Atherogenic Index of Plasma (AIP) in Hypertensive Individuals: A Case Control Study

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Increased level of Atherogenic index of plasma (AIP) can cause atherosclerosis and lead to develop hypertension. The objective of the study was to evaluate the relationship between Atherogenic index of plasma (AIP) & hypertension. A total of 100 subjects were enrolled by purposive and convenient sampling. Study population were divided into case and control group based on presence or absence of hypertension respectively. Cases were again divided into controlled and uncontrolled hypertensive group. Atherogenic index of plasma (AIP) was measured in both group and compared. Patients of case & control group were similar in terms of age and sex. Atherogenic index of plasma (AIP) was significantly (P= 0.001) higher in case group than control group. Atherogenic index of plasma (AIP) was non significantly (P=0.445) higher in uncontrolled hypertensive subjects than controlled hypertensive subjects. 49 (98%) cases were within increased risk group of atherogenesis where as in control group it was 42 (84%) which was statistically significant (P < 0.05). A significant (P < 0.05) positive correlation between Atherogenic index of plasma (AIP) and Systolic blood pressure (SBP) & Diastolic blood pressure (DBP) was observed. From this study, it can be concluded that increased level of Atherogenic index of plasma (AIP) level is associated with hypertension. Increased level of AIP is found in uncontrolled hypertensive patients than controlled hypertensive patients.

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Key words: Atherogenic index of plasma (AIP), Hypertension

Introduction

Hypertension is an important public health challenge worldwide because of its high prevalence and the concomitant increase in risk of other diseases. Hypertension is one of the most important modifiable risk factor for cardiovascular, cerebrovascular and renal disease and one of the most preventable and treatable causes of premature deaths worldwide.[1]

Hypertension increases the risk for a variety of cardiovascular diseases including stroke, coronary artery disease etc. Hypertension accounts for an estimated 54 percent of all strokes and 47 percent of all ischemic heart disease events globally.[2] Hypertension in adult is diagnosed when the average of two or more diastolic and systolic blood pressure measurements on at least two subsequent visits

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are more than 90 and 140 mmHg respectively.[3] Its early detection and treatment can prevent a lot of serious complications such as heart attack, stroke, kidney diseases and heart failure.[4]

The prevalence of hypertension is increasing day by day. The estimated total number of adults with hypertension in 2000 was 972 million. Of these, 333 million were estimated to be in economically developed countries and 639 million in economically developing countries. By 2025, the number of people with hypertension will increase by about 60% to a total of 1.56 billion as the proportion of elderly people will increase significantly. Since the proportion of hypertensive people will increase dramatically worldwide, the prevention, detection, treatment and control of this condition should be a top priority.[5]

Various risk factors are responsible for development of hypertension. Among them higher level of Atherogenic index of plasma (AIP) is claimed to be a risk factor. AIP is defined as log of TG to HDL-C ratio. People with high AIP have a higher risk for coronary heart disease (CHD) than those with low AIP. Individual having AIP level <0.11, 0.11-0.21 and > 0.21 belongs to low risk, intermediate risk and increased risk group respectively.[6] AIP is useful in predicting atherogenecity. Triglycerides and HDL-cholesterol in AIP reflect the balance between the atherogenic and antiatherogenic lipoproteins respectively.[7]

Methods

This case control study was carried out in the Department of Biochemistry of BSMMU, Shahbag, Dhaka from January 2013 to December 2013. A group of clinically diagnosed hypertensive patients were selected as cases. Equal number of apparently age & sex matched healthy normotensive adults were selected as control.

Cases were again divided into two group. Atherogenic index of plasma (AIP) was measured & compared in between the groups. Data was analyzed by SPSS and descriptive statistics were presented as frequencies and percentages.

Results

The study included 50 cases and 50 controls. The mean age of the case and control group were 44.72 ± 8.96 years and 42.30 ± 9.50 years respectively (Table I).

