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Research Article

Apolipoproteins and Serum Lipid Profile in Acute Myocardial Infarction

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Abstract: Acute Myocardial Infarction [AMI] is now a common disease with serious consequences in mortality and morbidity. Altered lipid profile with low HDL-C and high LDL-C and TGs has been implicated in coronary atherosclerosis. Recently it has been shown that measurement of Apoliopoproteins was superior to LDL-C and HDL-C in risk and prognosis of Acute Myocardial Infarction. We measured the Levels of Serum Lipids and Apoliporoteins Apo B100: Apo A-1 ratio in 32 Acute Myocardial Infarction patients and measured the values with age and sex matched controls. Statistical analysis was done using SPSS software version 17. p value less than 0.05 was considered significant. There was increase in serum LDL-C and TGs and Low HDL-C in patients with AMI. The ratio of Apo B100/Apo A-I (>1.0) was significantly related with Acute Myocardial Infarction. Within the limitations of the present study it can be concluded that levels of Total Cholesterol, LDL-C and TGs were elevated in Myocardial Infarction The ratio of ApoB100:apoA-I was significantly correlated with the AMI in individuals. Therefore ApoB100: Apo A-I ratio may be better in risk prediction and prognosis of AMI especially in younger age group.
Keywords: Acute Myocardial Infarction, Lipids, Lipoproteins.

INTRODUCTION

Atherosclerosis is now becoming a major health problem of middle and late adulthood and dyslipedemia is one of the significant and important factors for atherogenesis. Serum lipid (cholesterol, triglycerides) and lipoprotein levels (VLDL, LDL and HDL) have immense importance in CAD patients because variations from normal levels can predict the cause of CAD to a great extent and now a days apolipoproteins have been considered as more stable risk factor than lipid parameters [1, 2]. Apolipoproteins A-I and B 100 levels, which are the protein component of HDL-C and LDL-C respectively, have been described as better predictors of atherosclerotic diseases than the lipid and lipoprotein concentrations [3]. The Apo B 100/apo A-1 ratio represents the balance between atherogenic particles, rich in Apo B 100, and the antiatherogenic ones, rich in apo A-I, and it has been shown to be a better parameter for the prediction of cardiovascular risk than the lipids, lipoproteins, and lipid ratios [4, 5]. Studies like Quebec Cardiovascular study, Prospective Epidemiological Study of Myocardial Infarction (PRIME) study, Apolipoprotein related mortality risk (AMORIS) study have confirmed apolipoproteins as a stronger risk factor for development of CAD [2, 6, 7]. The levels of apolipoproteins are minimally influenced by biological variables as compared to lipid measurements [8]. However there is considerable debate regarding the importance of apolipoproteins measures in comparison to the conventionally measured lipid fractions in determining CVD risks. There is only sparse data available in Asian population with this in mind, we tried to evaluate the serum lipid profile and Lipoprotein levels in Acute Myocardial Infarction cases.

MATERIALS AND METHODS

This study was carried out in Konaseema Institute of Medical Sciences and Research center Amlapuram 2008-2010. Ethical approval was obtained from the Instutional Ethics committee Konaseema Institute of Medical Sciences. Written consent was obtained from the patients for the study. Total of 70 patients were included they were divided into two groups control group total of 37 individuals who acted as age and sex matched controls. They were free from any clinical disorder and not on any medications. The second groups of AMI patient total number of 33 patients were included in study.

Fasting Blood samples were obtained from anticubital vein. Sampled were allowed to clot for half

an hour and serum was extracted after centrifuging. Total cholesterol was estimated by Zlatkis method modified by Zak (serum triglyceride by enzymatic GPO-PAP method [9], HDL-C by method of Burstein *et al*. [10], LDL-C by method of Bates *et al*. [11]. Serum Apo-B levels were estimated by Immunoturbidimetric method (Diasys diagnostic systems Gmbh and Co. KG site, Holzheim Germany) [12]. Reagents used were TRIS buffer (pH 7.5), poly ethylene glycerol detergent stabilizers and antihuman Apo-B (Goat antibody). Serum Phospholipids were measured by Modified Fiske and SubbaRow method [13]. ApoA-1 was estimated by the turbidimetric test using Spinreact Kit method [14]. ApoA-1 concentration in the sample was calculated by interpolation of its absorbance in the calibration curve using the ERBA Chem -5 plus semi-autoanalyzer. The data was analyzed by statistical methods using SPSS Version 17 Software descriptive statistics were calculated for all variables by groups. Using students 't' test, p value < 0.05 was considered statistically significant.

RESULTS

In the present study total of 70 patients were included they were divided into two groups control group total of 37 individuals who acted as age and sex matched controls. They were free from any clinical disorder and not on any medications. The second groups of AMI patient total number of 33 patients were included in study of which 26 were males and 7 females. Their various parameters are given in Table 1.

