

Original article

Lipid profile fractions responsible for non ST-Elevation myocardial infarction in unstable angina patients of south India

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Abstract:

Background: Although it is well known that dyslipidemia is the major risk factor for developing acute coronary syndrome (ACS) but its role in causing minor myocardial damage in unstable angina (UA) patients is rarely studied in south India, where obesity and dyslipidemia has been more common due to genetic and life style factors.

Objective: The aim of our study was to find out the role of lipid profile parameters predicting the occurrence of non ST-elevation myocardial infarction (NSTEMI) in the patients of UA.

Methods: In this study, the laboratory parameters like troponin-I and serum total cholesterol (TC), triacylglycerol (TAG), low density lipoproteins (LDL), high density lipoproteins (HDL) were estimated in all patients of UA by using commercially available kits whereas TC/HDL and LDL/HDL ratio were calculated manually. The lipid levels were compared between troponin-I positive i.e. NSTEMI group and troponin-I negative i.e. UA groups. The data was analysed by using unpaired T-test and forward type of logistic regression analysis.

Results: The TC/HDL was found to be the only factor predicting the occurrence of NSTEMI in UA patients, even though the mean values of serum TC, TAG, TC/HDL and LDL/HDL ratio were significantly high in NSTEMI group as compared to UA group.

Conclusion: It can be concluded that TC/HDL ratio is the best risk predictor of myocardial damage in unstable angina patients of south India.

Keywords: Dyslipidemia, non ST-elevation myocardial infarction, unstable angina, troponin-I.

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unit of Narayana Medical College, Nellore. The age ranged from 35 to 65 years with mean age of 50 yrs. Informed consent was taken from the patients. The study was approved by institutional ethical committee of Narayana Medical College, Nellore.

Inclusion criteria

Patients admitted with typical symptoms and signs of UA i.e. left pericardial chest pain with duration 5 to 30 min or more radiating to the left arm, jaw, neck, right shoulder associated with sweating, nausea, vomiting and relieved by nitrates along with no ST segment elevation on ECG.

Exclusion criteria

Patients presenting with STEMI, known cases of thyroid dysfunction, liver disease, renal disease, trauma, sepsis, pulmonary embolism, myocarditis, congestive heart failure, muscular dystrophy, skeletal muscle injury were excluded from the study.

Sample collection

First blood sample was collected within 12-24 hours after the onset of chest pain in evacuated tubes and allowed to clot at room temperature. Then serum was separated by centrifugation at 3000 rpm for 10 minutes. Troponin-I was detected by hexagon Troponin plus kit. It detects cardiac Troponin-I with sensitivity limit minimum of 0.5 ng/ml [7].

Then fasting blood sample was collected next day morning after admission for laboratory evaluation of lipid profile. The serum cholesterol was estimated by Cholesterol Oxidase Phenol Aminophenazone (CHOD-PAP) method. The serum TAG was estimated by Glycerol 3 Phosphate Phenol Aminophenazone (GPO-PAP) method. All these estimations were done by using an autoanalyser Humastar 300 (Human Diagnostics). The serum LDL and HDL was

measured by enzymatic colorimetric method. The ratio of TC/HDL and LDL/HDL were calculated manually. Control and calibrators were run before each batch to achieve adequate quality control. Troponin-I positivity indicates the myocardial damage, hence troponin-I was estimated to establish the diagnosis of NSTEMI where as troponin-I negative cases were included in UA group. Fasting serum TC, TAG, LDL, HDL, TC/HDL and LDL/HDL cholesterol ratio were estimated to predict the risk in both groups [8].

Data evaluation was done using statistical package for social sciences (SPSS) programme by using unpaired student's-t test. The results were expressed as a mean \pm standard deviation. The p-value was used to compare between two groups. The p-value of <0.05 was considered to be significant. The evaluation of the factors predicting the myocardial injury (Troponin-I positive) the forward type of logistic regression analysis method was used [9].

Results

Out of the 50 patients studied, 17 were Troponin-I positive (14 males & 3 females) which were detected as NSTEMI and 33 patients who were Troponin-I negative (22 males & 11 females) were diagnosed as UA.

As shown in table I, fig. 1 and 2, the means of TG, TC/HDL, TC and LDL/HDL ratio were significantly higher in troponin-I positive group as compared to troponin-I negative. The mean values of serum LDL and VLDL cholesterol were higher in troponin-I positive group as compared to troponin-I negative group but the difference was not found to be statistically significant. The mean value of serum HDL cholesterol was lower in troponin-I positive group as compared to troponin-I negative group with no significant difference.

After studying the results of unpaired T-test in this study, the logistic regression analysis was used since our interest was to determine the predictors for Trop-I which was a categorically dichotomous variable, so forward conditional method was used. At first to get the amount of variation, the Nagelkerke R square was determined the value of which was 0.44. It tells that 44.1% of the variation in the dependent variable (Troponin-I) is explained by the logistic regression model (Table.3).