The mean age of the case group was higher than the control group but the difference was not statistically significant (P =0.193). Male and female subjects were equal in number both in case and control group. Male Female ratio was 1:1.

Table I: Distribution of study subjects according to age and sex

	Group		p value
	Case (n=50)	Control (n=50)	
Age (years) (Mean ± SD)	44.72 ± 8.96	42.30 ± 9.50	0.193
Sex			
Male	25 (50.0)	25 (50.0)	
Female	25 (50.0)	25 (50.0)	

t test was done to measure the level of significance.

Biochemical status of the study population was measured and analysed (Table II). Mean TG was 182.00 ± 59.37 mg/dl in case group and 117.74 ± 50.70 mg/dl in control group. Mean HDL level was 38.74 ± 8.48 mg/dl in case group and 43.74 ± 11.57 mg/dl in control group. Mean AIP level was 0.65 ± 0.20 in case group and 0.41 ± 0.23 in control group. Regarding biochemical parameter there was statistical significant difference (P < 0.05).

Table II: Comparison of serum TG, HDL-C and atherogenic index of plasma between cases and controls

Biochemical findings	Group		p value
	Case	Control	
TG (mg/dl)	182.00 ± 59.37	117.74 ± 50.70	0.001
HDL (mg/dl)	38.74 ± 8.48	43.74 ± 11.57	0.016
Atherogenic index of plasma	0.65 ± 0.20	0.41 ± 0.23	0.001

t test was done to measure the level of significance.

Mean AIP was 0.68 ± 0.19 in uncontrolled hypertensive patients and 0.64 ± 0.19 in controlled hypertensive patients (Table III). There was no statistically significant difference between two groups (P = 0.445).

Table III: Comparison of atherogenic index of plasma in controlled and uncontrolled hypertensive patients

Atherogenic index of plasma	Hypertension		p value
	Controlled	Uncontrolled	
Mean ± SD	0.64 ± 0.19	0.68 ± 0.19	0.445

t test was done to measure the level of significance

Table IV showing, 49 (98%) cases within increased risk of atherogenesis and in control group it was 42 (84%) which was statistically significant (P < 0.05).

Table IV: Distribution of study subjects according to level of AIP

AIP	Group		p value
	Case	Control	
≤ 0.21	1 (2.0)	8 (16.0)	0.031
> 0.21	49 (98.0)	42 (84.0)	
Total	50 (100.0)	50 (100.0)	

Chi square test was done to measure the level of significance

The figure 1 showing, there was a positive correlation between AIP and systolic blood pressure. It was observed that the correlation was statistically significant (r = 0.291, p = 0.04) by Pearson correlation test.

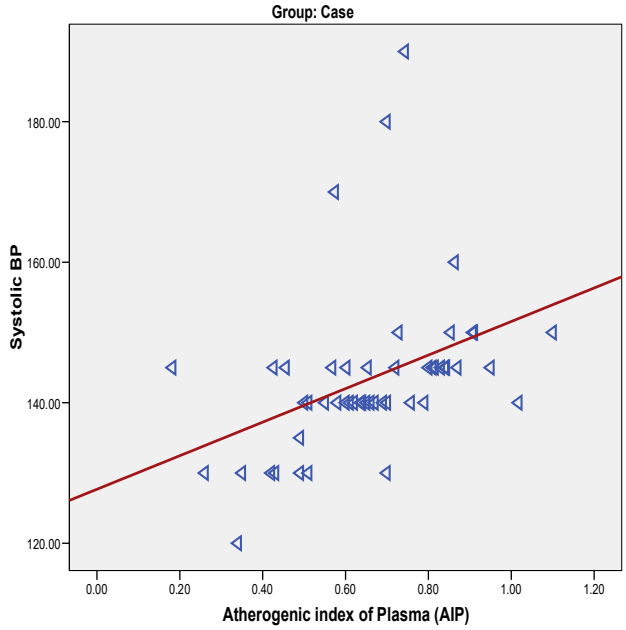

Figure 1. Correlation between Atherogenic index of plasma and Systolic blood pressure in case group. Pearson correlation, r = 0.291, p= 0.04

The figure 2 showing, there was a positive correlation between AIP and diastolic blood pressure. It was observed that the correlation was statistically significant (r = 0.391, p = 0.005) by Pearson correlation test.

