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Evaluation of Serum Gamma GlutamylTransferase Level in Diabetic Retinopathy

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ABSTRACT

BACKGROUND: Diabetes retinopathy (D.R.) is a microvascular complication of diabetes mellitus. S.GGT is a liver enzyme is involved in oxidative stress like D.R. Recent studies have shown association between raised S.GGTlevels and diabetes complication. Therefore we investigated whether S.GGT can be useful maker in predicting early diabetic retinopathy.

OBJECTIVE: In this study we compared GGT levels in diabetic retinopathy (D.R.)

METHODS: Hospital based cross sectional observational study conducted with 91 patient having diabetes retinopathy , their S.GGT were estimated and their role in D.R. evaluated.

RESULT: A significant relation ($p<0.001$) was found between diabetic retinopathy and serum gamma glutamyltransferase

CONCLUSION :serumGGTlevel can be useful marker for early diabetic retinopathy.

KEYWORDS: Serum Gamma GlutamylTransferase , Diabetic retinopathy, Oxidative stress,

I. INTRODUCTION:

Diabetes is now regarded as an epidemic,this will lead to approximatly 4 million people around the world losing their sight due to diabetic retinopathy,the leading cause of blindness in patient aged 20 to74 years.[1]

The retina has the highest oxygen uptake and glucose oxidation compared to other tissues. It also has a higher concentration of polyunsaturated fatty acids. This renders the retina more susceptible to oxidative stress and lipid peroxidation due to glucose toxicity in hyperglycemia.[4]

In the CARDIA (Coronary Artery RiskDevelopment in Young Adults) study diabetic and hypertensive adults showed a strong correlation between serum GGT levels and microalbuminuria.[5]The study has shown that serum GGT maybe a marker of oxidative stress even when the confounding effects of alcohol are accounted for.

AIM AND OBJECTIVE :

The present study **"EVALUATION OF SERUM GAMMA GLUTAMYL TRANSFERASELEVEL IN DIABETIC RETINOPATHY"** was carried out in the Department of Ophthalmology, Assam Medical College and Hospital, Dibrugarh, with the following aim and objectives:

Place of Study: Outpatients and Inpatients of Department of Ophthalmology ofAssam Medical College and Hospital Dibrugarh.

Duration of Study:6 month

Type of Study: Hospital based cross sectional observational study.

Study Population: All patients below and above 40 years of age diagnosed to have diabetic retinopathy fulfilling the exclusion and inclusion criteria

Sample Size: Considering 95% c.i. with margin of error of 10% and proportion patient with g.g.t. >73 U/L to be 61.5 % sample size calculate in rounded of to be 91

Inclusion Criteria:

- Both male and female of age below and above who were diagnosed to have diabetes with

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retinopathy.

Exclusion Criteria:

- ☒ Diabetic Retinopathy patients with any other complications such as Ischaemic Heart Disease, Infections
- ☒ Subjects with regular alcohol consumption, liver diseases, hypertension
- ☒ Any subject who is not willing

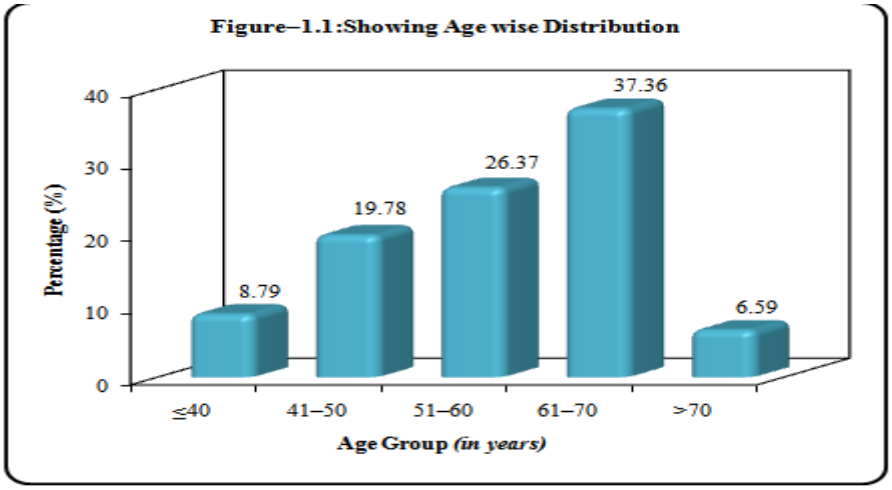
II. STATISTICAL ANALYSIS

Discrete data were expressed as number (%) and were analysed
using Chi-square or Fisher's exact test. Results on continuous measurements were presented as mean ± standard deviation and compared using Analysis of Variance (ANOVA). Where the p value was found significant ($p < 0.05$) using ANOVA for assessing the role of Serum GGT in patient of diabetic retinopathy.