Table 1: Age and sex wise distribution of cases and controls

Age Group	Control			AMI Patients		
	Males	Females	Total	Males	Females	Total
31-40	2	3	5	4	0	4
41-50	6	3	9	5	2	7
51-60	4	4	8	7	2	9
>60	8	7	15	10	3	13
Total	20	17	37	26	7	33

Serum lipid profiles of the two groups were measured and mean and standard deviation was calculated with confidence intervals. The cholesterol phospholipid ratio was calculated the mean value for control group was 0.98 and for AMI group was 1.07 the calculated p values were significant (Table 2).

Table 2: lipid profile in control and acute myocardial infarction subjects

	Total cholesterol mg%			Total phospholipids mg%			Cholesterol /phospholipids ratio			
	Mean	SD	95% CI	Mean	SD	95% CI	Mean	SD	95% CI	p value
Control	196.93	31.6	165 – 264	203	28.29	170 - 264	0.98	0.14	0.8 – 1.29	
AMI	298.5	25.47	264 - 352	277.53	30.45	207 - 328	1.07	0.10	0.99 -1.43	0.037*

*Significant

Serum triglyceride levels of both groups was calculated and the mean value of triglycerides in control was 106.66 mg% and the that of the AMI group was 208.87 mg% however the t test value was greater than 0.05 which was not significant (Table 3).

Table 3: Total triglyceride levels in control and AMI individuals with p values

	Total Triglycerides mg%			
	Mean	SD	95% CI	p value
Control	106.66	17.31	84 -138	
AMI	208.87	26.82	181 -287	>0.05 NS

The values of total cholesterol and HDL-C were recorded and total cholesterol/ HDL-C ratios which is also called as atherogenic or Castelli index were calculated for control and AMI patients. The mean serum total cholesterol levels of control group was 196.93 mg% and the HDL-C was 62.2 mg% and the mean Total cholesterol/ HDL-C was 3.25. For AMI group the mean value of total cholesterol was 298.5 mg% and HDL-C was 48.76 mg% and total cholesterol / HDL-C ratio was 6.17 Table 4.

Table 4: Showing total cholesterol, HDL-C and Total cholesterol / HDL-C ratio

	Total cholesterol mg%			HDL Cholesterol mg%			Total Cholesterol / HDL-C ratio			
	Mean	SD	95% CI	Mean	SD	95% CI	Mean	SD	95% CI	p value
Control	196.93	31.6	165 – 264	62.2	10.1	52 -88	3.25	0.78	1.95 – 4.71	
AMI	298.5	25.4	264 - 352	48.76	3.68	42 -54	6.17	0.73	5.11 – 7.48	0.02*

*Significant

Table 5: Showing the values of Apolipoprotein A-1 and Apolipoprotein B100 and their B100/A-I ratio

	Apolipoprotein A-I mg%			Apolipoprotein B100 mg%			Apo B100/Apo A-1			
	Mean	**SD**	**95% CI**	**Mean**	**SD**	**95% CI**	**Mean**	**SD**	**95% CI**	**p value**
Control	135.18	14.84	110 -160	90.62	15.8	63 -120	0.66	0.11	0.57 -0.75	
AMI	93.32	10.19	72 - 112	155.19	20.37	138 - 198	1.6	0.10	1.5 – 1.77	0.001*

*Significant

Apolipoprotein A-1 and Apolipoprotein B100 were measured for control group and AMI group and Apo B100/Apo A-1 ratios were calculated. The control group had Apolipoprotein A-1 levels of 135.18 mg% and ApoB100 mean value was 90.62 mg% and the calculated Apo B100/Apo A-I Ratio mean was 0.66. The AMI group has Apolipoprotein A-1 levels of 93.32mg% and ApoB100 mean value was 155.19 mg% and the calculated Apo B100/Apo A-I Ratio mean was 1.6. The p values were less than 0.001 which is highly significant Table 5.

