

Serum lipid and lipoprotein profile abnormality in predicting the risk of coronary artery disease in non-diabetic patients attending NMCTH, Birgunj

M Adak and JN Shivapuri

Department of Biochemistry, National Medical College and Teaching Hospital, Birgunj, Nepal

Corresponding author: Dr. Manoranjan Adak, Associate Professor of Biochemistry, Department of Biochemistry, National Medical College and Teaching Hospital, Birgunj, Nepal; e-mail: manoranjanadak@rediffmail.com, itsmradak@gmail.com

ABSTRACT

Dyslipidemia is one of the primary causes for coronary artery disease (CAD). Elevated total cholesterol (TC), triglycerides (TG), low-density lipoprotein-cholesterol (LDL-C) and lowered high-density lipoprotein-cholesterol (HDL-C) are conventional risk factor in myocardial infarction patients. The present study was undertaken with an objective to frame out the lipid and lipoprotein profile in non-diabetic patients attending OPD of NMCTH, Birgunj. Out of 599 total patients, 317 patients were male and 282 patients were female. The mean $\pm$ SD (mg/dl) levels of lipid, lipoprotein and their ratio among different age group were found increased with increasing age and these were statistically significant when compared with healthy control group. Desirable TC level (<200 mg/dl) in 73.0%, normal TG level (<150 mg/dl) in 59.0%, optimal level of HDL-C (<40 mg/dl) in 82.0% and normal LDL-C (<129 mg/dl) in 32.0% were found of the total population. Nearly 16% population in total, male and female had normal (40-60 mg/dl) HDL-C respectively. Higher percentage of female (46.8%) than male (34.9%) had optimal level of LDL-C (<100 mg/dl). About 20.0% male had very high level of LDL-C (>160 mg/dl) while it was noted in 6.7% of female patients. Higher ratio of TC/HDL-C in both male and female patients was observed compared to controls and it was highest among >70 years age group. Higher ratio of LDL-C/HDL-C of all age group in male patients was observed when compared with control and it was statistically significant while in female patients the ratio was found increased significantly ($p<0.05$) after the age of 50 years. The study concludes that the importance of assessing the lipid profile and their ratio even in a normal individual as these are atherogenic factors for development of myocardial infarction and other coronary complications. The practice of computing the ratio should be practiced even in a normal health check up packages.

Keywords: Lipid profile, coronary artery disease, dyslipidemia, non-diabetes.

INTRODUCTION

Adverse lipid and lipoprotein profile have been recognized as independent risk factor for atherosclerosis and coronary artery disease (CAD).^{1,2} Lipid disorder is often leads to myocardial infarction and heart failure.³ The relationship between cholesterol and saturated fat with CAD is identified as early as in 1950s.⁴ It has been shown that control of total serum cholesterol levels can reduce the incidence and mortality from coronary artery disease.^{5,6} At present, it is firmly believed that dyslipidemia is both atherogenic and thrombogenic. During dyslipidemia, a major biochemical change in the arteries took place due to accumulation of lipids either in the form of free cholesterol or its ester, which leads to formation of plaques in inner wall of artery. If total cholesterol level is below 150 mg/dl, no new plaques will be formed.⁷ Acute coronary event is expected when the plaques with thin fibrous cap ruptures. It is not the degree of narrowing of the coronary artery but the nature of the plaque determines the onset of acute coronary

event. Dyslipidemia is known to increase platelets aggregation, fibrinogen levels and platelets activation inhibitor.⁸ In addition, an elevated total cholesterol (TC), triglycerides (TG), low-density lipoprotein-cholesterol (LDL-C) and lowered high-density lipoprotein-cholesterol (HDL-C) are conventional risk factor for myocardial infarction as well as the major cause of atherosclerosis.⁹⁻¹² Low-density lipoprotein cholesterol (LDL-C) is the main therapeutic target in the prevention of CAD. The TG/HDL-C ratio is also widely used to assess the lipid atherogenesis.¹³ However, the utility of this ratio for predicting CAD risk is not clear.

CAD is associated with several factors, including raised serum lipid and lipoproteins, an increase in LDL oxidation (free radical damage), increased platelet aggregation (clumping), increased plasma fibrinogen, coagulation factors, hypertension, alterations in glucose metabolism, smoking, genetic and environmental factors.^{14,15} High intakes of fruits and vegetables are also

Table-1: Age and sex distribution of the patients (n=599)

Age group(years)	Male	Female	Total	%
21 - 30	49	54	103	17.2
31 - 40	60	105	165	27.5
41 -50	58	53	111	18.5
51 -60	89	38	127	21.2
61 - 70	33	22	55	9.2
>70	28	10	38	6.3
Total	317 (52.9%)	282 (47.1%)	599	100%

associated with decreases in CAD risk markers including total and LDL cholesterol,¹⁶ blood pressure.¹⁷ About 70.0% of CAD can be prevented or delayed with dietary choices and lifestyle modifications¹⁸. Exercise and a diet with minimal saturated lipid will help the patients to increase their serum HDL and lower triglyceride levels.^{19,20} Borderline hypertriglyceridemia is usually due to obesity, excessive alcohol intake, poorly controlled diabetes mellitus, chronic renal failure, nephrotic syndrome or use of drugs like beta-blockers, estrogens and corticosteroids.²¹ Lipoprotein (Lp-a) has also been identified as an independent risk factor for the development of coronary heart disease.²²

