

Evaluation of Serum Gamma-Glutamyl Transferase Activity and Serum Uric Acid Level in Type II Diabetes Mellitus Patients

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ABSTRACT

Studies in past few years have linked oxidative stress as a potential marker of diabetes mellitus. Thus, based on the previous literature this study was planned with the aim to evaluate serum GGT activity and serum uric acid level as potential indicators of oxidative stress in type-2 diabetes mellitus patients.

A total of 68 participants were included following inclusion and exclusion criteria. After the statistical analysis, statistically significant differences were observed in the mean GGT activity between controls (30.19 ± 7.639 IU/L) and cases (59.386 ± 22.215 IU/L) ($p=0.000$). Similarly, mean serum uric acid level of controls (5.180 ± 1.476 mg/dl) and cases (3.510 ± 0.792 mg/dl) ($p=0.000$), were also statistically difference.

Further, after applying Pearson's correlation, positive correlation between GGT and HbA_{1c} level ($r=0.390$) and with GGT and FPG level ($r=0.375$) were observed. However, correlation between HbA_{1c} and uric acid ($r=-0.372$); FPG and uric acid ($r=-0.374$) level suggested serum uric acid concentration was inversely proportional to the degree of dysglycemia in diabetes mellitus patients of this study.

Hence, results of this study suggested serum GGT activity and serum uric acid level were altered as compared to controls and cases. Thus, further study on these parameters may help to serve it as potential markers of oxidative stress in diabetes mellitus patients.

Key Words: Diabetes mellitus, HbA_{1c}, GGT, Uric acid and Oxidative stress.

INTRODUCTION

The prevalence of DM is about 6.4%, affecting 285 million adults in 2010 and expected to increase by 7.7% affecting a million of individuals by 2030¹. Previous studies have suggested, diabetes mellitus to be one of the free radical diseases which propagates severe complications with increased free radical formation and oxidative stress is thought to be increased in

system where the rate of free radical production is high and antioxidant mechanisms are impaired^{2,3}. Thus, considering the antioxidant activity of glutathione, increased level of serum gamma-glutamyl transferase (GGT) may be linked to oxidative stress because serum gamma- glutamyl transferase (GGT) is an ectoplasmic enzyme responsible for the extracellular catabolism of glutathione and

GGT have been found to have an important role in glutathione homeostasis⁴. Further, many studies have even suggested a positive association between serum GGT and oxidative stress in the patients of diabetes mellitus⁵.

Similarly, another important observation made in various studies were, uric acid on account of its reducing nature may function as an antioxidant and it has been observed that, serum uric acid level is significantly decreased in chronic diabetes mellitus patients as compared to non-diabetic individuals⁶. However, observation suggested by many different studies were not consisted with GGT and uric acid level. Thus, based on the above observation, present study was directed towards the evaluation of serum GGT activity and serum uric acid level in diabetes mellitus patients as compared to normal individuals.

METHODOLOGY

Inclusion Criteria:

As case: Known cases of diabetes mellitus, patients above the age more than 18 years were considered.

As control: Normal healthy individual with no history of diabetes mellitus above the age of 18 years were taken as controls.

Exclusion criteria:

Patients with known history of infectious disease, autoimmune disease, immune compromised patients, pregnant women and lactating mother were excluded from the study.

Inform written consent was taken from all the participants at the time of enrolment for this study.

STATISTICAL ANALYSIS:

Mean \pm SD were calculated for all the parameters analyzed and were compared by Student's t-test and correlated by calculating Pearson's correlation coefficient using Microsoft excel. P-values considered significant were as follows:

P <0.05– As significant

P <0.001 – As highly significant

P >0.05 – As non-significant

RESULTS

This study was a hospital-based survey and based on inclusion and exclusion criteria, participants were selected. A total of 34 type-2 diabetes mellitus patients and 34 age matched normal individuals were included as controls for this study. The statistical analyses of different parameters are as follows:

Table 1: Comparison of serum gamma glutamyl transferase (GGT) activity between controls and diabetes mellitus patients by Student's t-test.

Parameter	Control groups (n=34) Mean \pm SD	Diabetic patients(n=34) Mean \pm SD	p- value
Serum GGT activity (IU/L)	30.19 \pm 7.639	59.386 \pm 22.215	0.000

Statistically significant differences were observed between the mean serum GGT activity of controls (30.19 \pm 7.639IU/L) and diabetic patients (59.386 \pm 22.215IU/L) (p=0.000).

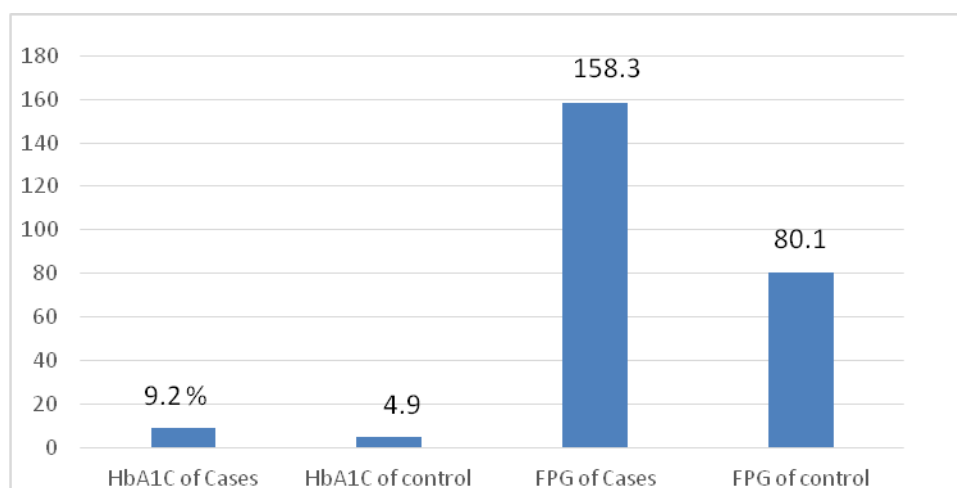
Table 2 : Comparison of serum uric acid level between controls and diabetic mellitus patients by Student's t-test.

