"Comprehensive levels of Serum Enzymes and Lipid Profile testing in MI and Stable Angina Subjects."

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Abstract:

Background: Cardiovascular diseases have over taken all other causes of mortality. Heart disease has been thus, labeled as the single largest killer in the world. CVD is the major cause of death, after the age of 40 years in men and 50 years in women. Initially the estimation of serum lipids like cholesterol and triglycerides were used to assess the risk of coronary heart disease. Numerous studies have shown that elevated levels of apolipoproteins (Apo B) are associated with increased cardiovascular risk. We advocate greater use of apolipoproteins measurements in clinical practice to identify patients at high risk in a variety of situations. There is paucity of literature on the enzyme levels and lipid profile in Stable Angina patients. Hence this particular group was included in this present study.

Materials & Methods: - The total numbers of subjects in this study were 141 divided into three groups. **Group I**- Patients with acute myocardial infarction, **Group II** - Patients with stable angina and **Group III** - were Healthy individuals (control) in age group between 45-75years. The following investigations were carried out **Enzyme assay:** Creatine kinase, Creatine kinase-MB, Aspartate amino transferase, Lactate dehydrogenase. **Lipid assay:** Total cholesterol, Triglycerides, HDL-C, LDL-C, VLDL-C, Apo A & Apo B.

Results: - Our study showed that there was a significant elevation in the serum enzymes CK-MB, total CK, AST and LDH in AMI patients in contrast to SA & Control subjects. In addition there was a significant increase in total cholesterol, triglycerides, LDL-C, VLDL-C and Apo B while there was a significant decrease in HDL-C & Apo A in AMI patients as compared to healthy controls.

Conclusion: There was significant elevation in serum enzymes, Apo B and decrease in HDL, Apo A in AMI. Thus elevation of CK-MB, Apo B could serve as reliable indicator for diagnosis of AMI and decrease in HDL-C, Apo A could serve as reliable indicator for prognosis of AMI.

Keywords: Cardio Vascular Disease (CVD); Acute Myocardial Infarction (AMI); High Density Lipoproteins (HDL); Low Density Lipoproteins(LDL); Creatine kinase(CK); Apo lipoproteins (A&B); Stable Angina (SA)

INTRODUCTION:

Coronary Artery Disease (CAD) affects two third of world population. Recent estimates indicate that annually 12 million deaths occur worldwide due to this disease. In 1990 approximately 25% of deaths in India were attributed to CVD. Prevalence of CAD is known to be very high both among migrant Asian Indians and also among people within the Indian subcontinent. In An Indian study Cases of CVD may increase from about 2.9 crore in 2000 to as many as 6.4 crore in 2015. Deaths from CVD will be more than double.

Most of this increase will occur on account of coronary heart disease —AMI, angina, CHF and inflammatory heart disease (1, 2). Heart disease and stroke are usually due to atherosclerosis of large and medium sized arteries. Hypercholesterolemia is the most important factor in the pathogenesis of atherosclerosis. Hypertension, smoking, diabetes, obesity, physical inactivity, and atherogenic diets have all been identified as modifiable risk factors for heart disease. Age, gender, and a family history of premature coronary heart disease (CHD) have been identified as nonmodifiable risk factors (3).

Important differences in prevalence of this disease exist not only in different countries but even within a single country Prevalence rates of CVD in rural populations will remain lower than that of urban populations. The prevalence rates among younger adults (age group of 40 years and above) are also likely to increase Prevalence rates among women will keep pace with those of men across all age groups. (4). Available prospective cohort studies suggest that lipid abnormalities are associated with increased risk of cardiovascular events. Various studies have demonstrated that LDL, HDL, and triglycerides are independent predictors of CVD (10, 11).

Apolipoproteins are the protein components of lipids. Apo-A is the major protein constituent of HDL. Apo-A and HDL are protective; Apo-B and LDL are atherogenic. HDL has 2 molecules of Apo-A, whereas cholesterol content varies in each of these lipoprotein particles.Therefore measuring Apo-A is an determinant of the number of antiatherogenic particles in circulation, than the cholesterol content, which varies (5,6). The

14

atherogenic lipoprotein particles LDL, VLDL remnants, or IDL, and chylomicron remnants each contain 1 molecule of apoB as the structural protein. The plasma apoB concentration reflects the number of atherogenic lipoproteins, and studies in men have demonstrated that apoB can be a valuable predictor for CAD (7,8).

