International Journal of Medical Research & Health Sciences
www.ijmrhs.com Volume 3 Issue 1 (Jan- Mar) Coden: IJMRHS Copyright @2013 ISSN: 2319-5886
Received: 6th Sep 2013 Revised: 9th Oct 2013 Accepted: 4th Nov 2013
Research article

A STUDY ON CHANGES IN SERUM GGT AND MAGNESIUM LEVEL IN ALCOHOLIC LIVER DISEASE

*Gandhi Paulin A[1], Sendhav Sandip S[2], Sanghani Hiren I[2], Patel Arpita P[3]

[1]Tutor, Departments of Biochemistry, G.C.S. Medical College, Ahmedabad, Gujarat, India
[2]Senior Resident, Departments of Biochemistry, B. J. Medical College & Civil Hospital, Ahmedabad, Gujarat
[3]Junior Lecturer, Departments of Biochemistry, N.H.L. Medical College, Ahmedabad, Gujarat, India

*Corresponding author email: pautalk@gmail.com

ABSRACT

Aims: A study on changes in Serum GGT and Magnesium level in Alcoholic Liver Disease. **Material and Methods**: Serum GGT and Serum Mg^{++} were estimated with the help of commercially available kit in patients of Alcoholic Liver Disease (n=50) and Normal Individuals (n=50) on fully automated biochemistry analyzer Erba XL-640. **Results**: Serum GGT level was found significantly higher (P< 0.01) in Alcoholic patients as compared to healthy non-alcoholics. Moreover Serum Mg^{++} was found significantly lower (P< 0.01) in Alcoholic Liver Disease as compare to normal Individuals. In addition to that there is significant inverse correlation (r= - 0.553) between serum GGT and Mg^{++} in study group. **Conclusions**: None of the individual tests of conventional liver function tests are of much importance in diagnosis of liver disease; however when many of the liver function tests are abnormal at the same time, liver disease is the most probable diagnosis. Data of the present study clearly conclude that serum GGT activity along with serum Mg^{++} status can be useful marker for alcoholic liver disease.

Keywords: Gamma Glutamyl Transferase, Magnesium, Alcoholic Liver Disease

INTRODUCTION

Excessive alcohol consumption and consequent medical disorders are considerable problems in our countries which causes a wide variety of medical and social problems[1]. It is estimated that only 20-50 % of patients with alcoholism are actually identified in health care and thus more reliable and accurate methods are urgently needed. There is no exact clinical finding or symptom clinical setting that can detect alcohol abuse in its early phase. So there are some biochemical substances in the body that can indicate the presence or progress of a condition or any genetic predisposition toward it, are called "Biomarkers" [2] which may detect excessive drinking and evaluate the extent of the resultant tissue damage.

Gamma-glutamyl transferase (GGT) is a membrane-bound glycoprotein enzyme which catalyzes the transfer of the gamma-glutamyl moiety of glutathione to various peptide acceptors. Chronic ethanol consumption induces a rise in serum GGT, and it has therefore been widely used as an index of excessive ethanol intake [3-4]. Its sensitivity varied from 15 to 85% in previous studies[8-10]. Recent work by comparing alcoholic group with normal control group which emphasis on important factor serum GGT activities which can increase in case of alcoholics [5-6].

Magnesium (Mg^{++}) a ubiquitous element, involve in membrane stabilization, ion transport, and Ca^{++} channel activity, cofactor for more than 300 enzymes [7], may get depleted by several mechanisms associated with alcoholism like magnesium deficiency, including urinary Mg^{++} wastage, malnutrition, gastrointestinal losses, phosphate deficiency, acidosis/alkalosis, vitamin D deficiency etc.

This work was aimed at investigating the diagnostic value of serum GGT level and Serum Mg^{++} level and correlation of serum GGT and Mg in the evaluation of chronic alcoholic liver disease.

MATERIALS AND METHODS

In the present cross-sectional study, 50 cases of Alcoholic liver disease and 50 normal individuals were selected from OPD and various clinical wards of B.J. Medical College and Civil Hospital, Ahmadabad, Gujarat during the period of April 2010 to December 2012. The study was approved by the BJ Medical college, Ahmadabad and inform consent form was obtained form the all participants. All patients were primarily evaluated by clinical examination and then confirmed by investigations for liver involvement due to alcoholism. In study group (n=50), we have included male patients between age of 20 – 60 years, BMI ≤ 30 kg/m^2, alcohol consumption for at least last 5 years with clinical evidence of alcoholic liver dysfunction. In control group (n=50), we have included normal healthy individuals having same age and sex. Exclusion criteria: Age < 20 or >60 years, Athletes, Clinical Evidence of current illness, Clinical evidence of any chronic infection, Smoking had not been allowed 1 hour prior to sampling, Protein energy malnutrition, Post operative patient, Patient taking anticonvulsant therapy (Benzodiazepines, Phenobarbitone), BMI > 30 kg/m^2, Serum Bilirubin level > 20 mg/dL.

