Original Article

A Study of Serum ALT, AST and GGT (Hepatic Markers) in Patients with Chronic Alcoholic Liver Diseases in Tertiary Level Care Hospital

Rahima Malek[1], Sohil Mansuri[2], Rizwan N Ansari[3], Shagufa M Pathan[4]

[1]Assistant Professor, department of biochemistry, Dr N. D. Desai faculty of medical science and research, Nadiad, [2]Assistant Professor, department of community medicine, GMERS medical college, Godhra, [3]Associate Professor, department of Medicine, GCS Medical College Hospital and Research center, [4]Assistant Professor, department of Otorhinolaryngology, Dr N. D. Desai faculty of medical science and research, Nadiad

How to cite this article: Rahima Malek, Sohil Mansuri, Rizwan N Ansari et. al. A Study of Serum ALT, AST and GGT (Hepatic Markers) in Patients with Chronic Alcoholic Liver Diseases in Tertiary Level Care Hospital. Indian Journal of Public Health Research and Development / Vol. 15 No. 4, October-December 2024.

Abstract

Background: Excessive alcohol consumption and consequent medical disorders are considerable problems in many countries. Aminotransferases (alanine aminotransferase ALT and aspartate aminotransferase AST) are the liver enzymes commonly used for detecting excessive drinking. Gamma-glutamyl transferase (GGT) is a membrane-bound glycoprotein enzyme widely used as an index of excessive ethanol intake. The aim of this study is to determine the changes in levels of ALT,AST and GGT in chronic alcoholic liver diseases.

Materials and Methods: A cross-sectional study was done and included 100 individuals (50 chronic alcoholic liver diseases cases and 50 normal controls). Serum ALT, AST, GGT were estimated by colorimetric method on fully automated chemistry analyzer.

Result: Data were fed under Microsoft Excel 2007 and statistically analyzed by Graphpad software; Version 6.0, which evaluated the differences of various parameters in both groups on the basis of p value. Serum ALT, AST & GGT levels were significantly elevated in chronic alcoholic liver diseases patients as compared to normal healthy controls.

Conclusion: Chronic consumption of alcohol results in the secretion of pro-inflamatory cytokines (TNF alpha, Interleukin 6 [IL6] and Interleukin 8 [IL8]),oxidative stress, lipid peroxidation, and acetaldehyde toxicity. These factors cause inflammation, apoptosis and eventually fibrosis of liver parenchyma which leads to elevations in liver enzymes like AST & ALT.GGT is an enzyme produced in the bile duct. Measurement of GGT is an extremely sensitive test. It is induced by alcohol and its serum activity may be increased in heavy drinkers even in the absence of liver damage or inflammation. Hence these parameters should be regularly monitored in chronic alcoholic liver diseases patients.

Keywords: Chronic alcoholic liver diseases**,** Serum ALT, AST, GGT

Corresponding Author: Shagufa M Pathan, Assistant Professor, Department of Otorhinolaryngology, Dr N.D.Desai faculty of medical science and research, Nadiad.

E-mail: rahimamalek786@gmail.com

Submission date: Dec 5, 2023 **Revision date:** 18 Jan 2024 **Published date: September 20 , 2024**

Introduction

Excessive alcohol consumption and consequent medical disorders are considerable problems in many countries. Simultaneously, the percentage of individuals abstaining from alcohol entirely has decreased [1]. The diagnosis of excessive alcohol consumption is often based on patients' own reports and answers to questionnaires. This approach suffers from a lack of reliability, because patients are usually unwilling to show excessive drinking. 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 called "Biomarkers"[2].

Aminotransferases (alanine aminotransferase ALT and aspartate aminotransferase AST) are the liver enzymes commonly used for detecting excessive drinking. Although these are frequently elevated in patients with excessive alcohol consumption, they are more directly related to liver status, so that increased AST and ALT values can be found in other conditions where the liver is damaged, e.g. due to viral hepatitis or medications[3]. It has been suggested that the ratio of AST to ALT may indicate the etiology of liver disease: a ratio over 2 often being seen in alcohol-related liver disease, particularly in advanced states[4]. Aminotransferase levels have been reported to normalize in 2 to 3 weeks after cessation of drinking, depending on the original level[5].

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 is known to induce a rise in serum GGT, and it has therefore been widely used as an index of excessive ethanol intake[6-7-8-9].

Materials and Methods

Study setting, type and sample size: In the present cross-sectional study, 50 cases of chronic alcoholic liver disease and 50 controls of normal healthy subjects were selected from Civil Hospital and B. J. Medical College, Ahmedabad, Gujarat. The study was conducted during the period of November 2015 to February 2017.

