

APOLIPOPROTEIN A-I AND APOLIPOPROTEIN B IN SURVIVORS OF MYOCARDIAL

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Abstract

Sixty eight survivors of myocardial infarction were compared with similar age of 34 normal controls, aged 31 - 70 years. A decreased apolipoprotein A-I and HDL cholesterol and an increased apolipoprotein B were observed in age range from 31-70 years. Total cholesterol and triglyceride were significantly high upto the age of 50 years, whereas no change was found above this age. LDL cholesterol showed significant rise upto the age of 60 years. Ratio of apo A-I and apo B remains significantly low in all the survivors of myocardial infarction (JPMA 37: 44, 1987).

INTRODUCTION

Coronary heart disease has been the most important cause of death in most North European, North American and other industrialized Caucasian societies¹. In Pakistan too, as in other developing countries, the incidence of coronary heart disease appears to be on the rise. A biochemical metabolic abnormality in lipid metabolism is probably the principal factor in the pathogenesis of coronary artery disease. Clinical and experimental studies suggest that the apolipoprotein composition and concentration of particular lipoprotein classes could be important for atherogenicity²⁻⁴. Initially human plasma lipids and lipoproteins attracted attention because of their role in intravascular lipid transport. However recent research points to a multiplicity of their functions, ranging from lipid metabolism to the regulation of cell surface receptors. The protein component (apolipoprotein) maintains lipoprotein structure and in part directs metabolic activity. In addition Onitiri and Jover⁵ specified that the apolipoproteins have been implicated as the specific abnormalities in many disorders of lipid metabolism. Recently the study of Sveger and Fex⁶ suggests that the analysis of apolipoprotein especially apolipoprotein B. are of value to trace adolescents at risk for future coronary heart disease. Similarly it has been proposed⁷ that a change in the levels of plasma lipid and lipoprotein does not remain as a sensitive index for the prevision of risk factor for atherogenicity over an entire age range, while the levels of apolipoproteins A-I and B has been regarded as a better discriminator for the above aspect.

This study was also proposed to observe the changes in the level and the composition of lipKl and lipoprotein in the patients of myocardial infarction. Particular attention has been given to the quantification of apolipoprotein A-I and apolipoprotein B which are considered at present as more accurate parameters than lipid analysis for the prevision of cardiovascular disease related to atherosclerosis.

MATERIAL AND METHODS

Sixty eight survivors of myocardial infarction who had recovered from earlier attack of acute myocardial infarction were studied. The patients selected were outdoor patients attending for follow up at the National Institute of Cardiovascular Diseases and Cardiovascular Department of Jinnah Postgraduate Medical Centre, Karachi.

Apparently 34 healthy normal subjects of similar age and socio-economic status as that of patients were selected from staff and postgraduate students of Basic Medical Sciences Institute, Jinnah Postgraduate Medical Centre, and various areas of Karachi. The information about their blood pressure, smoking habit, body weight and any family history of cardiovascular disease were also recorded.

The survivors of myocardial infarction having diabetes were excluded from the study.

They were classified on the basis of age into 4 groups ranging from 31-40, 41-50, 51-60 and 61-70 years. Their lipids, lipoproteins and apolipoproteins were compared with similar age groups of normal subjects.

Blood was drawn in the morning after 12 hours fast and allowed to clot for 1 hour at 37°C. The serum was recovered by centrifugation.

The samples were analysed for total cholesterol (Boehringer Kit), triglycerides (Cromatest Kit), High density lipoprotein cholesterol (HDL-C) and Low density lipoprotein cholesterol (LDL-C) were calculated by the method of Friedewald et al. Apolipoprotein A-I (Apo A-I) and apolipoprotein (Apo B) were measured by immunochemical assay (Orion Diagnostica Kit).

RESULTS

TABLE
Lipids, Lipoproteins and Apolipoproteins in Survivors of Myocardial Infarction in Different Age Groups.
The values are expressed as mean \pm S.E.M. Number of observations is given in parenthesis.

Subjects	Cholesterol mg/dl	Triglyceride mg/dl	HDL-C mg/dl	LDL-C mg/dl	ApoA-I mg/dl	ApoB mg/dl	ApoA-I/ApoB mg/dl
Control (9) 31 - 40 years	187.1 ± 9.01	118.22 ± 10.23	50.8 ± 3.53	112.55 ± 8.93	128.11 ± 9.58	98.5 ± 6.77	1.32 ± 0.09
Survivors of Myocardial Infarction (8)	248.75** ± 17.08	171.50** ± 11.17	33.75** ± 2.45	180.75** ± 14.46	92.50* ± 7.63	148.0*** ± 7.63	0.66*** ± 0.10
Control (10) 41 - 50 years	203.7 ± 8.10	128.6 ± 10.42	53.6 ± 2.99	124.3 ± 8.61	129.4 ± 5.16	102.3 ± 6.72	1.29 ± 0.07
Survivors of Myocardial Infarction (23)	243.47*** ± 5.65	154.56* ± 6.89	35.69*** ± 1.59	176.86*** ± 6.16	102.56*** ± 4.43	142.04*** ± 4.88	0.74*** ± 0.04
Control (10) 51-60 years	218.3 ± 7.18	136.7 ± 7.67	54.8 ± 3.03	136.1 ± 6.24	135.2 ± 6.60	104.4 ± 4.55	1.31 ± 0.10
Survivors of Myocardial Infarction (27)	232.22 ± 6.88	150.96 ± 9.41	38.29*** ± 1.65	163.81** ± 6.37	103.74*** ± 4.54	137.96*** ± 5.15	0.77*** ± 0.04
Control (5) 61-79 years	208.2 ± 11.09	122.2 ± 8.73	49.8 ± 2.81	134.2 ± 10.37	131.4 ± 7.88	107.6 ± 3.4	1.22 ± 0.10
Survivors of Myocardial Infarction (10)	222.0 ± 9.49	140.1 ± 6.72	35.4** ± 1.97	158.8 ± 10.18	100.3** ± 6.61	139.1** ± 8.67	0.75*** ± 0.08

*P < 0.05, **P < 0.01 and ***P < 0.001 values are significant as compared to control subjects.