Global Burden of Disease Study reported that in 1990 there were 5.2 million deaths from CAD in economically developed countries and 9.1 million deaths from the same causes in the developing countries²³. It has been predicted that by the year 2020 there will be an increase by almost 75.0% in the global CAD burden.²⁴ Centers for Disease Control and Prevention reported in 2006 that more than 910,000 people in the US die of CAD each year.²⁵ Incidence of dyslipidemia is spectacularly increased day by day throughout the globe. A steady increase of cholesterol levels was noticed in Asian continent in the last decades of the 20th century and trend was increasing faster in urban areas than in rural

areas.^{26,27} The prevalence of dyslipidemia with advancing age and obesity is also reported in worldwide.^{28,29} A group of researchers conducted a series of hospital/clinical based study on lipid profile in Nepalese population in urban and rural areas of Nepal.³⁰⁻³⁵ Keeping in view all these facts, this study has been conducted to evaluate the prevalence of various lipids, lipoprotein profile and their ratios to HDL-C in non-diabetic adult patients attending the OPD of National Medical College and Teaching Hospital (NMCTH), Birgunj.

MATERIALS AND METHODS

This was a retrospective study conducted at National Medical College and Teaching Hospital (NMCTH), Birgunj, Nepal. All clinically suspected patients attending at our outpatient department (OPD) with common symptomatic disease like fever, diarrhea, skin disease etc. were selected for study. Patients with diabetes mellitus, hepatic impairment, bleeding disorder, renal problem were excluded from the study. According to American Diabetes Association (ADA),³⁶ those patients had impaired fasting glucose level 100-126 mg/dl, they were also excluded from the study. Detailed present and past histories of the patients were collected from preset proforma. The proforma included name, age, sex, dietary habit, drinking habit, smoking habit, family history of disease, socio-economic status, community and occupation. Thus, a total 599 adult patients in the OPD were included in the study. Out of total patients, 317 patients were male and 282 patients were female. Age of patients was considered from 21 years and more than 70 years. They were categorized into six groups with age of ten years interval. Total 190 (105 male and 85 female) with sex and age matched from 21-50 years, healthy, non-diabetes and no other clinical complication were taken as control.

About 5 ml of venous blood was collected under aseptic condition from each individual. The blood was allowed

Table-2: Lipid levels and their ratio among different age groups in total male patients

Agegroup	Meanage	Mean Lipid levels $\pm$ SD(mg/dl),n=317				TC/HDL-C	TG/HDL-C	LDL/HDL-C
		TC	TG	HDL-C	LDL-C			
21-30	27.04 $\pm$ 2.30	169.63 $\pm$ 49.97	143.76 $\pm$ 76.99 [#]	32.52 $\pm$ 4.39 ^{**}	117.26 $\pm$ 43.38	5.07 $\pm$ 1.46 [#]	4.19 $\pm$ 1.67 [#]	3.18 $\pm$ 1.21 [#]
31-40	35.30 $\pm$ 2.84	178.43 $\pm$ 54.45	165.60 $\pm$ 87.15 ^{**}	33.35 $\pm$ 9.89 ^{**}	102.18 $\pm$ 39.19	5.08 $\pm$ 1.47 [#]	4.22 $\pm$ 1.73 [#]	3.21 $\pm$ 1.33 [#]
41-50	45.34 $\pm$ 2.63	186.18 $\pm$ 43.58 [#]	151.23 $\pm$ 90.68 [#]	35.06 $\pm$ 8.45	115.89 $\pm$ 35.19	5.59 $\pm$ 1.93 ^{**}	4.39 $\pm$ 1.97 [#]	3.50 $\pm$ 1.41 ^{**}
51-60	54.65 $\pm$ 2.87	189.36 $\pm$ 56.01 [#]	181.80 $\pm$ 88.16 ^{**}	34.26 $\pm$ 8.43	128.86 $\pm$ 43.11 [*]	5.80 $\pm$ 1.69 [*]	4.80 $\pm$ 1.69 [*]	3.71 $\pm$ 1.44 ^{**}
61-70	64.96 $\pm$ 3.08	204.37 $\pm$ 43.83 [*]	184.84 $\pm$ 80.46 [*]	34.20 $\pm$ 8.17	134.05 $\pm$ 45.68 [*]	5.82 $\pm$ 1.80 [*]	4.89 $\pm$ 1.57 [*]	3.90 $\pm$ 1.36 [*]
>70	73.35 $\pm$ 2.24	225.63 $\pm$ 56.43 [*]	190.43 $\pm$ 79.19 [*]	34.46 $\pm$ 6.29	145.96 $\pm$ 50.91 [*]	5.87 $\pm$ 1.64 [*]	5.48 $\pm$ 1.47 [*]	4.51 $\pm$ 3.58 [*]
Control n=105	42.72 $\pm$ 9.63	177.96 $\pm$ 10.65	122.70 $\pm$ 19.71	36.75 $\pm$ 6.72	111.92 $\pm$ 13.78	4.29 $\pm$ 0.85	3.08 $\pm$ 1.06	2.59 $\pm$ 0.78

TC=total cholesterol, TG=triglyceride, HDL-C= high-density lipoprotein-cholesterol, LDL-C= low-density lipoprotein-cholesterol.

Probability values (calculated as compared to control group using Student's *t*-test) * <0.001 , ** <0.01 and # <0.05