All patients were primarily evaluated by clinical examination and then confirmed by investigations for liver involvement due to alcoholism. Informed consent taken from all participants during study.

***Study Groups*:**

- Group 1 (Cases)– Chronic Alcoholic Liver Disease patients (50)
- Group 2 (Controls) – Normal healthy subjects (50)

***Inclusion Criteria for Group 1 (Cases)*:**

- Age: - 20 to 60 years
- Sex: - Males
- Patient with continuous alcohol consumption.
- Patients with clinical evidence of alcoholic liver dysfunction.

***Inclusion Criteria for Group 2 (Controls)*:**

- Age: - 20 to 60 years
- Sex: - Males
- Samples of fifty normal healthy volunteer individual (No clinical evidence of any disease)

***Exclusion Criteria for Both Groups*:**

- 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 blood sample collection
- Protein energy malnutrition
- Post operative patient
- Patient taking anticonvulsant therapy (Benzodiazepines, Phenobarbitone)

Sample Collection:

- Venous blood was collected in clot activator serum vacutte from all the patients and control group by venepuncture. Serum was separated by centrifugation and analysis was done on Fully Automated Biochemistry Analyzer-Erba XL-640 at Hi-tech Clinical Chemistry Laboratory Services, Civil Hospital, Ahmedabad. Commercially available ready to use reagent kits were

used for estimation of various parameters. Following Laboratory Investigations were done in both the study groups.

Laboratory Investigations:

- Serum ALT (Alanine Aminotransferase): UV Kinetic method Reference range: Men: 0-45 IU/L Women: 0-34 IU/L
- Serum AST (Aspartate Aminotransferase): UV Kinetic method Reference range: Men: 0-37 IU/L Women: 0-31IU/L
- Serum GGT (Gamma Glutamyl Transferase):Glupa-C method Reference range: Men: ≤ 50 U/l Women:≤ 30U/l

Statistical analysis:

- Data was entered under Microsoft Excel 2007 and epi info 7. Demographic data analysis was performed and unpaired t-test was used to show the significance of serum ALT, AST and GGT levels between cases and controls. The entire data were analyzed using the software Graphpad.

A p-value of <0.05 - statistically significant, p-value <0.001 - highly significant and p ≥ 0.05 – No significant difference

Results

Table 1: Comparison of Mean activity of serum ALT in Study Group (group 1) & Control group (group 2)

Serum ALT (IU/L)		
Group	**Mean±SD**	**P value**
Study Group (group 1)	110.62±55.9	<0.001
Control group (group 2)	26.60±9.68	

Table 1 shows that serum ALT is increased in Study group as compared to control group (110.62±55.9IU/L, 26.60±9.68IU/L respectively). So, there is highly significant difference observed in between study group and control group of serum ALT (p<0.001).

Fig 1: Showing comparison of Mean and SD of serum ALT in Study group **(Group 1) & Control group (Group 2)**

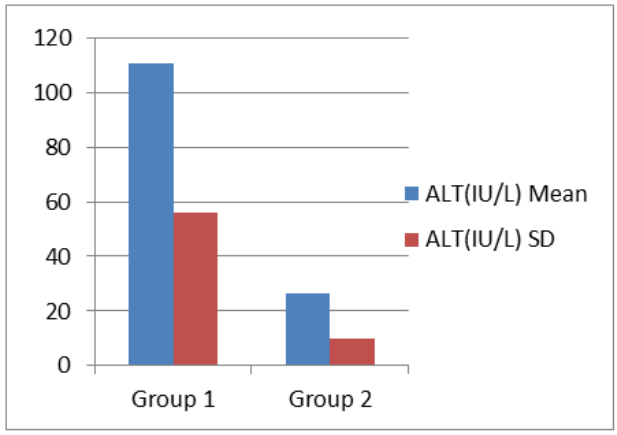

Fig 1: Serum ALT

Table 2: Comparison of Mean activity of serum AST in Study Group (group 1) & Control group (group 2)

Serum AST (IU/L)		
Group	**Mean±SD**	**P value**
Study Group (group 1)	95.54±77.59	<0.001
Control group (group 2)	22.50±7.66	

Table 2 shows that serum AST is increased in Study group as compared to control group (95.54±77.59 IU/L, 22.50±7.66 IU/L respectively). So, there is highly significant difference observed in between study group and control group of serum AST (p<0.001).

