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RESEARCH ARTICLE

ESTIMATION OF SERUM URIC ACID AND LIPID PROFILE IN PATIENTS WITH CORONARY ARTERY DISEASE AND ITS CAUSAL RELATIONSHIP

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ABSTRACT

Introduction: Coronary artery disease (CAD) is the most common cause of mortality around the world (2). Identification of risk factors and early diagnosis are important as symptoms may indicate unexpected and serious consequences. In addition to genetic predisposition; obesity, diabetes mellitus, dyslipidaemia, hypertension and smoking are well established risk factors. The relationship between increased Serum Uric Acid level and development of CAD has been investigated for more than 50 years.

Methods: The study is aimed to find out the significance of raised Serum Uric Acid level in patients with Coronary Artery Disease (CAD). In this study, we included forty CAD patients as test group and equal number of controls. Both test group and control group were selected according to inclusion and exclusion criteria. All candidates were assessed for anthropometric and biochemical parameters. Lipid profiles and Serum Uric Acid was estimated by auto-analyser and IFCC approved methods.

Results: The present study showed significant increased level of Total Cholesterol ($p< 0.001$) and elevated LDL-C ($p<0.001$) in CAD patients as compared to controls. Mean Uric Acid was also significantly higher in test group (7.83±1.83) as compared to control group (5.06±1.48).

Conclusion: Serum Uric Acid, TC/HDL and LDL/HDL ratios could be regarded as objective markers in association with existing atherogenic dyslipidaemia in patients with CAD.

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INTRODUCTION

The Cardio vascular disease(CVD) account for one thirds of all deaths world-wide, two-thirds of which occurs in developing countries like India (Murthy *et al*., 2012). The most common cause of Coronary Artery Disease (CAD) is the atherosclerotic disease of an epicardial coronary artery which is sufficient to cause regional reduction in myocardial blood flow and inadequate perfusion of the myocardium supplied by involved coronary artery. Globally, CADs are among the leading cause of morbidity and mortality (Jaloweic, 1989). The incidence of symptomatic CAD at a young age is low, involving approximately 3% of all CAD cases (Jaloweic, 1989). Although coronary artery disease is rarely seen in adults younger than 45 years of age; identification of risk factors and early diagnosis are important; as symptoms may indicate unexpected and serious consequences (Niskanen, 2004). Measurement of Total Cholesterol (TC), Low Density Lipoprotein cholesterol (LDL-C) and High Density Lipoprotein (HDL-C) are widely recommended for CAD risk assessment.

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Studies have shown that estimation of non-HDL Cholesterol including all other atherogenic factors such as dyslipidaemia, Apo-lipoprotein-B containing lipoproteins, are simpler and better screening tools for assessment of CAD risk in adults(3, 4).Dyslipidaemia has been long recognised as a major biochemical event predisposing to atherogenicity. LDL/HDL ratio and TC/ HDL ratio have also been proved to be an accurate predictor of cardio-vascular risk factor (Nichollas *et al*., 2007; Enomoto *et al*., 2011). Several epidemiological studies (Duran *et al*., 2012) have identified an association between increased serum uric acid and cardio-vascular risk in general population. More than five decades ago *Gertler et al*., postulated that an increase in Serum Uric Acid levels is a risk factor for CAD (Gertler *et al*., 1951). The exact role of Serum Uric Acid in predicting cardiovascular mortality is still a matter of debate as many studies suggest that hyperuricemia is associated with cardio-vascular disease (Gertler *et al*., 1951). Serum Uric Acid acts like an anti-oxidant in the early stages of atherosclerotic process and also is the strongest determinant of plasma anti-oxidant capacity (Naghavi *et al*., 2002). But in higher concentrations it changes into rather a pro-oxidant. This study was undertaken to evaluate whether there is existence of

any significant correlation between serum lipid profile and serum uric acid levels with the occurrence of CAD.

METHODS

Data was collected from 40 CAD patients as subjects and equal number of controls based on inclusion and exclusion criteria. The study was conducted in SMS Medical College and Hospitals, Jaipur.

