

A Study on Serum Triglyceride and Lipoproteins Cholesterol in Coronary Heart Disease Patients

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Zubair Ahmed Awan (Department of Biochemistry, Army Medical College, Rawalpindi.)

Abdul Baseer (Department of Biochemistry, Jinnah Postgraduate Medical Centre, Karachi.)

Abstract

Sera obtained from 42 patients of myocardial infarction, 28 of unstable angina and 25 healthy control subjects was assayed for total triglycerides, cholesterol, LDL cholesterol (LDL-C), HDL Cholesterol (HDL-C) and VLDL Cholesterol (VLDL-C). The level of cholesterol was also determined among the sub-fractions of HDL. The levels of total triglycerides, cholesterol, LDL-C and VLDL-C were significantly raised in both groups of patients. Total high density lipoprotein cholesterol was low in patients, which was highly significant in HDL2-C and not in HDL3-C. These results suggest that serum lipids are directly correlated with the severity of coronary heart disease (CHD). Total cholesterol when measured in major lipoprotein classes and further partitioned into sub fractions, increase their sensitivity, specificity and hence their predictive value as sensitive markers for the assessment of CHD risk (JPMA 45:263, 1995).

Introduction

Ischaemic heart disease develops due to a them sclerosis caused by accumulation of lipids, primarily cholesterol but also triglycerides, in the walls of coronary arteries which tend to narrow the lumen and decrease the blood flow¹⁻³. The concentration of serum triglycerides is increased in patients of CHD⁴⁻⁸. The occurrence of elevated levels of serum cholesterol in patients with CHD has been known over years^{6,9}. Lipids are incorporated with lipoproteins for their transport. The incisive studies of lipoproteins for the last few years have contributed to significant advances in understanding and management of lipid disorders, in fact related to abnormalities in the metabolism of lipoproteins¹⁰⁻¹². Clinically, the concentration of lipoproteins in the plasnm is assessed by quantifying the cholesterol moiety of lipoprotein particle, which are sensitive markers for the assessment of coronary artery disease (CAD) risk¹²⁻¹⁴. The concentration of HDL cholesterol especially HDL2 shows a strong inverse association with CHD^{12,15-18}. The levels of LDL- cholesterol were consistently raised in patients with CHD as compared to controls in various studies^{21,18,19} Significant rise in VLDL cholesterol has been reported in CHD patients in some studies²⁰. The present study was planned to evaluate the serum triglycerides as un variate risk factor for CHD. The changes occuring in different lipoprotcins cholesterol were also determined which are considered at present to be more sensitive means of assessing the persons at relative risk of developing ischaemic heart disease.

Patients and Methods

The patients of ischaemic heart disease ([IHD) included in this study were either admitted or registered as out-door cases at National Institute of Cardiovascular Diseases (NICVD) Karachi. The clinical history was recorded with particular emphasis on age, sex, occupation, family history of IHD, smoking habits, blood pressure and weight. Patients with diabetes mellitus were excluded. The patients comprised of two groups:

a. Forty two patients with myocardial infarction, diagnosed on history, ECG changes and elevation of the cardiac enzymes, (AST, LDH and CPK). The interval between first attack and the time of taking the blood sample was one to two months.

b. Twenty-eight patients of unstable angina diagnosed on history, subjected to coronary angiography and found to have stenosis of coronary arteries with different severity.

Control group comprised of healthy volunteers of similar age, sex and socioeconomic status. The information about their blood pressure, smoking habits, history of IHD in family was also recorded. Blood sample (10-15 ml) was drawn from each patient and controlled after an overnight fast of 12 hours. Serum was separated and stored at -20°C till estimation. Samples were analysed for total triglycerides by the enzymatic colorimetric method using kit supplied by Boehringer GmbH. Total cholesterol was determined by enzymatic method²¹ using the kit monotest cholesterol obtained from Boehringer GmbH. Total HDL cholesterol²² HDL3-cholesterol, HDL2-cholesterol²³ were determined by different precipitation procedures. LDL-cholesterol and VLDL-cholesterol²⁴ were estimated by calculated formula.

Results

Table I. Age, Sex and body weight in different groups of myocardial infarction and unstable angina.

	Control subjects (25)	Myocardial infarction (42)	Unstable angina (28)
Age (years)	47.76 ±10.73	49.57 ±7.4	49.67 ±5.42
Sex	Female=16% Male=84%	Female=7% Male=93%	Female=14% Male=86%
Body weight	60.80 ±5.22	62.28 ±5.92	62.64 ±4.52

The values are mean±SD The number of observations is given in parenthesis

Table I shows that IHD is predominant among males and the body weight of the patients was not significantly higher than the controls. The patients of IHD had a significantly higher blood pressure as compared to controls and the percentage of smokers was more among patients than the controls (Table II).

