

Assessment of Lipid Profile and Interleukin-6 as Biomarkers in Coronary Artery Disease**Avinash Bairwa¹, Shreya Nigoskar², Bhawna Lakhawat³**¹PhD Scholar, Department of Biochemistry, Index Medical College Hospital and Research Center, Indore, M.P., India²Professor and Head, Department of Biochemistry, Index Medical College Hospital and Research Center, Indore, M.P., India³PhD Scholar, Department of Pharmacology, Index Medical College Hospital and Research Center, Indore, M.P., India

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Abstract

Coronary artery Disease is a disease of attention as it is increasing in elderly as well as involving young population. It is well established that cardiovascular disease is associated with hypertension and elevated blood levels of low-density lipoprotein (LDL), total cholesterol, and triglycerides. In disparity, a low level of high-density lipoprotein (HDL) is a risk factor for mortality from cardiovascular disease. Elevated levels of serum IL-6 are a powerful predictor of cardiovascular mortality and mortality from all causes. A case control study was done. Total 121 cases and 121 controls were engaged in study after applying inclusion and exclusion criterion. Serum level of total cholesterol, triglyceride, HDL, LDL and IL-6 was recorded. Most common group was 30–60-year age group. Serum level of HDL was significantly low in cases than controls. Level of total cholesterol, triglyceride, LDL and IL-6 was found significantly high. In conclusion HDL Deficiency have significant relationship with CAD. Level of Total cholesterol, Triglyceride, HDL and IL-6 have significant increase in patients of CAD.

Keywords: Coronary Heart Diseases, Lipid Profile, Triglycerides, Total Cholesterol, HDL, LDL and IL-6.**DOI:** 10.25258/ijcpr.18.4.304

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Introduction

Coronary heart disease (CHD) or cardiovascular diseases are recognized to be one of the most important reasons of morbidity and mortality and imposes tremendously heavy socio-economic burden worldwide. There are varieties of risk factors in the literature which increases the incidence of CHD such as hyperlipidemia. By the year 2020, World Health Organization (WHO) is predicting more than 11.1 million deaths from CHD. It is projected that the annual number of deaths due to cardiovascular disease will increase from 17.5 million in 2012 to 25 million in 2030.

Coronary heart disease occurs when cholesterol accumulates on the artery walls, creating plaques. Reduced blood flow occurs when one or more of these arteries become partially or completely blocked. The four primary coronary arteries are located on the surface of the heart are: right, left main coronary artery, left circumflex artery and left anterior descending artery. [3] According to the guidelines of the American Heart Association, the

following values are prescribed for the above-mentioned risk factors for cardiovascular disease: total cholesterol: 40 mg/dL; and LDL. [4] There are specific characteristics that have an impact on the level of IL-6 in CAD patients, which includes age, smoking, inflammation, dyslipidemia, diabetes, hypertension etc. [5] It should be emphasized that IL-6 increases the precision of conventional risk scores and got predictive value for detecting the existence of early CHD. Patients with intermediate atherosclerotic cardiovascular risk and chest discomfort who have it at a level higher than 1 pg/mL have a high probability of developing CAD. [6] There is a correlation between elevated levels of circulating IL-6 and insulin resistance, hypertension and central obesity, all of which are risk factors for the development of cardiovascular disease [7].

In the last twenty years, considerable advances have been achieved in the determination and improvement of CHD risk factors including

diabetes and hypertension. Lipids and lipoproteins have become increasingly important in clinical practice, primarily because of their association with CHD, in case of their abnormalities known as dyslipidemia, and became the major risk factor for the development of this disease, according to epidemiological studies, especially in affluent countries where fat consumption is high. [8] Hence, this study was done to estimate the prevalence and to find out the association of lipid profile with CHD in a population of Bundelkhand region.

Materials and Methods

Study Design and Subject Selection: The present case-control investigation was conducted at the Index Medical College and Research Department of Biochemistry in Indore, India. After applying specific inclusion and exclusion criteria for CAD cases and controls, a total of 242 subjects were selected for the study. This included 121 CAD cases and 121 healthy controls. Subjects diagnosed with CAD according to the American heart Association Criteria were included in the CAD cases group. Patients were aged 30-70 years. Control group subjects were composed of healthy individuals aged 30-70. Subjects with a history of patient with acute or chronic inflammatory diseases (e.g., infections, autoimmune disorders), Patients with chronic liver disease or renal disease, malignancy, recent surgery, trauma, or acute illness. Patients on medications affecting inflammatory markers (e.g., steroids, immunosuppressants), Pregnant and lactating women are excluded from study. Meanwhile, the control group did not include participants with a history of acute or chronic illness.