The extensive mortality and morbidity associated with CAD has stimulated the search for non invasive methods to assist the clinician in the diagnosis (9). As AMI may strike an individual during the most productive years, it can have profound deleterious psychosocial and economic ramifications. (10). A Well designed preventive programmes which can initiated to prevent CAD in all public health education, primary prevention, early diagnosis, effective treatment and secondary prevention of Coronary Heart Disease should be aggressively pursued to contain the Lipid-associated risk for CVD events is graded and continuous. Hence an increasing need of identifying those at risk and also, of rapid and accurate diagnosis to provide effective treatment.

This will have a significant influence on the reduction or mortality and morbidity attributable to acute myocardial infarction.

MATERIAL AND METHODS :

The study population consisted of Men and Women; this study was performed at Melmaruvathur Adhi Parasakthi Institute of Medical Sciences & Research Centre (MAPIMS &

R), Melmaruvathur. Informed and consent was taken from all subjects. The Study conducted in between Dec 2008 and Dec 2009. This study had total numbers of subjects were 141 divided into three groups. Group I- 47 Patients with acute myocardial infarction, Group II - 44 Patients with stable angina and Group III - 50 were Healthy individuals (control) in age group between 45-75years. The investigations carried out were Enzyme assay: Creatine kinase, Creatine kinase-MB, Aspartate amino transferase, Lactate dehydrogenase. Lipid Profile: Total cholesterol, Triglycerides, HDL-C, LDL-C, VLDL-C, Apo A & Apo B.

INCLUSION CRTERIA:

Patients with stable angina were included in this study as per WHO 1985 Criteria. Identified the cases by clinical and electrocardiographical findings. Angina at rest, acute within 48 hours and patient dependent on intravenous treatment with nitrates and heparin are also included.

EXCLUSION CRITERIA:

Patients were excluded those they had stable angina in the presence of multivessel disease (defined as coronary lesions > 70% diameter stenos is on visual assessment in more than one major coronary artery) or restenotic coronary lesions. Patients with unstable Angina, Liver diseases, Muscular dystrophy, Known diseases or on lipid lowering drug therapy

15

STUDY PATTERN:

The Study groups were of same age and sex matched. All the samples were collected after an overnight fast of 10-14 hours, 5 ml of the venous blood was collected by taking aseptic precautions. The sample was centrifuged for 15 minutes at 3000 rpm. Serum was separated. All the samples were analyzed on the same day of sample collection. The following parameters are assessed in serum by using fully automated analyzer [Chemwell]. The investigations carried out were Enzyme assay: Creatine kinase, Creatine kinase-MB, Aspartate amino transferase, Lactate dehydrogenase. Lipid Profile: Total cholesterol, Triglycerides, HDL-C, LDL-C, VLDL-C, Apo A & Apo B.

RESULTS :

The study group comprised of 47 patients with acute myocardial infarction, 44 patients with stable angina and 50 healthy controls. The significance of differences was assessed by both paired and unpaired student 't' test. Results are shown in table No.1 & 2. The data was collected, tabulated and analyzed by using the paired 't' test or the comparison of the mean and SD by chi square test for the two by two tables. A 'p' value of 0.05 was taken as cut off for the measure of significance.

DISCUSSION:

RELATION BETWEEN SERUM ENZYMES & MYOCARDIAL INFARCTION:

Acute myocardial infarction is one of the most common causes of death and one of the most frequent causes of hospitalization; so many attempts have been made to improve its diagnosis. Detection of myocardial damage is diagnosed by using increasing serum concentrations of enzymes like Creatine Kinase, CK-MB, SGOT and LDH. In MI all these 4 are significantly increased ($p < 0.0001$), this is in accordance with earlier studies of Robert et al 1975. On the other hand, there was no significant difference in the enzyme levels between the healthy controls and stable angina patients. This is an important to clinical situation as this parameter if extrapolated can help in distinguishing between a case of stable angina and AMI.