Inclusion criteria

- Diagnosed cases of CAD attending cardiology OPD; SMS medical college and hospitals
- Age between 40-70 years

Exclusion criteria

- Critically ill patients
- Patients with HIV, chronic renal failure, malignancy, post-organ transplants, pregnancy and chronic liver failure

Generalised data of all subjects like age, name, and blood pressure were recorded. Venous blood was withdrawn for investigation from anterior cubital vein following overnight fast. Serum was separated for analysing biochemical parameters as TC, TG, LDL, HDL and Serum Uric Acid by auto analyser-Beckmann (AU-680) and IFCC approved methods after taking into consideration the proper measures of quality control and calibration.

Statistical analysis

The categorical data was compared among groups using Chi square test. Groups were compared for demographic data by using Student t- test. Pearson's correlation coefficient was calculated to find correlation of serum uric acid with LDL-Cand HDL-C in test and control groups.

RESULTS

The mean and standard deviation of anthropometric and physiological measures of controls and subjects are depicted in Table 1.

DISCUSSION

Coronary Artery Disease is now established as the disease of life- style. This forms a complex condition with other closely related diseases as dyslipidaemia, obesity, insulin resistance, and hypertension; termed as Metabolic Syndrome. Several risk factors have been defined as predictors of Coronary atherosclerosis (Hansson, 2005). Despite advances in treatment methods, CVDs remain leading cause of death in all developed countries (Murthy *et al*., 2012). The risk factors may be classified as modifiable and non-modifiable risk factors. Atherogenic dyslipidaemia including high LDL-C, VLDL and TAG levels with low HDL –C levels is a modifiable risk factor in both the genders. Present study showed significant rise in Lipid profile parameters in test group as compared to control.

Table 1. Anthropometric and Physiological Measures of Controls and Test groups

Parameters	Controls (Mean±SD)	Test (Mean±SD)	p-value
BMI (kg/m^2)	26.40±3.57	28.53±3.21	0.006 S
HTN	42.5%	72.5%	0.013
DM	25%	32.5%	0.62
COPD	25%	42.5%	0.256

P<0.001 is taken as significant

Table 2. Selected Biochemical Parameters in Controls and Test groups

Parameter	Control (Mean±SD)	Test (Mean±SD)	p-value
Total cholesterol mg/dl	164.25±34.32	194.72±22.54	<0.001S
TAG mg/dl	138.67±53.46	194.67±25.92	<0.001S
HDL mg/dl	44.37±6.07	40.6±4.79	0.003
LDL mg/dl	132.65±29.51	167.1±13.89	0.046
Non-HDL mg/dl	119.87±36.81	154.17±23.76	<0.0001
LDL/HDL	3.06±1.04	4.17±0.635	<0.0001
TC/HDL	3.81±1.15	4.87±0.85	<0.0001
Uric acid mg/dl	5.06±1.48	7.83±1.83	<0.001