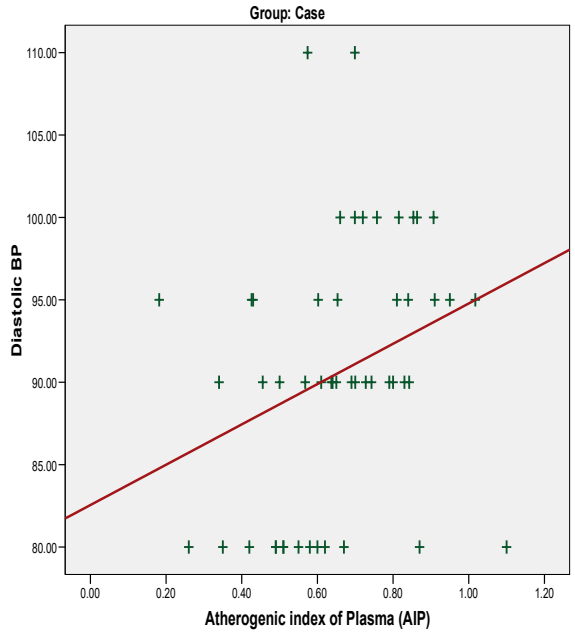

Figure 2: Correlation between Atherogenic index of plasma and Diastolic blood pressure in case group. Pearson correlation, r = 0.391, p= 0.005

Discussion

This case control, analytical study was conducted to evaluate the relationship between Atherogenic index of plasma (AIP) & hypertension. A total of 100 subjects were included in the study based on predefined enrollment criteria. They were grouped into cases (hypertensive) and controls (normotensive) on the basis of presence or absence of hypertension. Cases were subdivided into uncontrolled & controlled hypertensive group.

In this study male and female subjects were equal in number both in case and control group. There was no significant sex difference between two groups. Present study showed that the mean age of the case and control group were 44.72 ± 8.96 years and 42.30 ± 9.50 years respectively ranging from 25 to 60 years.

Present study showed that mean serum TG was significantly higher in cases than controls (p=0.001). This study is also in agreement with other studies.[8,9] Present study showed that mean serum HDL cholesterol was lower in cases than controls and a statistical significant difference was observed (P=0.016). This finding is also in agreement with the other study.[10] The present study also showed mean AIP was 0.65 ± 0.20 and 0.41 ± 0.23 in cases and controls respectively. Statistical significant difference was seen (P = 0.001). This study also showed that mean AIP was higher in uncontrolled hypertensive patients than controlled hypertensive patients but it was not statistically significant (P = 0.445). This findings is also in agreement with other study.[11,12] It also showed that 98% cases were within increased risk group of atherogenesis where as in control group it was 84% which was statistically significant (P < 0.05). Present study showed significant positive correlation between AIP with SBP and DBP (P < 0.05).

Conclusion

From this study it can be concluded that high Atherogenic index of Plasma (AIP) is associated with hypertension. Atherogenic Index of Plasma is found to be positively correlated with Systolic & Diastolic blood pressure.

Recommendation

The findings of our study will help the hypertensive individuals to build up their awareness & to modify their life style & dietary habit. Since hypertension is mostly a preventable problem, due care can be taken to deal this problem by implementation of multidimensional preventive strategies. Regular exercise, limited intake of

carbohydrate can reduce the Atherogenic index of plasma level and may decrease the chance of development of hypertension as well as atherosclerotic disease. So, we recommend a further population based and multicenter studies on this issue in our country, which will provide further information and will be beneficial for the large group of hypertensive patients for their preventive measures, diagnosis, management and treatment.

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