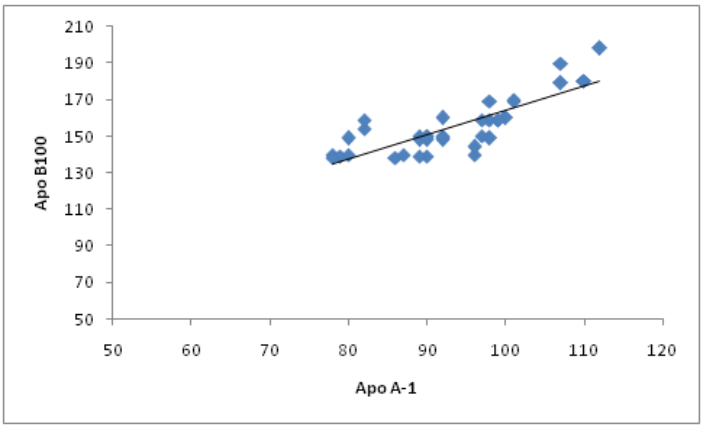

Table 1: Shows the values of Apo B100/Apo A-1 ratios in AMI group

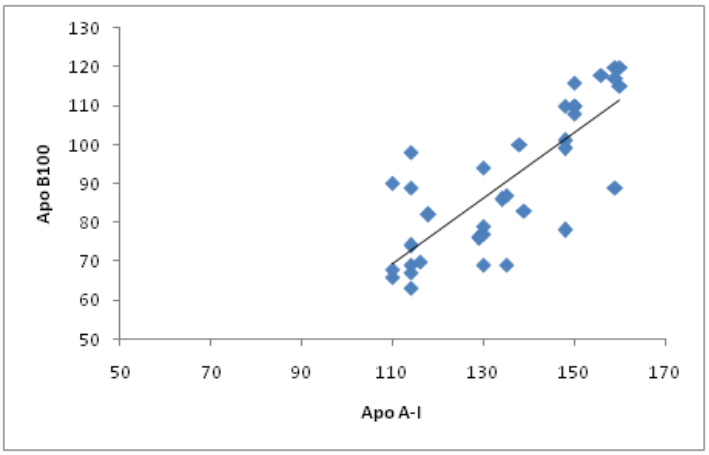

Table 2: Shows the values of Apo B100/Apo A-1 ratios in control group

DISCUSSION

Atherosclerosis has multifactorial etiology but abnormality in lipoprotein metabolism is one of the key factors in its development, which is an important risk factor in development of cardiovascular disease [15]. Despite dramatic progress in cardiovasular disease management there is a unanimous agreement that coronary risk assessment based exclusively on LDL is not optimal [16]. In an attempt to optimize the predictive capacity of lipid profile, several lipoprotein ratios or atherogenic indices have been formulated. With this background we decided to study apolipoprotein and lipid profile in acute myocardial infarction patients compared with normal age and sex matched controls. In our study we found there is marked hypercholestrolemia with serum cholesterol levels mean 298.5 mg% in AMI patients in comparison with the normal subjects whose mean cholesterol values recorded was 196.93mg% hypercholesterolemia is responsible for development of atherosclerotic heart disease [17]. Hypercholesterolemia and its link to Coronary Heart Disease have been reported by several authors [18-20]. Hyperphospolipidemia in coronary heart disease with serum phospholipids above 270mg% has been reported by Choen and Carlson [21, 22]. In the present study we found hyperphospholipidemia in acute

myocardial infarction subjects with mean values of 277.53 mg%. According to Gertler *et al*. [23] instead of considering either cholesterol or phospholipid levels in serum, to consider c/p ratio as an index of atherogenesity is more significant and Gertler [24] suggested 0.78 as a normal c/p ratio. According to these authors, atherosclerosis which is responsible for CHD there is high c/p ratio which is also observed in the present study. The C/P ratio in acute myocardial Infarction patients was significantly higher at 1.07 as compared to 0.98 which was found in the normal subjects.

The total cholesterol/ High density Lipoprotein (HDL) Cholesterol ratio is known as the atherogenic or Castelli index. It is one of the important component of indicators of vascular risk, the predictive value of which is greater than the isolated parameter. An increase in total cholesterol concentration more so with LDL cholesterol is an atherogenic lipid marker, whereas reduced HDL Cholesterol concentration is correlated with several risk factors including metabolic syndrome and probably also an independent risk [25]. Higher Castelli index indicates more atherogenesis and potential for development of Coronary Heart Disease which was found in our study, we found mean Castelli Index for AMI patients was 6.17 as compared to the normal which was calculated as 3.25. As Castelli index is considered more sensitive and specific index of cardiovascular risk then total cholesterol alone, the Canadian working group has chosen this lipid ratio as secondary goal of therapy [26].

Apolipoprotein B represents most of the protein content in LDL and is also present in intermediate-density lipoproteins (IDL) and VLDL. ApoA-1 is the principal apolipoprotein in HDL. ApoA-1 is also believed to be a more reliable parameter for measuring HDL than cholesterol content since it is not subject to variation. The Apo B 100/Apo A-1 ratio represents the balance between atherogenic particles, rich in Apo B 100, and the antiatherogenic ones, rich in Apo A-1, and it has been shown to be a better parameter for the prediction of cardiovascular risk than the lipids, lipoproteins, and lipid ratios [4,5]. This ratio is a better parameter for prediction of cardiovascular risk than lipids, lipoproteins and lipid ratios [4, 5]. Various studies like apolipoprotein related mortality risk (AMORIS) have confirmed that apolipoproteins as a stronger risk for development of Coronary Artery Disease [2, 4-7]. In the present we found increasing ratios of Apo B100/ Apo A-1 in acute myocardial infarction patients which was in agreement with previous studies [5-7], also because the apolipoproetin concentrations are minimally influenced by biological variables as compared with other lipid measurements [8]. Therefore apolipoprotein concentrations and their ratio may be better and reliable predictor of cardiovascular risks.

CONCLUSION

Within the limitations of present study it is seen that several lipid parameters were significant in indicating cardiovascular risks. However two indices the c/p ratio and the Total/HDL ratios were better indicators of cardiovascular risks. Recent trends in Apolipoprotein measurements that have stronger association with atherogenesis consequently development of Acute Myocardial Infarction is gaining importance particularly an increase in Apo B100/Apo A-1 should be viewed as increased risk of development of AMI in this group of population.

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