Fig 2: Showing comparison of Mean and SD of serum AST in Study group (Group 1) & Control group (Group 2)

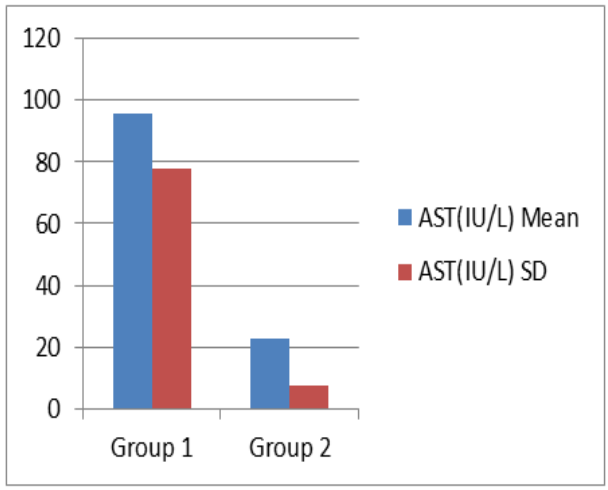

Fig 2: Serum AST

Table 3: Comparison of Mean activity of serum GGT in Study Group (group 1) &Control group (group 2)

Serum GGT (U/l)		
Group	**Mean±SD**	**P value**
Study Group (group 1)	94.73±49.06	<0.001
Control group (group 2)	25.88±11.86	

Table 3 shows that serum GGT is increased in Study group as compared to control group (94.73±49.06 U/l, 25.88±11.86 U/l respectively). So, there is highly significantdifference observed in between study group and control group of serum GGT (p<0.001).

Fig 3: Showing comparison of Mean and SD of serum GGT in Study group (Group 1) & Control group (Group 2)

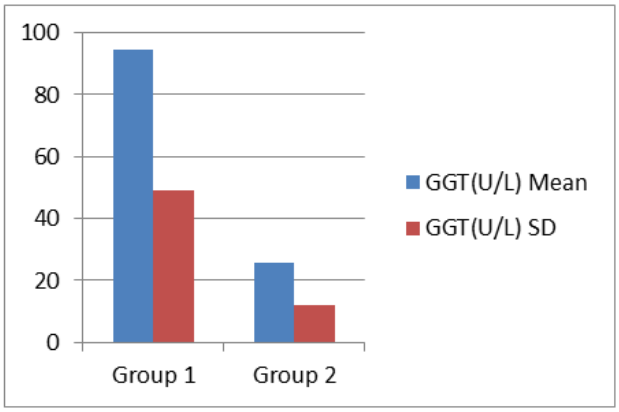

Fig 3: Serum GGT

Discussion

Alcoholism is a condition resulting from excessive drinking of beverages that contain alcohol. The major health risk of alcoholism includes liver disease, heart disease, pancreatitis, central nervous system disorders and certain forms of cancer [10]. The liver is particularly vulnerable to diseases related to heavy drinking, most commonly termed as alcoholic hepatitis or cirrhosis. The progression of alcoholic liver disease is characterized by steatosis, inflammation, necrosis and cirrhosis or even death in severe cases[11]. Chronic consumption of alcoholic beverages is a primary cause of liver injury[12]. Hence, an attempt has been made to evaluate the effect of chronic alcohol consumption on hepatic marker enzymes like AST, ALT, GGT

To find out the effects of alcohol consumption on hepatocellular injury the activities of ALT and AST levels in alcoholic patients were estimated. Patients consuming alcohol for a prolonged period showed elevated activities of ALT and AST as compared to those of the control subjects. The mechanism behind this is not completely understood. 80% of alcohol passes through the liver to be detoxified. Chronic consumption of alcohol results in the secretion of pro-inflammatory cytokines (TNF alpha, Interleukin 6 [IL6] and Interleukin 8 [IL8]),

oxdative stress, lipid peroxidation, and acetaldehyde toxicity. These factors cause inflammation, apoptosis and eventually fibrosis of liver parenchyma which leads to elevations in liver enzymes like AST & ALT. Our results correlate with those of the previous finding which showed elevated ALT and AST activities on alcohol consumption [10,13].

GGT is an enzyme produced in the bile duct and may be elevated in the serum of patients with bile duct diseases. Measurement of GGT is an extremely sensitive test. 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 GGT levels were markedly increased in alcoholic patients. The elevation of GGT alone with no other liver function test abnormalities often results from induction by alcohol[14].

