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ESTIMATION OF SERUM GAMMA GLUTAMYL TRANSFERASE IN CORONARY ARTERY DISEASE PATIENTS AND ITS CAUSAL RELATIONSHIP

Dr. Kamlesh Kumar Sharma[1], Dr. Vandana Sharma[2*], Dr. Aradhana Singh[3]

1, 3. Assistant professor, Department of Medicine, S.M.S. Medical College, Jaipur 2.Research Scholar, Department of Biochemistry, S.M.S. Medical College, Jaipur

***Email id of the corresponding author- dr.vandana4sharma@gmail.com**

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ABSTRACT

Introduction: Coronary Artery Disease(CAD) is the emerging cause of death all over the world causing mortality; hence it is one of the most researched pathologies **(2)**. An early diagnosis of the atherosclerotic condition is very important as many serious consequences may be prevented. Individuals may be attributable to high risk due to their genetic predisposition; hypertension; diabetes etc. Serum Gamma Glutamyl Transferase (GGT) and development of Coronary Artery Disease (CAD) has been investigated for long. **Method:** The study is aimed to find out the significance of raised serum GGT in patients with CAD. In this study, we included 40 CAD patients as a test group and an equal number of controls based on exclusion and inclusion criteria. All individual subjects were assessed for biochemical and anthropometric parameters. All tests were performed using IFCC approved methods. **Results:** The present study showed a significant increase in levels of serum GGT in the test group (146.35±84.59) as compared to control group (48.93±39.51) with a significance of more than 0.001. Other atherogenic factors as total cholesterol ($p<0.005$) and LDL-C ($p<0.00$) vary significantly with higher GGT value quartiles. HDL-C ($p<0.001$) also dipped significantly in higher quartiles of serum GGT. **Conclusion:** serum GGT levels were significantly associated with the development of CAD and can serve as a viable marker of CAD along with total cholesterol, LDL-C, HDL-C.

Keywords: Serum GGT, Coronary Artery Disease, Total Cholesterol, LDL-C, HDL-C

INTRODUCTION

Coronary Artery Disease(CAD)is the most common cause of mortality around the world. It is mainly the atherosclerotic narrowing of either one or all of the epicardial coronary arteries causing a reduced blood supply to the related area of myocardium. The incidence of symptomatic CAD was once thought to be low(Jaloweic, 1989)**(1);** but now it is creeping slowly in the younger age group too and thus an early identification of risk factors and diagnosis are important(Niskanen, 2004).

Many studies have revealed the Gamma Glutamyl Transferase (GGT) exhibits a graded positive association with severity of Coronary Artery Disease and equally with Cardio-vascular mortality and morbidity **(2)**. The link between serum GGT activity and plaque formation is based on the pro-oxidant action of glutathione

catabolites in the extra-cellular fluid as well as the production of reactive oxygen species. Higher GGT levels are associated with both inflammation and oxidative stress; both of which are proposed as key mechanisms for atherosclerosis **(3)**. Specific pathogenic mechanisms (from inflammation to lipid accumulation and oxidation within plaque) are likely to contribute to potential mechanisms in atherosclerosis and plaque destabilisation.

METHOD

Data was collected from forty CAD patients as subjects and an 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, Jaipur
- Aged between 40-70 years

Exclusion criteria

- Critically ill patients
- Patients with HIV, Chronic Renal Failure, malignancy, post-organ transplants, pregnancy, chronic liver failure.

Generalised data of all the subjects like age, name and Blood pressure were recorded. Venous blood was withdrawn for investigations from anterior Cubital vein following overnight fasting. Serum was separated for analysing biochemical parameters as total cholesterol, triglycerides, LDL-C, HDL-C, and Serum GGT by auto analyser Beckmann (AU-680) and IFCC approved methods after taking into consideration proper measures of quality control and calibration.

Statistical analysis

All analysis was performed using SPSS for windows 16.0. Quantitative variables were expressed as mean value±SD. The categorical data were compared using Chi-square test. Groups were compared for demographic data by using Student t-test.Comparison of parametric values among groups were performed by one way ANOVA. Pearson's test was used for correlation of parametric variables.

RESULTS

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

The study sample comprised of 65% males and 35% females. They were categorised into four categories based on serum GGT levels i.e. <4.6 IU/L, 4.7-6.2 IU/L,6.3-8.5 IU/L and >8.5IU/L. The mean age distribution in different quartiles is as Q1-55.90 years, Q2-53.9 years, Q3-55.95 years, Q4-53.1 years and gender distribution was as Q1 with 33.3% females and 66.6% males, Q2 with 40% females and 60% males, Q3 with 35% females and 65% males and Q4 with 31.6 % females and 68.4% males. Many parameters varied significantly with increasing GGT values in serum. There was a positive association between Total Cholesterol, Triglycerides, and LDL-C with increasing GGT activities.