Table 2 provides the overall accuracy of model to predict risk of subjects getting NSTEMI 82%. The

sensitivity is given 9/10 i.e. 56.25% and the specificity by 32/34 i.e. 94.11%. The positive prediction value is equal to 9/11 i.e. 81.81% and negative predictive value will be 32/39 i.e. 82.05%. The equation for calculating the probability of having the risk of NSTEMI (Troponin-I becoming positive) will be:

$$\text{Probability (Troponin-I positive)} = 1 / (1 + e^z)$$

Where e denotes exponential function with $z = -7.976 + 1.503 \times \text{TC/HDL}$

Table 2: Model discrimination table.

Observed value		Predicted value			
		Dependent variable		%	
		Troponin-I negative	Troponin-I Positive	Correct	
Step1	Dependent variable	Troponin-I Negative	32	2	94.1
		Troponin-I Positive	7	9	56.2
Overall percentage					82.0
a. The cut value is 0.50					

In table 3, Wald estimates gives the importance of TC/HDL. The Wald value of 10.413 is higher enough to justify the importance of this model. The justification for excluded variables is given in table 4.

Table 3: Estimates of the logistic regression model.

Variables in the Equation									
		B	S.E.	Wald	df	Sig.	Exp(B)	95.0% C.I. for EXP(B)	
								Lower	Upper
Step 1	TC/HDL	1.503	0.466	10.413	1	0.001	4.494	1.804	11.194
	Constant	-7.976	2.245	12.626	1	0.000	0.000		

a. Variable(s) entered on step 1: TC/HDL.

al [14] studied lipid profile in STEMI and NSTEMI also couldn't find any change in TC, whereas Rafaela et al who studied lipid profile in NSTEMI patients could not find any association TC with severity of ACS [9]. Others P. K. Nigam [12] and Vessa Manninen [18] have noted no significant increase or decrease in total cholesterol after acute myocardial infarction.

Serum triacylglycerol

The mean values serum TAG were statistically highly significant ($P < 0.001$) in NSTEMI group as compare to US group. It may be due to elevated flux of fatty acids and impaired removal of VLDL from the plasma. The studies of R. Salehi et al [16], Amit Kumar Shrivastav et al [11], P. K. Nigam et al [12] and Okon Ekwere Essien et al [17] supported our findings. Jorgen Jeppesen et al [15] conducted prospective study on risk factor of ischemic heart diseases and showed that low TAG and High HDL lowers the risk of developing IHD. Other researchers have observed higher triacylglycerol values in coronary artery disease as compared to controls. Unlike our findings some researcher Haseeb A. Khan et al [14], Rafaela et al [10] have noted lower triacylglycerol levels after acute coronary syndrome.

Serum HDL cholesterol

The mean values of serum HDL cholesterol were low in troponin-I positive group as compare to troponin-I negative group which is statistically not significant ($p > 0.05$). Most of the researchers have found significantly lower levels of HDL cholesterol in coronary artery disease patients [12, 14, 15, 16]. But some of the workers also noted that the reduction in HDL occurs only during acute stage of ACS [12, 19].

Serum LDL and VLDL cholesterol

The mean values of LDL and VLDL cholesterol were higher in troponin-I positive group as compared to troponin-I negative group which is

statistically insignificant. But R. Salehi et al [16], Amit Kumar Shrivastav et al [11], P. K. Nigam et al [12] and Vishwanathan et al [13] noted the significantly high LDL cholesterol values in coronary artery disease as compared to controls. Recently researchers have indicated that the LDL levels get reduced after 24 hours of myocardial damage [14]. Mouaz H. Al-Mallah et al demonstrated that on admission low LDL levels have positive correlation with increased three year mortality [19].

Summary

This study demonstrated that significantly higher TC, TAG, TC/HDL, LDL/HDL, levels were estimated in patients of NSTEMI as compare to UA patients, along with no significant difference of HDL. But by logistic regression (binary) analysis TC/HDL ratio was found to be the only factor predicting the NSTEMI occurring in UA patients. These observations support the value of calculating the TC/HDL ratio and not individual lipid parameter while predicting the risk of myocardial damage in cases of UA as stated in adult treatment panel-IV guidelines, quoted by P.C. Talwalkar et al [20]. So that early correction or close monitoring of TC and HDL could be of use to reduce the chances of future myocardial damage occurring in unstable angina patients.

Limitations of our study: We could not estimate the newer inflammatory markers (apolipoprotein-A, neopterin, high sensitive C-reactive proteins) as the selection bias, less number of cases with unequal distribution of base line co-morbidities were also some of the limitations of our study.

Future scope: The larger study is required to be carried out in the future with inclusion of newer cardiac risk factors correlating with the severity of the acute coronary syndrome on UA patients of south India where there is higher prevalence of the ACS.

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