Every participant had their clinical history gathered using a data collection form. In Indore, Madhya Pradesh, the Index Medical College and Research Center's Institutional Ethics Committee gave its approval for the collecting of blood samples from human subjects.

Sample Collection and Separation of Serum: 5 ml of blood will be collected from the individuals under the aseptic condition in EDTA vial and plain

vials. The Blood Sample will be allowed to clots at room temperature for 10 minutes. The blood sample will then be centrifuged at 3000 rpm for 10 minutes to separate the serum. Which was then used to estimate the concentration of lipid profile and interleukin-6.

The statistical analysis was using SPSS version 28.0. All data were expressed as mean $\pm$ SD. Continuous normal distributed variables were compared by using the un-paired t-test. Correlation was used to find the significance. Of study parameters between the two group of patients. P value less than 0.05 was considered as statistically significant and less than 0.001 will be considered as highly significant.

Method of Biochemical Estimation: Cholesterol was estimated by enzymatic colorimeter test. Estimation of HDL-C was done through phosphotungstic precipitation and LDL-C was also done through the same precipitation method. Estimation of Triglycerides (TG) was done by enzymatic colorimetric test. Serum of VHD patients were used for individual determinations of lipid profile for Cholesterol, HDL-C, LDL-C, TG and IL-6 was estimated using Competitive electrochemiluminescence protein binding assay on cobas e411 by using clinical laboratory kits.

Results

In the present study, lipid profile and IL-6 of patients with coronary heart disease (CHD) showed significant variation when compared to that of the control group. The Total Cholesterol ($p < 0.05$), triglyceride ($p < 0.05$), Low-Density Lipoprotein ($p < 0.05$), interleukin-6 ($p < 0.05$) and BMI ($p < 0.05$). Were significantly higher in the cases Table-1, 2, 4 and 5. Whereas the High-Density Lipoprotein-Cholesterol had significantly lowered ($p < 0.05$) from that of the controls Table-3 and figure-1. In CAD individual's only significant correlation was between total cholesterol, triglyceride and HDL. (Table-6). Figure 2-a, b shows the negative correlation between total cholesterol with triglyceride and HDL while no correlation between IL-6 with T.CHO, TG, HDL, LDL and BMI.

Table 1:

Parameter in mg/dl	Case (N-121)	Control (N-121)	p-value
T. CHO	228.24 $\pm$ 45.63	164.40 $\pm$ 19.76	<0.001

Table 2:

Parameter in mg/dl	Case (N-121)	Control (N-121)	p-value
TG	196.95 $\pm$ 51.67	116.40 $\pm$ 18.30	<0.001

Table 3:

Parameter in mg/dl	Case (N-121)	Control (N-121)	p-value
HDL	39.40 $\pm$ 8.86	46.98 $\pm$ 7.38	<0.001

Table 4:

Parameter in mg/dl	Case (N-121)	Control (N-121)	p-value
LDL	131.59±40.96	96.75±19.40	<0.001

Table 5:

Parameter in mg/ml	Case (N-121)	Control (N-121)	p-value
IL-6	49.68±19.85	6.20±2.62	<0.001

Table 6:

Parameters	T. CHO	TG	HDL	LDL	IL-6	BMI
T. CHO	1.000	-.348**	-.203*	-.030	-.086	.401
TG	-	1.000	.079	.020	.097	.663
HDL	-	-	1.000	.077	-.045	.944
LDL	-	-	-	1.000	.068	.815
IL-6	-	-	-	-	1.000	.422
BMI	-	-	-	-	-	1.000

