common type of dyslipidemia which includes increased Triglycerides (TGL), Total Cholesterol, Low Density Lipoprotein (LDL), and decreased High Density Lipoprotein (HDL). This is supported by a study conducted in urban population of south India.³ The study states, that the prevalence of CV D is increased in Hyperlipidemia.

The commonly known fact that, obese individuals are more prone to cardiovascular events is questioned by a study which says hyperlipidemia can also be seen in non-

obese individuals.⁴ Lipoprotein(a) [Lp (a)], an individual parameter and a type of LDL has shown its specificity on the CVD.⁵

To understand more as a predictor of CVD, the two most important lipid profile parameters, LDL and HDL taken together to calculate the Atherogenic Index of Plasma (AIP) and the single most significant parameter were compared among diabetic patients.

Estimating Lp(a) is costlier and not a routine parameter. This study was also aimed to highlight the importance of the ratio of the usually estimated lipid parameters, LDL and HDL on the single effective and costlier parameter, Lp(a).

2. Materials and Methods

The study included 30 non-diabetic subjects as Group A and 30 diabetic patients as Group B from Sree Balaji Medical College Hospital, Chennai. Blood samples were drawn from the participants after overnight fasting. Lipoprotein(a) was

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Table 1: Parameters with their methods of estimation

Parameter	Method
TGL	Enzymatic GPO-POD
HDL	Direct antibody inhibition
Lp(a)	Immunoturbidimetry

Table 2: Values of TGL and HDL among group A & B

Group	Parameter	N	Min	Max	Mean	Std. Deviation
A	TGL	30	116	188	155.43	19.611
	HDL	30	30	60	44.00	10.072
B	TGL	30	180	282	209.63	24.848
	HDL	30	18	55	35.03	9.936

Table 3: Comparison of Lp(a) and AIP among the subjects in group A

Group A	N	Mean	Std. Deviation	df	t - Statistics	P - Value
Lp(a)	30	10.2867	1.29075	58	40.459	0.000*
AIP	30	0.7464	0.04552			

p- value < 0.05 is considered statistically significant.

Table 4: Comparison of Lp(a) and AIP among the controls in group B

Group B	N	Mean	Std. Deviation	df	t - Statistics	P - Value
Lp(a)	30	22.1200	4.31544	58	27.250	0.000*
AIP	30	0.6447	0.09865			

p – value < 0.05 is considered statistically significant.

estimated by Immunoturbidimetry by Respos 910 analyzer and the parameters, TGL and H DL by their respective methods in Erba MI-150 Auto-analyzer.

The sample collection was in accordance to the ethical criteria of the institute.

AIP was calculated with the help of the formula, $AIP = \log (TGL/HDL)$.

3. Results

The results of the parameters of group A and B are as follows. The parameters, Lp(a) and the calculated parameter AIP, were compared within their group A & B with the help of Independent t test under the guidance of the statistician.

4. Discussion

The study reveals a positive correlation of AIP with the Lp(a). When the TG L/HDL and Lp(a) values were compared by the difference in the mean values among the patients in Group A who are non-diabetic subjects, it showed a highly significant value $p < 0.001$. It was also highly significant with $p < 0.001$ when the same variables were compared among the Group B, diabetic patients.

A study conducted by Kanthe PS et al, atherogenic index was the best indicator of CVD next to dyslipidemia.⁶ This was in accordance with a study, which concludes that serum

triglyceride level has a predicting ability along with HDL.⁷ The above mentioned studies highlight the importance of commonly tested lipid parameters and correlation of these lipid parameters among each other has a very good predicting capacity of CVD. From this study, the calculated parameter AIP, obtained from TGL and HDL, had a mean of 0.74 among the control group A and a mean of 0.64 among the study group B [Tables 3 and 4].

Considering the variation in prevalence and prognosis of CVD based on different races , based on the Lp(a), a study conducted by Dahlen GH et al among the white patients concludes Lp (a) as a n important risk factor for CVD.⁸ Another study conducted by Heyden S, et al compared Lp (a) levels between black and white races. The study concluded that, Lp(a) levels are important in black race people than the white race. Lp(a) levels were also significantly increased in Cerebrovascular disease, apart from CVD.⁹ This is supported by a study conducted by Howard BV et al among two ethnic groups, which showed a relation of Lp(a) with LDL and fibrinogen.¹⁰ Increase in LDL and fibrinogen are considered to be important causes for CVD. The study also suggested longitudinal data to understand Lp(a) as a predict or in CVD disease among various ethnic groups. The present study was hence conducted to study the significance of Lp(a) in Asian population. From this study, the parameter Lp(a) had a mean of 10.29 among the control group A and a mean of 22.12 a

among the study group B [Tables 3 and 4].

The need to predict CVD at an early age and in non-obese younger population is growing recently. This fact is supported by a study conducted by Cunningham TE et al , Chu NF et al and Herd SL et al among various ethnic groups , which concluded that Lp(a) to be estimated in children with a family history of premature CVD and more effective than anthropometry.^{11–13}

Lp(a) is being considered as a better prediction marker of CVD in various other studies. Increased Lp(a) concentration is related to vascular events like CVD and stroke, a study says.¹⁴

The pathogenesis of Lp(a) in CVD was explained genetically by studies conducted by Clarke R et al and Spence JD.^{15,16} The former study identified two Lp (a) variants and according to the latter study, strong correlation between Lp (a) and kringle IV type 2 genotype atherosclerotic stenosis in the coronary, carotid, and femoral arteries. These facts are supported by a study conducted by Phan BAP et al, suggesting the involvement of Lp(a) in commencement and development of atherosclerosis.¹⁷

According to a study conducted by Oladipo A et al, women had increased AIP than men with high significance.¹⁸

A study conducted by Anupama Kamath et al had decreased HDL levels with increased BMI in women , similar to our study [Table 2].¹⁹

AIP as a risk predictor for CVD was also proved by a study conducted by CJ Ikewuchi.²⁰

Our study shows a higher significance of $p < 0.001$ when Lp(a) and AIP were compared within the control group and the study group, revealing the importance of these parameters in predicting a case of CVD.

Hence, there is an increase in the AIP among diabetics when compared to the non-diabetics, which correlated with the Lp(a) values with high significance.

5. Conclusion

It is summarized that, the Atherogenic index of plasma will have to be accepted as a better indicator of cardio-vascular risks other than taking into account one of the lipoproteins as such. Estimating Lipoprotein(a) is costlier compared to the other lipoproteins, which makes it an objectionable parameter by the patients themselves. In the future, we would thereby, insist the rationale behind estimating the lipoprotein ratios as better markers of assessing cardiovascular risks.

6. Source of funding

None.

7. Conflicts of interest

None.

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Cite this article: Vasanthan M, Birundha. S , Lalitha.S S, Rajalakshmi K , Balasubramanian. A . **Studying atherogenic index of plasma and lipoprotein (A) for better cardiac risk stratification in public health.** *Int J Clin Biochem Res* 2020;7(1):76-79.