Table II. Risk factors of myocardial infarction and unstable angina in different groups.

	Control (25)	Myocardial infarction (42)	Unstable angina (28)
Blood pressure	120.20/75.20	*127.5/79.61*	*128.10/79.07
Systolic/ Diastolic (mmHg)	$\pm 7.28 \pm 5.59$	$\pm 12.29 \pm 6.16$	$\pm 11.71 \pm 6.72$
Tobacco smoking	36%	45%	21%
Positive family history of IHD	4%	33%	25%

*P<0.01 as compared with normal control subjects.

The values are expressed as mean $\pm$ SD. The number of observations is given in parenthesis.

The mean levels of total triglycerides, total cholesterol and different lipoproteins cholesterol for the patients and controls are given in Table III and IV.

Table III. Lipid values in different groups.

	Triglyceride (mg%)	Total Choles- terol (mg%)	LDL- Choles- terol (mg%)	VLDL- Choles- terol (mg%)
Control (25)	120.56 ±15.98	200.24 ±17.88	119.44 ±19.43	24.20 ±3.21
Myocardial Infarction (42)	164.04** ±36.79	243.78** ±39.74	173.40** ±44.34	32.78** ±7.42
Unstable Angina (28)	174.07** ±25.65	254.03** ±31.46	180.75** ±36.37	34.89** ±5.22

**P<0.001 as compared with normal control subjects

Values are expressed in mg% as mean±SD. The number of observations is given in parenthesis.

Table IV. HDL-Cholesterol, HDL₃-cholesterol and HDL₂-cholesterol in different groups.

	Total HDL-Cholesterol (mg%)	HDL₃-Cholesterol (mg%)	HDL₂-Cholesterol (mg%)
Control (25)	56.60 ±6.71	33.68 ±6.58	22.92 ±3.88
Myocardial Infarction (42)	37.59** ±8.39	29.19* ±6.76	8.40** **±4.84
Unstable Angina (28)	38.50** ±7.87	31.39 ±6.61	7.10** ±3.11

***p<0.01 and **p<0.001 as compared with normal control subjects
Values are expressed in mg% as mean ±. The number of observations is given in parenthesis.**

The values of triglycerides, total cholesterol, LDL-C and VLDL-C were significantly elevated in all patients as compared to controls ($p<0.001$). The values of total HDL-C were significantly low in patients as compared to controls ($p<0.001$), maximum decrease was in HDL₂-C ($p<0.001$) in both patients of myocardial infarction and unstable angina. HDL₃-C was decreased in myocardial infarction ($p<0.01$) but not in unstable angina (Table IV).

Discussion

Epidemiological, clinical and animal experimental research has clearly demonstrated that increased serum lipid concentrations and abnormal lipoprotein metabolism are intimately involved in development of CHD^{12,13,25}. Most of the studies demonstrate a univariate association of CHD with raised serum triglycerides^{4,5,26,27}. Raised levels of total and HDL cholesterol along with modification of other risk factors have been reported in many studies²⁷⁻³⁰. In the present study, serum triglycerides was significantly raised in patients as compared to controls, which is in agreement with the previous data. Hypercholesterolemia in patients of CHD has been reported by many workers^{6,19,26,31} which was also found in this study. The increasing interest in detailed measurements of lipoproteins and their protein and lipid moieties is based on experimental evidence linking the different fractions to specific functions, which may be important in the understanding and management of atherosclerosis of CHD. The serum LDL cholesterol and VLDL cholesterol were increased in all the patients as compared to those reported by other workers^{20,31,32}. The mean levels of total HDL-cholesterol in patient groups

were significantly lower than the controls as shown by the previous workers^{12,15,33,34}. This is useful for identifying patients at high risk of CHD. The strongest inverse relation was between the cholesterol concentration in HDL2 subfraction of HDL but not HDL3 in the patients of ischaemic heart disease. This observation is consistent with the reports of other workers^{13,18,35-38}. The present study has demonstrated an apparent urn-variate association between hypertriglyceridemia and coronary heart disease which may have clinical utility if used in conjunction with raised blood cholesterol level. More studies are required to explore the role of triglycerides in the development of CHD. Measurement of cholesterol in major lipoproteins has more significant value especially LDL and HDL. This study also suggests that concentration of HDL2 cholesterol may provide a more sensitive predictor for subjects at risk of developing CHD.

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