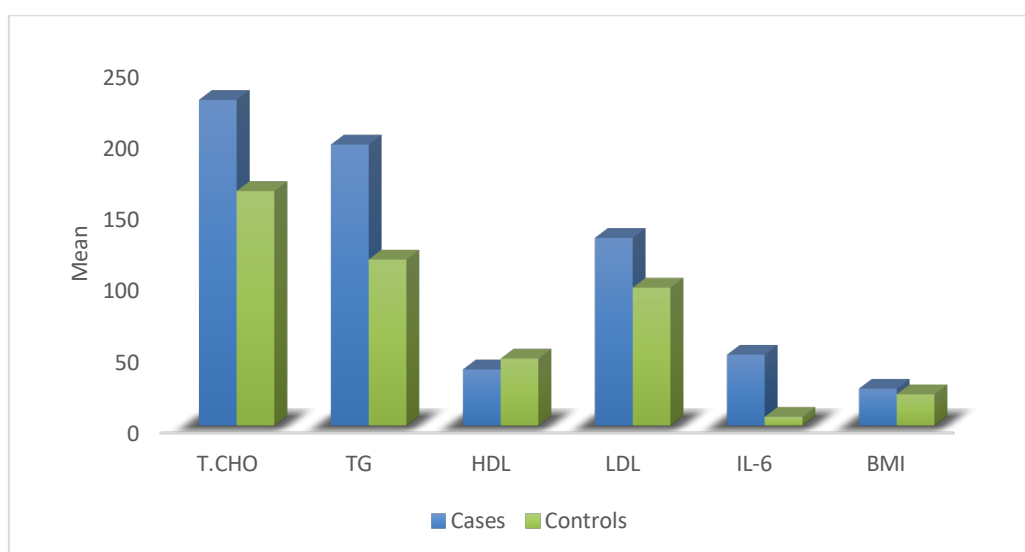


Figure 1: comparison of biochemical parameters in controls and CAD subjects

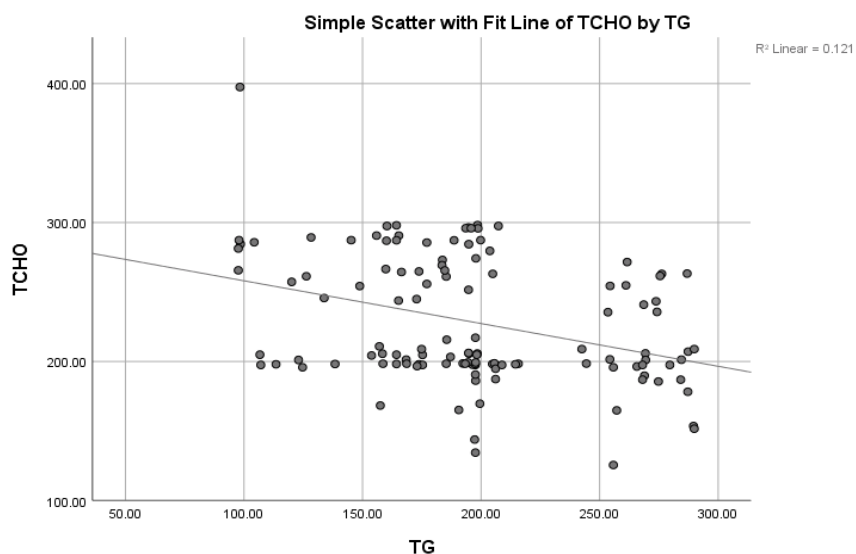


Figure-2 a: correlation between T.CHO and TG

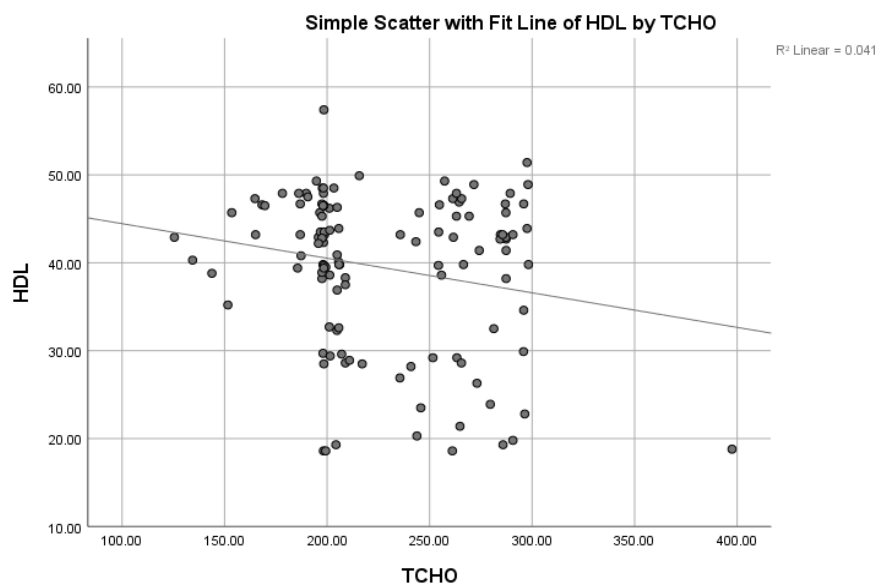


Figure-2 b: correlation between T.CHO and HDL

Discussion

In the present study T. CHO, TG, LDL, IL-6 and BMI levels were shown higher while HDL were lower in coronary artery disease compared to the healthy controls. According to this hypothesis, increased plasma cholesterol concentrations increase the risk of CHD and decreasing plasma cholesterol levels decreases the risk of CHD. The Multiple Risk Factor Intervention Trial (MRFIT) showed that there is an increased risk at levels >200 mg/dL. The Seven Countries Study also demonstrated that elevated plasma cholesterol levels increased the incidence of CHD. The Framingham study clearly demonstrated the association of elevated cholesterol with CHD. [9,10]

Another recent prospective cohort study of apparently healthy male physicians demonstrated that an increase in HDL-C of ≥ 12.5 mg/dl over 14 years was associated with a 57% lesser risk of developing CHD. However, according to major clinical guidelines, HDL-C is a secondary target in CHD prevention. Current guidelines from the Adult Treatment Panel III emphasize on targeting primarily LDL-C, secondarily non-HDL-C, and then HDL-C. According to the American heart Association, HDL-C should be considered a "secondary target" along with TAG, with a goal of HDL-C levels >40 mg/dL. The recent American Heart Association / National Heart, Lung, and Blood Institute scientific statement proposes that HDL-C should be a "tertiary target", following LDL-C and TAG, with goals of HDL-C levels >40 mg/dl in men and >50 mg/dl in women. [11,12] In the present study, although there was an increase in the triglycerides levels in the cases compared to the controls; yet the increase was statistically significant. Clinical studies based on extensive

literature supports the inverse relationship between HDL-C levels and atherosclerosis. HDL enhances the reverse cholesterol transport and has antioxidative, anti-inflammatory, antithrombotic, and Vaso protective effects. [13] Studies have also consistently demonstrated that HDL-C is inversely associated with the risk of CHD. Thus, an increase in HDL-C is linearly associated with a reduction in cardiovascular risk. In line with these findings, present study demonstrated a significant decrease in the HDL-C levels in patients with CHD when compared to controls. [14,15]