Venous blood was collected in clot activator serum vacutte from all the participants. Serum was separated and analyzed for GGT, Mg on fully Auto Analyzer – Erba XL-640 at Biochemistry Section. Serum GGT was analyzed by carboxy substrate[8] method and serum Mg was analyzed by calmagite method[9] with commercially available ready to use reagent kits.

Numerical variables are reported in terms of mean and standard deviation. Comparison between two groups is made with the Mann-Whitney test [10]. Correlations were calculated with pearson product moment correlation coefficient by using graphpad prism version 3.03 statistical software.

RESULTS

Table 1: Comparison of Serum GGT and Magnesium in Alcoholic Liver Disease and Normal Individual

Parameter	Biological Reference Interval	Group-1(ALD Patients) n=50	Group-2 (Control Group) n=50	Significance
		Mean ± SD	Mean ± SD	P value
GGT	10-50 U/L	101.04 ± 52.2	42.02 ± 12.82	P<0.01*
Magnesium	1.6 – 3.0 mg/dL	1.50 ± 0.49	2.03 ± 0.36	P<0.01*

*P< 0.01: highly significant difference between two groups

In this study we measured Serum activity of Gamma Glutamyl Transferase and Magnesium in both groups. There is highly significant difference observed in between study group and control group. Correlation between serum GGT and Magnesium level in alcoholic liver disease and normal individual during observation significant inverse correlation (r= - 0.533, P<0.01) was found in alcoholic patients whereas it was not significant in normal individual (r= 0.031, P>0.05).

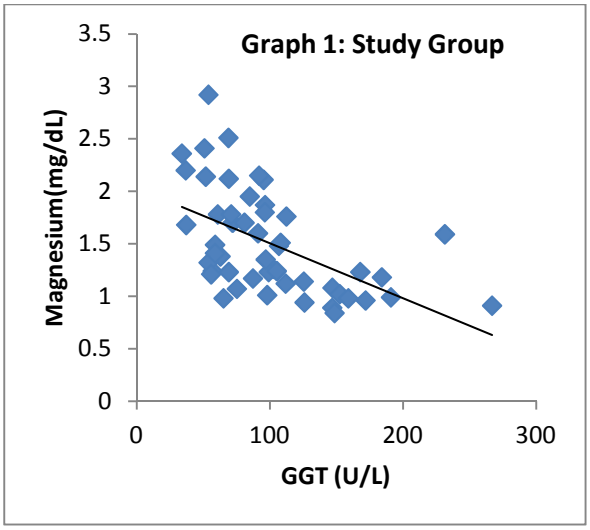

Fig 1; Correlation of serum GGT with magnesium in Study group

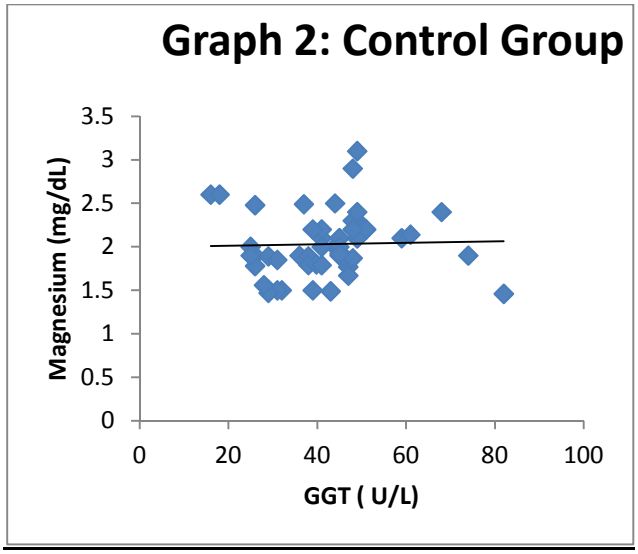

Fig 2: Correlation of serum GGT with magnesium in control group

DISCUSSION

Liver serves many important biological functions to sustain life, so early diagnosis of liver involvement is of utmost priority to prevent life threatening complications. Over past decade a large number of new laboratory markers have emerged for alcohol abuse. One of these is Gamma Glutamyl Transferase. In order to assess its usefulness, I have studied Serum GGT level and Serum Magnesium in 50 patients of alcoholic liver disease and 50 normal individual. I have tried to match control with the disease population as far as possible.

Glutamyl transpeptidase (γGT) is an enzyme produced in the bile duct. It is induced by alcohol and its serum activity may be increased in heavy drinkers even in the absence of liver damage or inflammation. In this study the serum γGT levels were markedly increased in alcoholic patients ($P<0.01$). The GGT activity in serum increases after induction of the enzyme, and the possibility of parenchymal damage should always be considered. The elevation of γGT alone with no other liver function test abnormalities often results from induction by alcohol [11]. The results of present study are correlate well with earlier studies by B. Usharani et al 2012 [12], Turecky L et al. 2006 [7], Subir kumar Das et al 2005 [13] etc.

