Original Article

Serum Gamma-Glutamyl Transferase and it's association with High Sensitivity C- Reactive Protein in Patients with Myocardial Infarction

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ABSTRACT

INTRODUCTION: Myocardial infarction (MI) is an acute coronary syndrome that can occur during the process of coronary atherosclerosis. Serum Gamma-Glutamyl Transferase has been found to be involved in the pathogenesis of cardiovascular disease and High Sensitivity- C Reactive Protein is inflammatory and prognostic marker for cardiovascular disease. **Aim:** To Evaluate serum Gamma-Glutamyl Transferase and High Sensitivity- C Reactive Protein and their association in Patients with Myocardial Infarction. **Materials and Methods:** Fifty patients diagnosed with Myocardial Infarction were enrolled for the study. Fifty age and gender matched individuals constituted the control group. For all subject thus enrolled, samples were drawn for GGT and hs-CRP. Results obtained were later subjected to statistical analysis. **Results and Discussion:** The study documented that increased GGT and hs-CRP levels (P value = <0.001) in patients and the correlation between GGT and hs-CRP was also found clinically significant in Myocardial Infarction patients by applying student's t-test. **Conclusion:** This study stated that serum GGT and hsCRP can be used as assisted biochemical marker in AMI patients along with other cardiac markers.

Keywords: Atherosclerosis, CVD, GGT, hs-CRP.

INTRODUCTION

Myocardial infarction (MI), is an acute coronary syndrome which occur during the period of coronary atherosclerosis, it referred in lay terms as **"heart attack"**. Progression of atherosclerosis is triggered and enhanced by several factors, which can cause mediating disease or it affects directly arterial wall. In further stages of disease atherosclerotic plaque develops.[1,2] Myocardial Infarction is one of the leading causes of increasing mortality and morbidity globally.[3] Ischemic heart disease (IHD), particularly myocardial infarction is the leading causes of death across the world accounting for 12.7% of global mortality.[4] In India, IHD had become the leading cause of death by 2004, accounting for 1.46 million deaths (14% of total deaths) and deaths due to IHD were expected to double during 1985–2015.[5] GGT is an enzyme present in the serum and on the outer surface of numerous cell types. This enzyme is widely distributed in the human body especially in liver kidney and frequently localized to the plasma membrane with

its active site directed into the extracellular space. Serum GGT activity has been used as a marker for excessive alcohol consumption or liver diseases in clinical practice.[6] Serum GGT levels are a useful marker for easy and reliable prediction of long-term clinical outcomes in patients with MI.

High sensitive C-reactive protein (hs-CRP) is a marker of low grade chronic inflammation synthesized by liver. Low grade chronic inflammation is a key process in the development of atherosclerosis and high hs-CRP levels is cardiovascular risk factor.[7]Clearly shown a preponderance of inflammatory cells in the ruptured plaques of patients have shown a preponderance of inflammatory cell in patients who have died of acute coronary syndromes. Inflammation, manifested by elevated serum levels of C-reactive protein (CRP) measured by hs-CRP, manifested inflammation which is further associated with an increased risk of cardiovascular events.[8-10] The present study was planned to estimate serum levels of hsCRP & GGT and association between GGT and hsCRP in patients with myocardial infarction.

MATERIALS AND METHODS

The present study was conducted in the department of Biochemistry in collaboration with Department of Cardiology at Mahatma Gandhi Medical College & Hospital, Jaipur after seeking approval from the Institutional ethics committee (IEC). Study comprises of 100 subjects, 50 were known cases of acute MI and 50 were age and sex matched healthy controls in the age group of 18-65 years and included those who were willing to participate. Pregnant and lactating females and patients with Cardiogenic shock, concurrent acute coronary syndrome or infection, Heart failure and any other chronic disease were excluded from the study.