- ➔ For all analysis, the statistical significance was fixed at 5% level of significance.
- ➔ The statistical analysis of data was performed using the computer program, Statistical Package for Social Sciences (SPSS for Windows, version 21.0 Chicago, SPSS Inc.) and Microsoft excel 2010.

III. RESULT AND OBSERVATION:

Figure–1.1:Showing Age wise Distribution



The mean age group participated in the study was 57.64 ±12.47 years,The mean value of GGT obtained in the study was 71.69 U/L having standard deviation of about ±23.90

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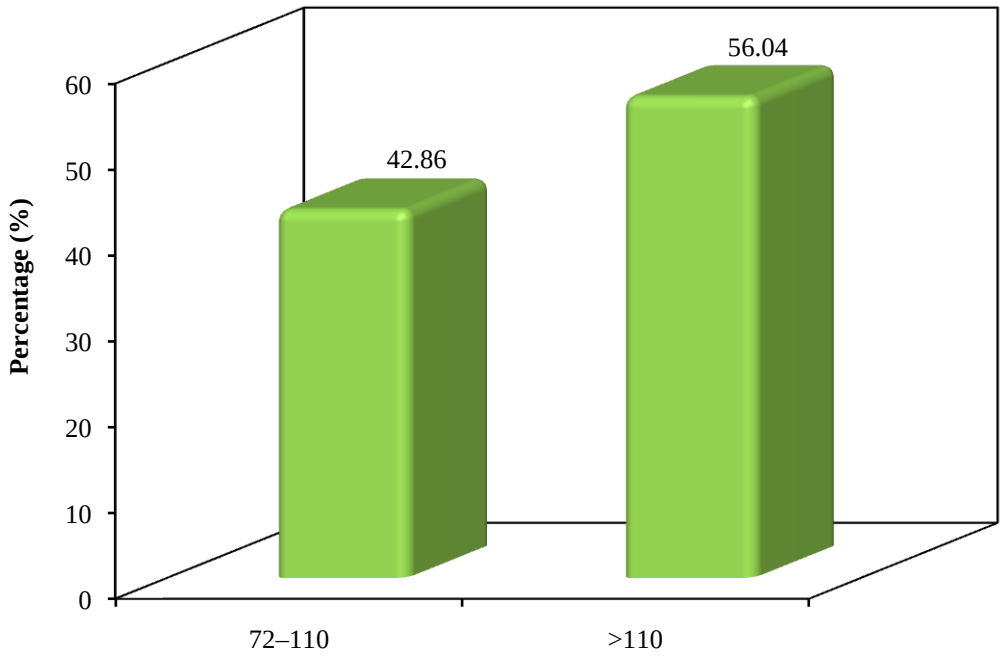
Figure–1.2:Showing FBS Level Distribution



Table–1.1. Showing Severity of Diabetes Retinopathy with GGT Level

Severity of Diabetes Retinopathy		GGT Level			Total
		<15	15–73	>73	
Mild NPDR	n	3	18	1	22
	%	100.0%	62.1%	1.7%	24.4%
Moderate NPDR	n	0	6	19	25
	%	0.0%	20.7%	32.8%	27.8%
Severe NPDR	n	0	4	19	23
	%	0.0%	13.8%	32.8%	25.6%
Very Severe NPDR	n	0	1	8	9
	%	0.0%	0.0%	13.8%	8.9%
Proliferative DR	n	0	1	4	5
	%	0.0%	3.4%	6.9%	5.6%
High Risk PDR	n	0	0	7	7
	%	0.0%	0.0%	12.1%	7.8%
TOTAL	n	3	29	59	91
	%	100.0%	100.0%	100.0%	100.0%

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p value = <0.001
*Fisher Exact Test; the p-value is significant at 5% level of significance