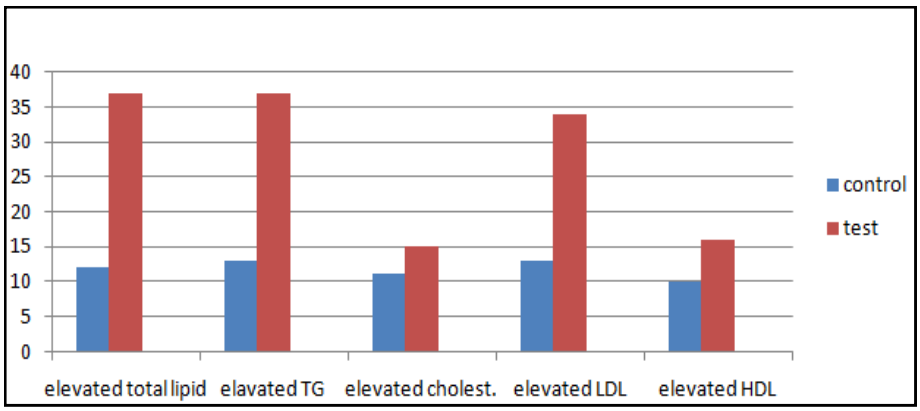

Figure 1. Patient distribution according to lipid profile abnormalities

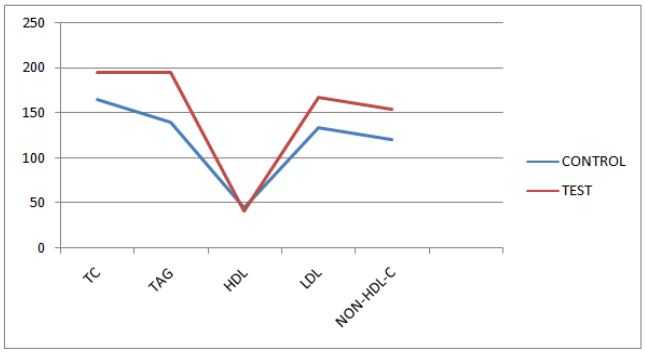

Figure 2. Comparison of Lipid Profile in Control and Test groups

A significant atherogenic dyslipidaemia and abnormal lipid ratios were observed in patients with CAD (Table 2; Figure -2). This similar study was done by Hommoudeh *et al.* (2008). In this study LDL-C was significantly elevated in test group which is attributed to oxidative modification of LDL-C (Hammoudeh *et al*., 2008). In present study we noted a decrease in serum HDL-C in CAD patients (40.6±4.79) as compared to controls (44.37±6.07). Similar study has reported that HDL-C levels are decreased in CAD patients (Cuchel, 2006).

On statistical analysis we found that in test group ,proportion of patients with elevated total lipid, TG, cholesterol, LDL-C and low HDL-C were 92.5%, 92.5%,37.5%,85%, 40% respectively which is higher as compared to control group. It means dyslipidaemia is a known risk factor for CAD. The study also reported that LDL-C/HDL-C ratios in CAD patients (4.17±0.635) were significantly high as compared to controls (3.06±1.04) (Table-2, Figure-1). LDL-C/HDL-C ratio is a useful tool to access risk of complications in CAD and also to monitor patients. In our study also; there are increased levels of non-HDL-C in test group (154.17±23.76) suggesting its role in CAD. Correlation between Serum Uric Acid with HDL and LDL was calculated using Pearson's correlation coefficient. r-value for LDL-C and HDL-C in control group was found to be 0.150 and -0.270 respectively and in test group 0.0726 and -0.281 respectively; all showing a weak correlation with LDL-C having a positive correlation while HDL-C having a negative correlation. Uric Acid is the end product of purine metabolism and is responsible for scavenging 60% of free radicals in human serum (Maxwell *et al*., 1997). The relationship between Serum Uric Acid and development of CAD has been investigated for many years. A close relationship has been observed between high Serum Uric Acid level and inflammatory markers such as number of neutrophils, CRP etc. (Ruggiero *et al*., 2006) but when serum uric acid levels rises above 7.0 mg/dl, this antioxidant state is paradoxically reversed into a pro-oxidant state in the later stages of atherosclerotic process. This paradoxical state is dependent on several environmental factors, such as stage of disease process, acidity of tissues (Khosla *et al*., 2005). In another study, it was demonstrated that high serum uric acid levels results in 2.5 fold increase in cardio-vascular mortality (Niskanen *et al*., 2004). But In many epidemiological studies (Duran *et al*., 2012), uric acid was found to be an independent risk factor for cardio-vascular disease. Present study showed an increase in uric acid levels in CAD patients that was more significant ($p<0.001$) than control group (Table 2). According to mean, mean of serum uric acid level in test group (7.83±1.83 mg/dl) was significantly higher as compared to control group (5.06±1.48 mg/dl).

Conclusion

Significant increase in Mean value of Serum TG, TC and LDL-C were seen in patients with CAD. A decreased HDL-C concentration with high Serum Uric Acid concentration was observed in CAD patients as compared to controls. This facilitates the claim that Serum Uric Acid in association with Lipid profile could serve as simple and economically viable biochemical marker.

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