Blood samples were collected by venipuncture using standard techniques. The samples collected were subjected to following investigation-Gamma-Glutamyl Transferase (GGT) by International federation of clinical chemistry (IFCC) method, and High Sensitivity CRP (hs-CRP) by High Sensitivity Immunoturbidimetric method.

Statistical Analysis

The results obtained for various parameters were presented as mean ± SD (standard deviation) between two groups i.e., Myocardial Infarction patients (n=50) and control group (n=50). The result of patients group was compared with those of control group by applying student's t-test. To evaluate the association between serum GGT level and serum hs-CRP level in MI patients, Pearson's correlation test was also applied. P-value of ≤ 0.05 was considered as significant for all the statistical tests.

RESULTS

In the present study, Cases and Controls were distributed on the basis of gender, In group A (MI patients) out of 50 patients 37 (74%) were males and 13 (26%) were females. In group B (healthy controls) out of 50, 39 (78%) were males and 11(22%) were females shown in
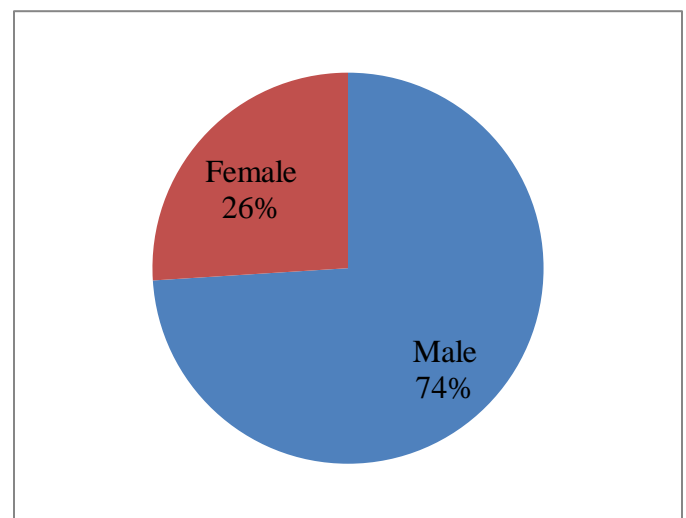

Figure 1.

Fig:1 Distribution of cases on the basis of Gender

Serum GGT and hs-CRP levels were compared between cases and control; it was observed that Increased GGT (t =-13.18, P=<0.001) and hs-CRP (t=- 21.09, P=<0.001) levels were observed in MI patients in comparison to control group.

After analyzing the association, a strong positive correlation was observed between serum GGT and hs-CRP (r=0.52, P-<0.001) in MI patients by applying Pearson's correlation.

DISCUSSION

The present study was planned to evaluate serum GGT and hs-CRP and their correlation in patients with MI. Patients were selected on the basis of predefine inclusion and exclusion criteria after seeking consent. MI is an acute coronary syndrome that can occur during the process of coronary atherosclerosis. MI is generally the result of a blood clot in the epicardial artery that supplies that territory of heart muscle.[11] GGT is present in proximal convoluted tubule, liver, intestine and pancreas.[12] GGT act has an antioxidant. In the present study, Serum GGT levels were increased in patients when compared to control group as shown in figure 2.

and elevation of cardiac mortality in patients with Acute myocardial infarction (AMI). **Kavitha MM et.al., 2017,**[14] reported same observation that GGT levels were increased in MI patients. According to **Ozcan F et.al., 2012,**[15] serum GGT activity detection may be helpful in identifying patients at a greater risk for no-reflow and worse long term prognosis.