Parameter	Control group (n=34) Mean \pm SD	Diabetic group (n=34) Mean \pm SD	p-value
Serum Uric acid (mg/dl)	5.180 \pm 1.476	3.510 \pm 0.792	0.000

Statistically significant differences were observed in the mean serum uric acid level of controls (5.180 \pm 1.476mg/dl) and type 2 diabetic patients (3.510 \pm 0.792mg/dl) (p=0.000).

Graph 1: Representing the differences in the mean HbA1C and Uric acid level between control and cases.

After the comparison of mean HbA₁C and uric acid level between control and cases 9.2%, 4.9% and 158.3mg/dl, 80.1mg/dl respectively results suggested a significant difference in mean between control and cases (p=0.000).



Graph 1: Comparison of mean HbA_{1c} and Uric acid level between control and cases.

Table 3: Correlation between different parameters. [Pearson's correlation coefficient (r) and p-value].

Clinical Parameters	r-value	p-value
GGT - HbA _{1c}	0.390	0.033
Uric acid - HbA _{1c}	-0.372	0.043
GGT -FPG	0.375	0.041
Uric acid - FPG	-0.374	0.042

After applying Pearson's correlation coefficient, it was found that there was a positive correlation between serum GGT activity and HbA_{1c} level (r=0.390) and also with serum GGT activity and FPG (r=0.375).

However, after applying Pearson's correlation coefficient between serum uric acid and HbA_{1c} (r=-0.372) and with serum uric acid and FPG level (r=-0.374), results suggested negative correlation.

DISCUSSION

Oxidative stress is considered to be one of the reasons of cellular functional impairment⁷. It is a condition where excessive production of free radicals and reactive oxygen species (ROS), as well as reduced antioxidative properties were seen⁸. Different studies had reported that GGT has a central role in the maintenance of intracellular antioxidant defenses through its mediation of extracellular glutathione transport into most types of cells⁹. Some researchers even consider serum GGT activity as a direct marker for increased oxidative stress¹⁰. Similarly, previous studies suggested, uric acid is a physiological free radical scavenger¹¹. The association between serum GGT activity,

serum uric acid and type 2 diabetes mellitus risk have been documented in several previous studies but still a clear diagnostic role has not been well documented. Thus, this study was done with the purpose to evaluate the serum GGT activity and serum uric acid level as potential indicators of oxidative stress in diabetes mellitus.

The findings of this study had demonstrated the mean level of serum GGT activity in this present study was (59.38±22.21IU/L) in cases and (30.19±7.63IU/L) in controls, suggesting significantly higher in cases as compared to age matched normal healthy controls (p=0.000). This finding was similar to the outcomes of a study by Balogun *et al.*, 2008¹². Another important finding of this study was a positive correlation between serum GGT activity with HbA_{1c} (r=0.39) and FPG (r=0.375) which was similar to the finding of Gohel and Chacko., 2013¹³. Similar correlations were also observed in a study by Iqbal *et al.*, 2010¹⁴.

On the other hand, mean serum uric acid level in present study was (3.51±0.79mg/dl) in cases and (5.18±1.47mg/dl) in controls respectively suggesting a statistically significant difference (p=0.000). Similar results were obtained in the study by Sharma *et al.*, 2018¹⁵. On the contrary, a study conducted by Lal *et al.*, 2009 found elevated level of serum uric acid in diabetic patients¹⁶. Furthermore, after applying Pearson's correlation coefficient between serum uric

acid with HbA1c ($r=-0.372$) and FPG ($r=-0.374$) show inverse correlation. Which was similar to the result obtained in a study of Austrian men¹⁷. The significant reduction in serum uric acid concentration in diabetic patients as compared to healthy controls obtained in this present study may be due to the fact that, the higher plasma glucose concentration may increase fractional excretion of urate (soluble form of uric acid in blood) caused by an effect of glucose at the renal tubule¹⁸.

Thus, the findings of this study in terms of decreased serum uric acid levels and increased serum GGT activity in diabetic patients give us the reason to look for the association between the antioxidant status, with the evolution of diabetes mellitus and its chronic complications.

CONCLUSION

Diabetes mellitus is undoubtedly one of the most challenging health problems of 21st century. Thus, after the analysis of results, this study suggested that serum GGT activity and serum uric acid levels were altered between controls and cases and it may serve as potential markers of oxidative damage in diabetes mellitus patients.

Acknowledgement: None

Conflict of Interest: None

Source of Funding: None

Ethical Approval: Approved

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- How to cite this article: KM Devi, Patil RK, Malhi M et.al. New evaluation of serum gamma-glutamyl transferase activity and serum uric acid level in type II diabetes mellitus patients. *Int J Health Sci Res.* 2021; 11(9): 187-191. DOI: <https://doi.org/10.52403/ijhsr.20210929>