Chronic alcohol abuse also causes primary malnutrition by insufficient dietary magnesium intake. Moreover, as the cause of secondary malnutrition chronic ethanol intake leads to functional and structural disorders in the gastrointestinal tract that result from its direct action on the gastrointestinal tract and damage to the liver and pancreas. In also affects the magnesium transport mechanisms in the plasma membrane, either directly (alcohol-related modification of the phospholipid environment or acetaldehyde-protein interaction) or indirectly (via the decrease in cellular ATP content).One of the major reasons for ethanol-induced hypomagnesaemia in alcohol abusers is increased urinary magnesium excretion due to damage to the renal proximal tubules and the Henle loop directly induced by ethanol [15-17]. These study is also supported by data of previous studies Elisaf M. et al 1995 [18] and Virginija Stasiukynienė et al 2002 [19]. It is concluded from the present study that the estimation of serum GGT can be useful and more cost-effective in diagnosing alcoholic liver diseases as it significantly rises in alcoholic liver disease. Moreover, serum Mg can also be used as a marker of chronic alcoholic liver disease along with serum GGT as they have significant correlation in alcoholic liver disease.

CONCLUSION

It is concluded from the present study that the estimation of serum GGT can be useful and more cost-effective in diagnosing alcoholic liver diseases as it significantly rises in alcoholic liver disease. Moreover, serum Mg can also be used as a marker of chronic alcoholic liver disease along with serum GGT as they have significant correlation in alcoholic liver disease.

REFERENCES

1. Room R, Babor T, Rehm, J. Alcohol and public health. Lancet 2005; 365: 519–30.
2. Peterson K. Biomarkers for alcohol use and abuse: A summary. Alcohol Res Health 2004-2005; 28(1):30-37.
3. Zein M, Discombe G. Serum gamma-glutamyl transpeptidase as a diagnostic aid. The Lancet 1970; 296: 748–50.
4. Gogoi JB, Tyagi PK, Amit Singh. Study of serum gamma glutamyl transferase as a diagnostic marker in alcoholic hepatitis. IOSR Journal of Pharmacy (IOSRPHR) 2012; 2; 69-71.
5. Peters TJ, Cook CC. Obesity as a cause of 'falsepositive' alcohol misuse laboratory

investigations. Addiction Biology 2002; 7:443–46.
6. Katri Puukka. Gamma-glutamyl Transferase As a Marker of Alcohol Abuse: Effects of Moderate Drinking, Obesity & Increasing Age on Reference Intervals, University of Tampere, Medical School Seinajoki Central Hospital, Department of Laboratory Medicine and Medical Research Unit, Finland, 2007: pp 15.
7. Turecky L, Kupcova V, Szantova M. Serum magnesium levels in patients with alcoholic and non-alcoholic fatty liver. Bratisl Lek Listy. 2006; 107(3):58-61.
8. Bergmeyer H-U, Horder M, Rej R. IFCC methods for the measurement of catalytic concentrations of enzymes, J. Clin. Chem. Clin Biochem. 1986; 24: 497-510.
9. Gindler E. Colorimetric Determination With Bound "Calmagite" of. Magnesium in Human Blood Serum. Clin. Chem.1971; 17: 662.
10. Rosie Shier. Statistics:2.3 The Mann-Whitney U Test. Mathematics learning support center 2004:1-5.
11. Keeffe EB, Sunderland MC, Gabourel JD. Serum gamma-glutamyl transpeptidase activity in patients receiving chronic phenytoin therapy.Dig Dis Sci. 1986; 31(10): 1056-61.
12. Usharani B, Vennila R, Nalini N. Biochemical changes in Alcoholics: A case control study. International Journal of Research in Pharmaceutical and Biomedical Sciences 2012; 3: 201-05.
13. Subir Kumar Das, Prasunpriya Nayak, Vasudevan DM. Biochemical markers for alcohol consumption. IJCB 2005, 20(1): 35-42
14. Kocur J. Concentration of bioelements in alcohol dependent patients. Biul.Magnezol. 1997; 2: 239.
15. Elisaf M, Merkooropoulos M. Pathogenetic mechanisms of hypomagnesaemia in alcoholic patients. J. Trace Elem. Med. Biol. 1996; 9: 210.
16. Vormann J. Magnesium: nutrition and metabolism. Mol. Aspects Med.2003; 24: 27.
17. Elisaf M, Merkouropoulos M, Tsianos EV. Pathogenetic mechanisms of hypomagnesemia in alcoholic patients. J Trace Elem Med Biol 1995; 9: 210-14.
18. Virginija Stasiukynienė. Blood plasma potassium, sodium and magnesium levels in chronic alcoholic patients during alcohol withdrawal. Medicina 2002; 38:892-95.