Onat A et.al., 2011,[16]concluded, that GGT is involved in CHD risk, mainly by mediating adiposity by maintenance normal triglycerides and CRP levels. **wannamethee S et.al., 2008,**[17] demonstrated in their study, that elevated GGT levels were shown to be a significant long term predictor of diagnosed CHD, major stroke incidence and overall cardiovascular mortality. GGT may be a useful marker in assessing in long term CVD risk. The high-sensitivity C- reactive protein (hs-CRP) measures general levels of inflammation in the body. In the present study , when hs-CRP level were compared between cases and control then it was observed that, the level of hs-CRP increase in patient group as shown in Figure 3.
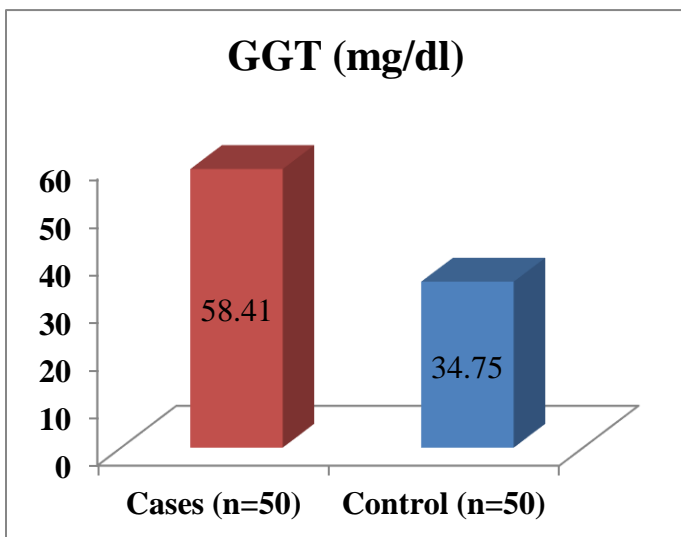
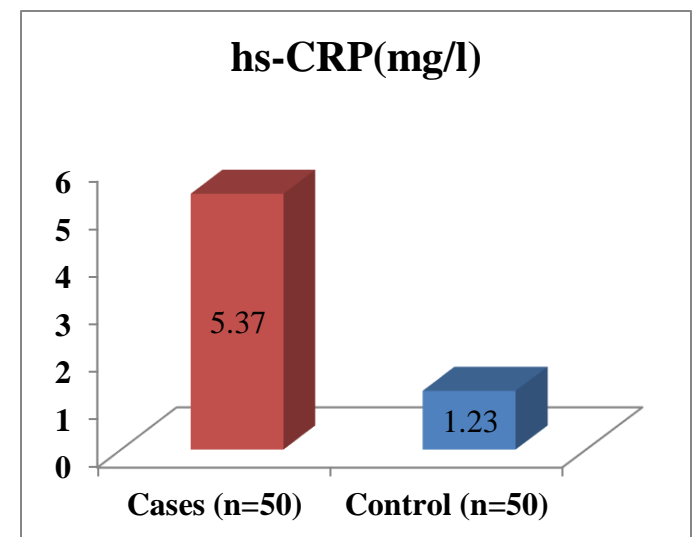**Fig 2: Distribution of Gamma-Glutamyl Transferase in MI Cases and Control.**

kim J et.al., 2018,[13] reported that GGT is an independent predictor of advance long term prognosis

Fig:3 Distribution of high-sensitivity C-Reactive Protein in MI Cases and Control.
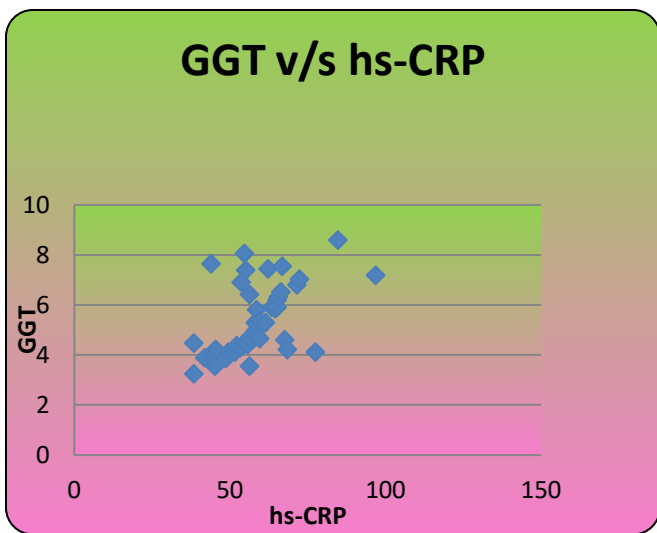
Figure 4: Correlation between GGT and hs-CRP

