

Original Research Article

Possible Relationship between LDL/HDL Cholesterol Ratio and HDL as A Surrogate Marker in Acute Myocardial Infarction

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ABSTRACT

Acute Myocardial Infarction (MI) is one of the important reasons for death and unhealthiness in the world. In patients with acute Myocardial Infarction, cholesterol levels are no longer valid after 24 hrs from presentation, because acute Myocardial Infarction causes a rapid decline in serum levels of Total cholesterol and HDL cholesterol.

The objectives of this study were to evaluate the Fasting levels of serum total cholesterol, high density Lipoprotein (HDL) cholesterol, low density Lipoprotein (LDL) cholesterol, very low density Lipoprotein (VLDL) cholesterol, Triglyceride (TG), HDL cholesterol / LDL cholesterol ratio. The diagnosis is based on the ECG and enzyme profile. Increased total LDH level was taken as criteria for selection of patients. Total 80 cases were studied in the age group 30 to 80 years and status was compared with 80 age and sex matched healthy controls in the same age group. A significant elevations were found in the levels of total cholesterol, LDL cholesterol and LDL cholesterol / HDL cholesterol ratio ($p < 0.001$). these results indicates that the high levels of total cholesterol and LDL cholesterol / HDL cholesterol ratio are associated with risk of Myocardial Infarction in adult and detection of this ratio still could be useful for cholesterol risk assessment in patients with Acute Myocardial Infarction.

Key Words- Acute Myocardial Infarction (AMI), Lipid Profile, LDL cholesterol / HDL cholesterol ratio, Coronary Artery Disease.

INTRODUCTION

Acute Myocardial Infarction (AMI) is one of the most common diseases among the developing countries. MI is defined as prolonged chest pain and is diagnosed as

acute myocardial infarction on clinical examination, electrocardiographic changes and laboratory basis ⁽¹⁾. The mortality rate of MI is approximately 30% and for every 1 in 25 patients who survive the initial

hospitalization, dies in the first year after AMI. Indians are four time more prone to AMI as compared to the people of other countries due to a combination of the genetic and lifestyle factors that promote metabolic dysfunction. The risk of cardiovascular disease is predicted by various factors such as age, sex, smoking, hypertension and dyslipidemia ⁽¹⁾. Elevated serum triglyceride, total cholesterol and LDL cholesterol are well established risk factor, for cardiovascular disease ⁽²⁻⁷⁾. A low serum HDL cholesterol level is therefore, thought to be an independent cardiovascular risk factor that leads to the development of atherosclerosis and related cardiovascular events ⁽⁸⁾.

Many large scale studies have shown a high correlation between total plasma cholesterol and LDL levels and the severity of atherosclerosis as judged by the mortality rate from ischemic heart disease ⁽⁹⁾. This is why; it was considered a consequence of hyperlipidemia, especially hypercholesterolemia.

It is well established that a western lifestyle, a high fat, high calorie diet, physical inactivity and tobacco smoking plays a major role in the causes and risk of MI. The biochemical or physiological consequences of this lifestyle include elevated blood pressure, elevated plasma cholesterol, low plasma high density lipoprotein (HDL) cholesterol, elevated plasma TG, diabetes, obesity and thrombogenic factors ⁽¹⁰⁾.

Several epidemiologic studies have shown that the ratio of total cholesterol to HDL cholesterol and LDL cholesterol to HDL cholesterol also can be used as predictors of MI ⁽¹¹⁾.

The present study was conducted to evaluate the association of lipid profile and LDL/HDL ratio in the patients with first Myocardial Infarction.

MATERIAL AND METHODS

The present research was carried out in the Department of Biochemistry, B. J. Medical College, Pune in collaboration with Sassoon General Hospital, Pune and Department of Biochemistry PDVVPF's Medical College, Ahmednagar, Maharashtra. The Institutional Ethical Committee clearance was obtained and utmost care was taken during experimental procedure according to the Declaration of Helsinki 1975.

The study had been performed on total 160 cases, which included 80 age and sex matched (48 males and 33 females) healthy controls and 80 (64 males and 16 females) myocardial infarction patients which were previously diagnosed by ECG and enzyme profile. Increased total LDH level was taken as criteria for selection of patients. All patients were under the strict supervision of medical professionals during this period. All the patients having history of any heart disease, hypertension, thyroid dysfunction, diabetes mellitus were excluded from the study. Screening with complete blood count, ESR, fasting blood glucose was performed and if found abnormal, were excluded from the study.

After obtaining a written consent from all the participants, total 5ml blood was withdrawn aseptically from the antecubital vein from each subject in plain bulb after 12 hrs overnight night fast. The samples were centrifuged at 3000 rpm for 10 min to separate. The separated serum was collected in polythene tube with cork and stored at -20°C. The serum with no sign of hemolysis was used for analysis of all the parameters.