RELATION BETWEEN SERUM LIPIDS & MYOCARDIAL INFARCTION :

The association between the incidence of coronary artery disease and total serum cholesterol concentration is well established. The low density lipoprotein subtraction is mainly responsible for this relation, while values of high density lipoprotein are inversely related. In view of this close link between cholesterol concentrations and CAD and the accumulating evidence that treating hypercholesterolemia in middle aged men may reduce mortality and morbidity from ischemic heart diseases,

16

Table.1 Enzyme levels in Healthy Controls, AMI & Stable Angina (SA) Patients (IU/L)

Enzyme	Healthy Control	AMI	SA
CK MB	15.03 $\pm$ 3.89	177.09 $\pm$ 20.60*	16.05 $\pm$ 4.83
CPK	122.02 $\pm$ 23.47	284.04 $\pm$ 27.03*	127.09 $\pm$ 23.70
SGOT	24.09 $\pm$ 6.97	140.06 $\pm$ 20.93*	24.87 $\pm$ 5.23
LDH	152.3 $\pm$ 42.5	318.03 $\pm$ 25.02*	162.6 $\pm$ 31.50

The parenthesis * shows $p < 0.0001$

Table – 2 Lipid Profile In MI, Stable Angina & Healthy Control (mg/dl)

Lipid Profile	Healthy Control	AMI	SA
Triglycerides	107.02 $\pm$ 13.09	165.03 $\pm$ 20.09*	125.09 $\pm$ 20.02
Total Cholesterol	195.42 $\pm$ 18.03	224.02 $\pm$ 14.92*	202.39 $\pm$ 15.72
HDL – C	48.09 $\pm$ 6.19	31.82 $\pm$ 4.49*	44.03 $\pm$ 5.37
LDL – C	126.07 $\pm$ 18.37	160.08 $\pm$ 18.27*	137.02 $\pm$ 20.75
VLDL – C	21.69 $\pm$ 2.92	32.89 $\pm$ 4.12*	24.83 $\pm$ 4.03
Apo A	130.20 $\pm$ 20.35	90.22 $\pm$ 18.26*	107.20 $\pm$ 17.22
Apo B	92.18 $\pm$ 8.19	147.23 $\pm$ 20.42*	112.28 $\pm$ 11.15

The parenthesis * shows $p < 0.0001$

serum lipid assessment is very important in patients who have had a myocardial infarction(13,14). In the present study there was a significant increase in total cholesterol, triglycerides, LDL-C, VLDL-C and Apo B while there was a significant decrease in HDL-C & Apo A in AMI patients as compared to healthy controls. There was a slight difference in lipid profile in stable angina and controls but it is not significant. This study showed that patients with AMI had significantly higher total cholesterol LDL- C & Apo B levels than healthy controls (p<0.0001). HDL-C, Apo A levels were significantly lower among patients with AMI than among the control group. (p<0.0001). This accords with the correlations found by Vincel [12]. There is no significant difference between the lipid values measured Stable angina group patients. This is in accordance with the earlier studies. There is a possibility that T.Cholesterol and TGs are affected by factors like caloric intake, exercise smoking, diabetes, Nutrition etc., and therefore the increase in their values found in the present study cannot serve as reliable prognostic indicator in MI patients (15 – 18). On the other hand HDL-C is not acutely affected by the said factors. HDL-C could therefore serve as a reliable prognostic indicator for patients with acute myocardial infarction.

There is paucity of literature regarding the effect of MI on the serum VLDL-C concentration. However as VLDL-C is the major lipoprotein fraction known to carry triglycerides, its level should parallel the triglyceride level, as observed in the present study.

CONCLUSION:

The present study showed that there was a significant elevation in the serum enzymes CK-MB, total CPK. SGOT and LDH in AMI patients in contrast to stable angina patients. Since CK-MB is the most specific isoenzyme for the heart, the elevation in CK-MB levels is significant.In addition there was a significant increase in total cholesterol, triglycerides, LDL-C, VLDL-C and Apo B while there was a significant decrease in HDL-C & Apo A in AMI patients as compared to healthy controls. There was no significant difference in Stable angina group

As HDL-C is not acutely affected by modifiable factors like diet and exercise it can serve as a reliable prognostic indicator in AMI patients. Thus elevation of CK-MB could serve as reliable indicator for diagnosis of AMI and decrease in HDL-C, Apo A could serve as reliable indicator for prognosis of AMI.

Further large scale clinical studies are required in this direction to corroborate our findings and to bring into utility "decreased HDL-C & Apo A" as a reliable indicator in prognosis of MI.Evaluation of Apo A & Apo B should be routinely added to the routine lipid profile testing in MI.This is important if extrapolated to the clinical situation as these parameters can help in distinguishing between a case of stable angina and AMI.

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19

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