Pfutzner A et.al., 2006,[18] demonstrated in their study that hs-CRP has become an accepted laboratory marker for prediction of cardiovascular risk. They also concluded correlation between the hs-CRP risk group and the observed cardiovascular outcome in populations **jialal I et.al., 2019,**[19] concluded that hs-CRP is a strong independent predictor of risk of future myocardial infarction, stroke, peripheral arterial disease, and vascular death among people without known cardiovascular disease. In addition, among patients with acute coronary ischemia, stable angina, and myocardial infarction, levels of hs-CRP have been associated with increased vascular event rates.

Al Aseri A et.al., 2019,[20] stated that inflammatory processes play an independent role in the development of heart failure after myocardial infarction. CRP can be a useful marker for predicting the time course of heart failure in patients with AMI and **Ridker P et.al., 2003,**[21] reported in their study, that in systemic inflammation, hs-CRP is a stronger predictor of future cardiovascular events than LDL cholesterol and adds prognostic information to Framingham risk scoring and LDL cholesterol categorization.

hs-CRP is an important marker of inflammation, appears to stimulate endothelial dysfunction and promote inflammation in the vessel wall, thus contributing to the initiation and progression of atherogenesis and an increased risk of cardiovascular events.

In this study, A strong positive correlation was observed between serum GGT and hs-CRP. The presence of CVD can be independently and positively associated with serum GGT and hs-CRP levels but negatively with diabetes reported by **Dogan A et.al., 2015**[22].

Kavitha mm et.al., 2017[14] Elevation of serum GGT activity hsCRPhas significant association and positive correlation . Increased hsCRP levels in AMI patients suggest involvement of inflammation in pathogenesis of MI and its potent prognostic role in AMI. Since, serum GGT and hsCRP are simple and cost effective biochemical test, can be advised in routine cardiac marker profile. So GGT and hsCRP can be used as assisted biomarker along with other cardiac markers in MI patients and also cardiovascular risk evaluation.

CONCLUSION

The present study founds a strong association between Serum Gamma-Glutamyl Transferase and High Sensitivity C-reactive protein level. Elevated GGT and hs-CRP level can be recommended as useful indicator of poor prognosis and hence can be helpful in early identification of patients at risk. Screening of Myocardial Infarction patients for these parameters may be helpful in better management of such patients and in averting the risk of mortality.

REFERENCES

1. Thygesen K, Alpert JS, White HD, et al.: Universal definition of myocardial infarction. Circulation. 2007; 116(22): 2634–2653.

2. Thygesen K, Alpert JS, Jaffe AS, et al.: Third universal definition of myocardial infarction. Circulation. 2012; 126(16): 2020–2035.

3. Bhattacharya KP, Agarwal M, Gautom D, Salkia H, Role of serum uric acid level in predicting outcome in acute myocardial infarction; :Oct.2016; 5(4):IO18-IO22.

4. Kumar S. Behera, kumar A. Samal. Study of serum uric acid level as a prognostic marker in acute ST elevation myocardial infarction patients. Int J Adv Med. jun 2018; 5(3):592-6.

5. Gupta R, Joshi P, Mohan V, Reddy KS, Yusuf S. "Epidemiology and causation of coronary heart disease and stroke in India". Heart. January 2008; 94 (1): 16–26.

6. Teschke, R., Brand, A. and Strohmeyer, G. Induction of hepatic microsomal gamma-glutamyltransferase activity following chronic alcohol consumption, Biochem. Biophys. Res. Commun. 1977; 75, 718–724.