In this study, serum ALT, AST & GGT level in study group and control group which correlated well with the study done by **Turecky L et al. 2006 [15], B. Usharani et al. 2012 [10] and Subirkumar Das et al. 2005[16]**

Conclusion

The present study was aimed to evaluate the changes in serum ALT, AST & GGT in patients with chronic alcoholic liver diseases.

Level of serum ALT, AST & GGT was significantly increased in chronic alcoholic liver diseases as compared to normal individuals.

So, the first step in the diagnostic journey of alcoholic liver disease begins with a careful history and physical examination. Then, the laboratory tests should be used in a selective manner to rule in or

rule out the most unlikely diseases. This approach should be used to develop strategies of using the laboratory testing in diagnosis and alcoholic liver disease management in a cost-effective manner. The development and application of laboratory tests that can identify early liver impairment due to alcohol have the potential of reducing the healthcare costs and suffering associated with liver disease.

Acknowledgement: Staff of Biochemistry department of college and patients.

Ethical Clearance: Ethical clearance permission taken from institutional ethics committee of B.J.Medical College and Civil Hospital,Ahmedabad. (Ref. No. IEC/Certi/42/17 on 8th May, 2017)

Source of Funding: Self-sponsored

Conflict of Interest: Nil

References

1. Johanna Hietala. Novel Use of Biomarkers and Their Combinations for Detecting Excessive Drinking, University of Tampere, Medical School Seinajoki Central Hospital, Department of Laboratory Medicine and Medical Research Unit, Finland,2007: pp 15.
2. Peterson K. Biomarkers for alcohol use and abuse- A summary. Alcohol Res Health 2004-2005; 28(1):30-37.
3. Conigrave KM, Davies P, Haber P et al. Traditional markers of excessive alcohol use. Addiction 2003; 98 (2): 31-43.
4. Harper's Illustrated Biochemistry; 27th edition: Chapter 25, Page no: 217 229.
5. Chrostek L, Cylwik B, Szmitkowski M et al. The diagnostic accuracy of carbohydrate-deficient transferrin, sialic acid and commonly used markers of alcohol abuse during abstinence. Clin Chim Acta 2006; 364: 167-171.
6. Boris Tabakoff, Anders Helander, Kate M. Conigrave. WHO/ISBRA Study on State and Trait Markers in Alcoholism: The WHO/ISBRA Collaborative Project. Alcoholism: Clinical and Experimental Research 2001; 25: 99–103.
7. Daniela Ionescu, B.Bumbacila, Carmen Cristescu, Raluca Dumache et al. Carbohydrate-Deficient Transferrin and Gamma Glutamyl Transpeptidase-Marker of excessive alcohol consumption. Romanian J. Biophys 2008; 18; 301–307.
8. Dr.J.b Gogoi, Dr. Praveen k.Tyagi, Dr. Amit k.Singh et al. Study of serum gamma glutamyl transferase as a diagnostic marker in alcoholic hepatitis. IOSR Journal of Pharmacy (IOSRPHR) 2012; 2; 69-71.
9. Zein, M. and Discombe, G. Serum gamma-glutamyl transpeptidase as a diagnostic aid. The Lancet 1970; 296: 748–750.
10. B. Usharani, R. Vennila, N. Nalini et al. Biochemical changes in Alcoholics – A case control study. International Journal of Research in Pharmaceutical and Biomedical Sciences 2012; 3: 201-205.
11. Felver ME, Merzey, Herlong HF et al. Plasma tumor necrosis factor, a predicts decreased longterm survival in severe alcoholic hepatitis. Alcohol Clin. Exp Res.1990; 31: 117-134.
12. Tuma DJ. Serial review: Alcohol, oxidative stress and cell injury free. Radi. Biol. Med 2002; 32: 303-308.
13. Vajro P, Lofrano MM, Fontanella A and Fortunato G et al. Immunoglonulin complexed AST ("macro-AST") in an asymptomatic child with persistent hypertansaminasemia. J Pediatr Gastroenterol Nutr. 1992; 15: 458-60.
14. Keeffe EB, Sunderland MC, Gabourel JD et al. Serum gamma-glutamyl transpeptidase activity in patients receiving chronic phenytoin therapy.Dig Dis Sci. 1986; 31(10): 1056-61.
15. Turecky L, Kupcova V, Szantova M, et al. Serum magnesium levels in patients with alcoholic and non-alcoholic fatty liver. Bratisl Lek Listy. 2006; 107(3): 58-61.
16. Subir Kumar Das, Prasunpriya Nayak, D.M.Vasudevan et al. Biochemical markers for alcohol consumption. IJCB 2005, 20(1): 35-42.