One more study done by Tousoulis, et al. [16] and Assier et al. [17] also states the similar results that IL-6 acts as inflammatory cytokine, and there is a defined role in regulating the acute phase response, which is mostly related to early response. Martin Josephs et al. [18] in their recent study shows very significantly high levels of IL-6 in cases of coronary heart disease than non-cardiac patients. Their study also states that raised levels of IL-6 increases the probability of CHD by 25% in comparison to normal levels of IL-6 patients.

Further there are other studies which are consistent to our results and showed a positive association between mortality from CAD and serum IL-6 concentration. [19,20] However, the causal role of elevated serum IL-6 in CAD mortality remains unclear. A recent study. [21] reported a possible causal role of IL-6 in the development of coronary heart disease as interleukin6 receptor (IL-6R) blockade may be responsible for reduced systemic and articular inflammation. Furthermore, a collaborative meta-analysis. [22] also supports this causal association between IL-6 Receptor related pathways and coronary heart disease strongly.

Conclusion

The findings from this study revalidate this scientific observation that there was a significant rise in the levels of T. CHO, TC, LDL-C, IL-6 and BMI even among patients who had recovered from CAD when compared to the controls and there was a significant low in the levels of HDL even among patients who had recovered from CAD when compared to the controls.

It is therefore important to focus on reduction of cholesterol levels IL-6. Our study provides evidence in favor of role of IL-6 in inflammation, atherosclerosis and also shows significant difference in levels of T. CHO, TG, HDL, LDL, IL-6 and BMI.

Lifestyle measures like consumption of a proper diet along with regular exercise; and if required, cholesterol lowering therapy (e.g. statins) should be initiated in susceptible populations even though the levels may be well within the internationally desired levels.

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