Table shows the serum levels of lipids, lipoproteins and apolipoproteins in different age groups of the participant. Serum levels of total cholesterol and triglycerides remain significantly higher in patients as compared with normal subjects in age groups of 31-40 and 41-50 years. Above this range no significant

increase in lipids been observed in age groups of 51-60 and 61-70 years.

The serum HDL-C level was significantly lower within an age range of 31-70 years, whereas LDL-C showed a significant increase within an age range of 31-60 years. Apolipoprotein A-I and apolipoprotein B showed a significant change in all age groups.

A significant decrease in the level of serum apolipoprotein A-I and an increase in the level of apolipoprotein B has been observed in all the age groups (31-70 years) of survivors of myocardial infarction.

The ratio of apolipoprotein A-I and apolipoprotein B was also significantly low in survivors in all age groups (31-70 years).

DISCUSSION

The debate on the value of plasma lipids as a predictive risk factor for atherogenesis has centered for many years on cholesterol, triglycerides and low density lipoprotein cholesterol. Lately interest has focussed on the role of high density lipoprotein cholesterol as an anti risk factor. Nevertheless a large proportion of patients who suffer a major clinical event from atherosclerosis may present with a completely normal lipid and lipoprotein pattern. A partial explanation of these heterodox cases has been offered by the recognition of the fact that chemical composition of lipoproteins is more relevant than the simple plasma level of the total cholesterol. Recently some workers have stressed on the reduced level of serum apolipoprotein A-I and increased level of apolipoprotein B in atherosclerotic patients as diagnostic feature. This changed level of apolipoproteins were also observed even in normolipidemic patients⁷.

Alterations in LDL composition may well have relevance to atherogenesis since the ability of HDL to remove cholesterol from cell culture can be modified by the apolipoprotein level, indicating that apolipoprotein A-I is a functional unit of HDL¹⁰. Miller and Miller¹¹ pointed out the inverse relation between HDL and coronary artery disease and suggested that HDL might promote the clearance of cholesterol from arterial wall. Schonfeld et al¹². found an altered HDL structure and molecular association of apolipoprotein A-I in hyperlipidemia. Recently Noma et al¹² reported a significantly low level of apolipoprotein A-I in survivors of myocardial infarction. Similarly¹⁴ low level of apolipoprotein A-I have been reported in patients angiographically assessed coronary artery disease and concluded that apolipoprotein A-I by itself is more useful index than high density lipoprotein for identifying patients with coronary artery disease. It has been observed in the present study that serum levels of apolipoprotein A-I is significantly lower in survivors of myocardial infarction in all age groups ranging from 31-70 years as compared to control subjects.

On the contrary, elevated levels of plasma apolipoprotein B were found regardless of whether they were normo cholesterolemic or hypercholesterolemic in the individuals with coronary artery disease¹⁵

In a comparative study Avogaro et al⁸. observed significantly low level of apolipoprotein A-I and high level of apolipoprotein B in survivors and concluded that the protein moiety of lipoprotein is a better discriminator than lipids between atherosclerotic subjects and controls. Value of Serum levels of apolipoprotein A-I and apolipoprotein B rather than on the levels of serum lipids has been emphasized for evaluation of the atherosclerosis. Our data (Table) is in agreement with the study of above workers in all age groups whether they may be hyperlipidemic (31.50 years) or normolipidemic (51.70 years).

The serum level of LDL cholesterol in survivors were found significantly higher within an age range of 31-60 years. In a prospective study of the Framingham and Liverpool populations it was demonstrated that LDL.C is a powerful risk factor for coronary artery disease in men younger than 50.55 years of age. However above this age the predictive power of LDL.C deteriorates with increasing age¹⁷

Ratio of apolipoprotein A-I and apolipoprotein B was also determined in the present study and found

significantly low in all age groups (31—70 years). The observation is in constant with the findings of many workers⁷⁻¹³

The serum levels of total cholesterol and triglycerides remains significantly high in survivors of myocardial infarction within the age range of 31-50 years. Above this age range no significant increase in the serum lipid have been observed. Similar findings have been observed by Avogaro et al⁷. and Trilokinath et al¹⁸

It has been concluded that apolipoproteins may be better predictive factors than cholesterol and triglyceride in discriminating between atherosclerotic patients and controls. When matched, the mean values of apolipoproteins A-I and B and their ratio seem as good as total cholesterol, triglyceride, LDL & HDL cholesterol in younger age. When patients and controls of old age with similar levels of total cholesterol and triglyceride were compared, survivors still showed significant differences in their values of apolipoprotein A-I and apolipoprotein B and their ratio.

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