DISCUSSION

The study intended to investigate whether serum GGT levels influence lipid profile and is it associated with Cardio-Vascular Disease risk factor. Ruttmann et al **(4)**, showed the sensitivities and specificities for selected threshold values of GGT predicting mortality from total CVD. GGT measures are low cost, simple and highly sensitive indicators that provide an index of hepato-biliary dysfunction. The relationship between high GGT levels with

well-known Cardio-vascular risk factors such as obesity, hypertension, dyslipidaemia, DM has been reported in previous studies**(5)**. Atherogenic dyslipidemia including high LDL-C, VLDL and triacylglycerol levels with low HDL-C are modifiable risk factors in both the genders. The present study showed a significant rise in lipid profile parameters in test group as compared to control group. A significant atherogenic dyslipidemia and abnormal lipid ratios were observed in patients with CAD (table-2). The similar study was done by Hommoudeh et al (2008) **(6).** In the present study, a decrease in serum HDL-C in CAD patients (40.6±4.79) as compared to controls (44.37±6.07) was observed.

On statistical analysis, we found that in the test group, the proportion of patients with elevated total lipid, triglyceride, cholesterol, LDL-C and low HDL-C were 92.5%,92.5%,37.5%,85% and 40% respectively which is higher as compared to control group. It shows that dyslipidaemia is a known risk factor for CAD. In the present study, we reported that LDL-C/HDL-C ratio in CAD patients (4.17±0.635) were significantly higher as compared to controls (3.06±1.04)(table-2). So LDL-C/HDL-C ratio is a useful tool to access the risk of complications in CAD and also to monitor patients. Our study too shows that a rise in non-HDL cholesterol (154.17±23.76) in test group occurs. A higher serum GGT associates with inflammation and oxidative stress, both of which are proposed as key mechanisms of atherosclerosis **(7)**. Serum GGT can trigger the oxidative stress within plaque and can contribute to the vulnerability and evolution of the plaque **(8)**. In present study also, it was observed that GGT activity is positively associated with total cholesterol, triglycerides, LDL-C and Total-Cholesterol/HDL-C ratio. It suggests that increased GGT activity is associated with more atherogenic lipid profile than just a marker of alcohol consumption and Hepato-biliary disease.

This study also showed that frequencies of undesirable values of LDL-C and Triglycerides increased in parallel with GGT activity, which is in corroboration with Kim et al, 2005.

The quartile study also showed the same pattern, i.e., increasing dyslipidaemia with increasing GGT values. According to mean, mean of serum GGT level in the test group was also significantly higher as compared to control group.

CONCLUSION

A significant graded increase in mean values of serum triglycerides, total Cholesterol and LDL-C were seen in patients with CAD. A lower HDL-C concentration with increasing GGT concentration was also observed in CAD patients as compared to controls. So this study also sets accordance with the fact that serum GGT activities, when associated with lipid profile, can serve as an economical and a viable marker of risk estimation in CAD process.

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Table-1.Baseline characteristics in GGT quartiles

	Q_1 <4.6IU/L	Q_2 4.7-6.2 IU/L	Q_3 6.3-8.5 IU/L	Q_4 >8.5IU/L	p-value
Number of cases	21	20	20	19	
GenderM/F	14/7	12/8	13/7	13/6	
Age (yrs)	55.90±6.82	53.9±7.19	55.95±4.02	53.10±5.5	0.345
BMI(Kg/m^2)	25.74±3.44	26.58±3.07	28.94±3.33	28.77±3.39	0.005
HTN/%	10/47.6%	5/25%	16/80%	15/78.9%	
DM	3/14.3%	7/35%	9/45%	5/26.3%	
CAD	4/19.04%	4/20%	15/75%	17/89.47%	
Fasting p. glucose(mg/dl)	104.0±27.4	119.8±40.3	128.2±45.8	115.11±47.6	0.294
Total cholesterol (mg/dl)	162.8±32.6	171.9±35.8	186.4±25.4	195.4±24.9	0.005
TG(mg/dl)	139.6±50.2	142.8±51.8	186.1±28.3	196.1±47.7	0.00
LDL-C(mg/dl)	137.9±29.0	136.0±33.0	162.5±18.4	164.3±20.3	0.00
HDL-C(mg/dl)	44.6±5.5	44.4±6.5	42.2±5.1	38.4±3.57	0.001

Table-2. Selected biochemical parameters in control and test groups

Parameter	Control (mean±SD)	Test (mean±SD)	p-value
Total cholesterol (mg/dl)	164.25±34.32	194.72±22.54	<0.001 S
TAG(mg/dl)	138.67±53.46	194.67±25.92	<0.001 S
HDL-C (mg/dl)	44.37±6.07	40.6±4.79	0.003
LDL-C (mg/dl)	132.65±29.51	167.1±13.89	0.046
Non- HDL-C (mg/dl)	119.87±36.81	154.17±23.76	<0.0001
LDL-C/HDL-C	3.06±1.04	4.17±0.635	<0.0001
TC/ HDL-C	3.81±1.15	4.84±0.85	<0.0001