Fasting levels of serum total cholesterol, high density Lipoprotein (HDL) cholesterol, low density Lipoprotein (LDL) cholesterol, very low density Lipoprotein (VLDL) cholesterol, Triglyceride (TG), HDL cholesterol / LDL cholesterol ratio were measured by enzymatic methods using

Kits form Erba chem. Limited on spectrophotometer techniques (Model Chemiline CL/310 UV/VIS) in the Biochemistry lab.

The statistical analysis was carried out by using the SPSS (Statistical Package for Social Sciences) software. The Student 't' test was applied for the statistical analysis

and the results were expressed in mean \pm SD, p values ($p < 0.001$) were considered as highly significant.

RESULT

The clinical characteristics of acute myocardial infarction patients and control subjects have been shown in table 1.

Table 1: Statistical comparison was done between Acute MI patients and control group.

Sr no.	Parameters	Acute MI patients (n=80)	Control group (n=80)
1	Total cholesterol (mg/dl)	200.86 \pm 44.24*	181.63 \pm 11.97
2	LDL cholesterol (mg/dl)	151.76 \pm 35.4*	121.13 \pm 21.3
3	VLDL cholesterol (mg/dl)	32.64 \pm 4.87*	23.65 \pm 5.13
4	HDL cholesterol (mg/dl)	39.05 \pm 5.08*	57.71 \pm 7.34
5	Triglyceride (TG) (mg/dl)	176.98 \pm 19.54*	121.63 \pm 32.05
6	HDL cholesterol / LDL cholesterol ratio	3.86 \pm 1.27*	1.59 \pm 0.60

Values are expressed in mean with standard deviation (mean \pm SD).

* $p < 0.001$ - considered as highly significant.

n= number of subjects.

Table-1 indicates significantly elevated ($p < 0.001$) levels of serum total cholesterol, low density Lipoprotein (LDL) cholesterol, very low density Lipoprotein (VLDL) cholesterol, Triglyceride (TG), HDL cholesterol / LDL cholesterol ratio as compared to control subject. Also the level of serum high density Lipoprotein (HDL) cholesterol was found significantly lower when compared to control subject.

DISCUSSION

Coronary artery diseases are the most important factors of death. There is an increasing prevalence of these diseases in developing countries ⁽¹²⁾. Serum cholesterol alone is poor indicator of CHD risk which is much increased when other risk factors are present. Because well established risk factor such as smoking, serum cholesterol, hypertension and diabetes acts together to

produce a heightened level of risk, the importance of rigorous sustained intervention in individuals with multiple risk factors for CHD cannot be overstated. Clinical epidemiological data also point to considering the atherogenic profile of the individual by using serum total cholesterol, HDL cholesterol and TG in the initial patient's assessment ⁽¹⁰⁾.

Many studies in the past few decades have shown that acute MI results in significant increase in the serum levels of total cholesterol, LDL cholesterol and TG ⁽¹¹⁾. In our study we have found that there is significant increase in total cholesterol level and it has supported by the Salahuddin et al and Ahmed Shirakan et al. Elevated serum cholesterol level has depends on consumption of fat and genetic basis ^(9, 12, 13).

In our present study serum triglyceride levels significantly increase in

AMI patients when compared with control subjects. There is different mechanism about elevation of TG after MI. it is reported that elevated TG levels may depends on genetic and nutritional basis. TG change level may because inherited abnormality of very low density lipoprotein. It may happen because of increased flowing of fatty acids and impaired elimination of VLDL from the plasma. Our results are supported by other researchers (9, 12, 14, 15).

The VLDL cholesterol and LDL cholesterol has found to be elevated significantly when compared with controls. LDL carries the most of the cholesterol in the plasma and increasing of LDL depend on increasing of total cholesterol (9, 10, 12).

Low HDL cholesterol is shown to be associated with higher prevalence and incidence of coronary artery diseases (9, 16). Reduction in HDL cholesterol concentration in our finding is agreement with other studies. According to Robert H Glew et al, the dairy products such as milk, butter, and cheese are excellent sources of trans fatty acids that decrease HDL cholesterol, and increase the risk of cardiovascular disease (8).

Several studies have supported that the ratio of LDL cholesterol/ HDL cholesterol shows the atherosclerotic injuries of the wall of the vessels (12). We found the significant increase in the ratio of LDL:HDL cholesterol level after acute MI. Our study has been supported by latest studies (12, 17, 18).

LDL cholesterol level may be increased as a result of reducing in refining or excessive production of LDL cholesterol. LDL cell surface receptors may changes as a result of coronary heart disease, thus uptake of LDL cholesterol is decreased. On the other hand, increase in LDL possibly as a result of excessive production of VLDL or decrease of VLDL remnants. The result of our study shows significant elevations in total cholesterol, LDL cholesterol, VLDL

cholesterol, TG and LDL cholesterol/ HDL cholesterol ratio after acute MI.

CONCLUSION

The core of our research lies in a fact that, there is a significant association of lipid profile with acute myocardial infarction. Changing of dietary and social activity habits of people in this area can help to prevent future atherogenic damaging in AMI patients. Reducing serum HDL cholesterol level in our study may be one of the effective reasonable lipid disorders in acute myocardial infarction.

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