7. Pepys MB, Hirschfield GM. C-reactive protein: a critical update. J Clin Invest. 2003;112:1805.

8. Koenig W, Sund M, Frohlich M, et al. C-reactive protein, a sensitive marker of inflammation, predicts future risk of coronary heart disease in initially healthy middle-aged men: results from the MONICA Augsburg Cohort Study, 1984 to 1992. Circulation 1999; 99:237–242

9. Shak PK. Circulating markers of inflammation for vascular risk prediction: are they ready for prime time? Circulation 2000; 101:1758 –1759

10. Mueller C, Buettner HJ, Hodgson JM, et al. Inflammation and long-term mortality after non-ST elevation acute coronary syndrome treated with a very early invasive strategy in 1042 consecutive patients. Circulation 2002; 105:1412–1415

11. Fuster V, Badimon L, Badimon JJ, Chesebro JH. The pathogenesis of coronary artery disease and the acute coronary syndromes (1). N Engl J Med 1992; 326: 242–50.

12. Center SA. Diseases of the gallbladder and biliary tree. Vet Clin North Am Small AnimPract 2009;39:543-98

13. Jae Gyung Kim, Kiyuk Chang, EunHoChoo, Jong-Min Lee, Ki-BaeSeung. Serum gamma-glutamyltransferase is a predictor of mortality in patients with acute myocardial infarction. Medicine. 2018; 97(29): 1-9.

14. Kavitha mm, Kashinakunti SV, Chandrashekharayya SH, Manjula R, Gurupadappa K, et.al , Levels of serum Gamma GlutamylTransferase (GGT), high sensitivity C-Reactive Protein (hsCRP) in Myocardial Infarction (MI)-A case control study, International Journal of Clinical Biochemistry and Research, October-December 2017;4(4):395-399

15. FiratOzcan, MD, Mehmet Fatih Karakas, MD, Mehmet FatihOzlu, MD et.al; Effect of Serum Gamma-GlutamylTransferase Levels on Myocardial Perfusion and Long-Term Prognosis After Primary Angioplasty in Patients With Acute ST-Elevation Myocardial Infarction; Journal of Investigative Medicine; volume 60, number 8; December 2012.

16. AltanOnat ,Günay Can , Ender Örnek, GökhanÇiçek, ErkanAyhan and YükselDoğan.

Serum γ-Glutamyltransferase: Independent Predictor of Risk of Diabetes, Hypertension, Metabolic Syndrome, and Coronary Disease 20,842-848 2011.

17. S.G. Wannamethee, L. Lennon, A.G. Shaper; The value of gamma-glutamyltransferase in cardiovascular risk prediction in men without diagnosed cardiovascular disease or diabetes; ELSEVIER; 201 168-175; 2008.

18. Andreas Pfützner,Thomas, Forst; High-Sensitivity C-Reactive Protein as Cardiovascular Risk Marker in Patients with Diabetes Mellitus Diabetes Technology & Therapeutics Volume 8, Number 1, 2006

19. IshwarlalJialal, and SrideviDevaraj; The Value of the High-Sensitivity C-Reactive Protein Assay as a Risk Marker; American Society of Clinical Pathologists; 116 (Suppl 1):S108-S115; 2001.

20. Zohair A A, Aseri, Syed ShahidHabib, AmeerMarzouk. Predictive value of high sensitivity C-reactive protein on progression to heart failure occurring after the first myocardial infarction Vascular Health and Risk Management. 2019.

21. Ridker PM. High-sensitivity C-reactive protein, inflammation, and cardiovascular risk: from concept to clinical practice to clinical benefit. Am Heart J Jul 2004; 148(1 Suppl):S19e26

22. Abdullah Dogan, AkifArslan, HabilYucel, FatihAksoy, AtillaIcli, Mehmet Ozaydin, ErcanVarol, DoganErdogan Gamma glutamyltransferase, inflammation and cardiovascular risk factors in isolated coronary artery ectasia; Portuguese Journal of Cardiology; 2016;35(1):33-39