Figure–1.3:Showing Severity of Diabetes Retinopathy with GGT Level

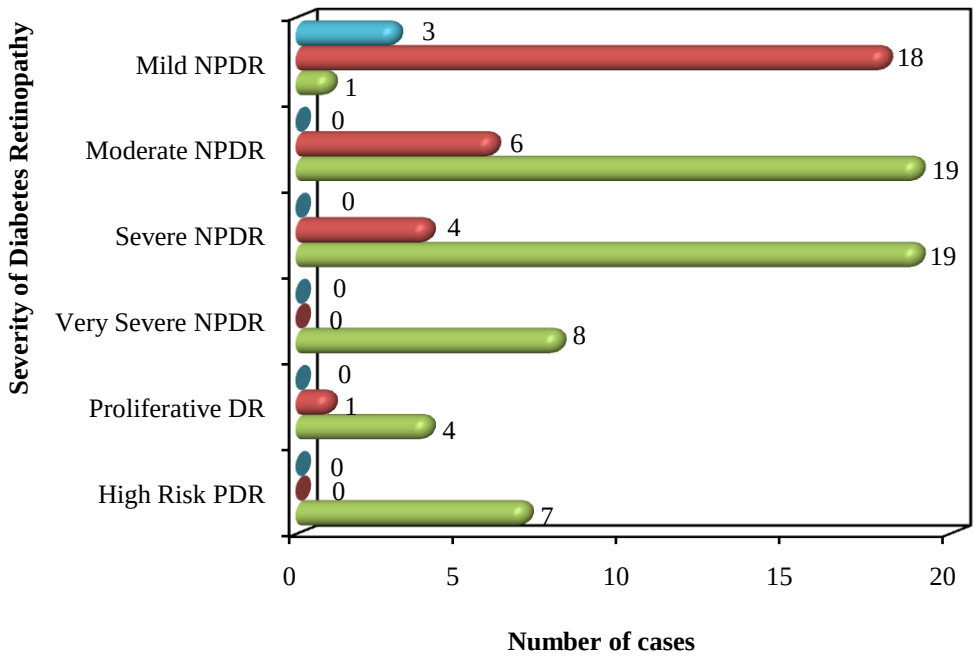

Table1.2. Distribution of FBS values based on GGT values

FBS (mg/dl)		**GGT Level**			**Total**
		<15	**15–73**	**>73**	
72–110	N	3	17	19	39
	%	100.0%	58.6%	32.8%	43.3%
>110	N	0	12	39	52
	%	0.0%	41.4%	67.2%	56.7%
TOTAL	N	3	29	59	91
	%	100.0%	100.0%	100.0%	100.0%

p value = 0.009
*Fisher Exact Test; the p-value is significant at 5% level of significance

This shows the mean values of FBS was more elevated in group with high GGT values than those with normal values .Elevated GGT is strongly associated with obesity and excess deposition of fat in the liver, termed non-alcoholic fatty liver disease, which is thought to cause hepatic insulin resistance and to contribute to the development of systemic insulin resistance and hyperinsulinemia[2].

Increased serum concentration of GGT could identify people with low but persistent increase of oxidative and other cellular stresses [3].

IV. DISCUSSION:

Diabetic retinopathy is the leading cause of vision loss among adults in the working age of

20-65 years. With increase in burden of disease worldwide, several studies have been conducted to improve the understanding of pathogenesis of disease. It has been observed that serum GGT is a biomarker of oxidative stress in various studies in diabetic retinopathy patients

Our study aims to asses role ofserum GGT as a biomarker in patient of diabeticretinopathy.

In the present study diabetic retinopathy observed in 62 % patient having elevated serum GGT level which was similar to study by **ValizadehN** et al.[10]

A study by Arkkila et al showed the association between GGT levels and complications of type 1 diabetes including neuropathy and retinopathy.[11]

The serum levels of GGT also showed significant positive correlation with serum malondialdehyde,which is a biomarker of oxidative stress.

This suggests that serum GGT may be an early marker of oxidative stress that maycontribute to the pathophysiologyof the onset and progression of diabetic retinopathy through defect in metabolic and vascular pathway.

Another study by Whitfield JB who reported that increased GGT activity may be a response to oxidative stress,which can the transport of glutathione precursors into cells.GGT is an easily available,universally standardized and routinely done test as part of liver function test serum GGT is a useful biomarker of oxidative stress like serum MDA. Hence it can be used as a surrogate marker of microvascular complication in diabetes mellitus like diabetic retinopathy

Serum GGT has been denoted as a novel biomarker of chronic inflammation and OS in some researches[6]. OS has a role in the development of chronic complications of DM

Meisinger et al., in 2005, during a 14-year longitudinal study, concluded that GGT is a valuable predictor of Type 2 diabetes incidence in both the male and female gender

Based on the Kasapoglu et al., study serum GGT, as apro-oxidant, also involved in the process of carotid and coronaryarteries atherosclerosis anditslevels, eveninnormal limits, can predict the metabolic syndrome and cardiovascular disease incidence[4].

Several studies have shown cellular GGT to be a marker of oxidative stress whose serum values are elevated along with serum MDA levels[7,8,9].Cellular GGT is a membrane bound enzyme that transfers the glutamyl moiety of glutathione to acceptors. Its main function is to make cysteine available for synthesis of glutathione within the cell, thus preventing oxidative stress. Recent experimental studies indicate that cellular GGT also has a pro oxidant potential. This effect occurs when GGT is expressed in the presence of iron or other transition metals. The cysteinylglycine product of GGT action has a strong ability to reduce ferric ions to ferrous .

V. CONCLUSION

- In conclusion a significant raised serum GGT level found in patient of diabetic retinopathy.Therefore raised S.GGT level can be a predictor of early diabetic retinopathy.
- The present study has shown thatraised S. GGT is found with raised FBS and poor glycemic control causes worsening of retinopathy.
- Elevations in serum GGT level correlates with severity of D.R. It can be used as a surrogate marker of microvascular complications in diabetes mellitus like diabetic retinopathy. Further studies using a larger sample size will be required to validate the results.
- The cross sectional design and small sample size of our study limits the ability to assess the causality. Longitudinal studies with larger sample size and longer follow ups are required to firmly establish this causation.

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