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Comparative Levels of ALT, AST, ALP and GGT in Liver associated Diseases

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ABSTRACT

Hepatic injury is associated with distortion of the metabolic function. Hepatic disease can be evaluated by biochemical analysis of the serum tests, includes levels of serum Alanine and Aspartate aminotransferases, alkaline phosphatase, and others. The present study was conducted to assay Liver associated enzymes on patients with Viral Hepatitis, Alcoholic liver diseases, and Liver cirrhosis and to find out the comparative levels of enzymes between the groups. In this study, total 60 male subjects (15 Healthy controls and 45 patients "Case group") aged between 30 to 50 years was enrolled. Each case group consisted of 15 male patients suffering with Viral Hepatitis, Alcoholic Liver disease (more than 10 years) and liver cirrhosis respectively. Serum levels of Alanine and Aspartate aminotransferases, alkaline phosphatase and Gamma glutamyle transferase were analyzed using standard methods. Data analyzed using SPSS Version 17.0 Several folds of variation in the analyzed enzymes were found between healthy control and case groups. Comparative elevation of Liver associated enzymes was observed to indicate the degree of Hepatic Damage in Viral Hepatitis, Alcoholic liver diseases and cirrhosis.

Key words: Viral Hepatitis, Alcoholic liver diseases, cirrhosis, Liver enzymes, Hepatic damage

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INTRODUCTION

The liver is the largest organ of the body, weighing 1 to 1.5 kg and representing 1.5 to 2.5% of the lean body mass. Liver is a complex organ with interdependent metabolic, excretory and defense functions .The use of several screening tests improves the detection of hepato-biliary abnormalities, helps differentiate the basis for clinically suspected disease and determine the severity of liver disease [1]. Blood tests used for initial assessment of liver disease include measuring levels of serum Alanine and Aspartate aminotransferases (ALT and AST), alkaline phosphatase, and others. The pattern of abnormalities generally points to hepatocellular versus cholestatic liver disease and helps to decide whether the disease is acute or chronic and whether cirrhosis and hepatic failure are present [2]. Serum enzyme levels fluctuate widely from normal to moderately abnormal, with values rarely into the high hundreds [3, 4, 5]. Marked elevation of aminotransferases in the appropriate clinical context indicates acute cell necrosis caused by viral infection, drugs, toxins, alcohol, or Ischemia [6].

Viral hepatitis is a global health problem that affects hundreds of millions of children and adults; viral hepatitis remains a leading cause of virus-associated morbidity and mortality, affecting millions of individuals worldwide [7]. The number of enzymes present, or pathologically increased in the plasma during viral hepatitis, and their comparative behavior in other types of liver diseases like Alcoholic liver diseases cirrhosis and others [8].

Alcoholic liver disease (ALD) represents a spectrum of clinical illness and morphological changes that range from fatty liver to hepatic inflammation and necrosis (alcoholic hepatitis) to progressive fibrosis (alcoholic cirrhosis)[9].

A reliable history is helpful; in reality this can be difficult. A biochemical clue is the ratio of AST to ALT (2:1 at least), reflecting the low level of activity of ALT in people with alcoholic liver disease. [10].

Present study was conducted to find the comparative level of liver associated enzymes among Viral Hepatitis, Alcoholic Liver disease and liver cirrhosis patients

MATERIALS AND METHODS

Present study was comprised of total 60 male subjects (15 Healthy control and 45 case group) aged between 30 -50 years, each case group consisted of 15 male patients of similar age suffering with Viral Hepatitis, Alcoholic Liver disease (more than 10 yrs) and liver cirrhosis. Histopathology Liver Biopsy report confirmed the Liver cirrhosis case group. All case groups were the patients admitted to Gastroenterology in Gandhi Hospital, Secudrabad and Owaisi Hospital Hyderabad. Ethical approval was obtained from concerned authority and informed consent was taken from each participant.

Alanin aminotransferase (ALT) and Aspartate aminotransferase (AST) were assayed by Reitman and Frankel method [11]. Alkaline phosphatase was determined by King and Kind [12].

Gamma Glutamyl Transferase (GGT) was determined by SZASZ [13]

Statistical Analysis

Statistical analysis was done using SPSS for Windows version 17.0. Results expressed as mean ±SD). Comparison of variables between two groups performed with student t-test for continuous variables. The p values < 0.05 were considered statically significant

RESULTS

Alanine aminotransferase levels were significantly raised in viral hepatitis, alcoholic liver disease and cirrhosis patients. The levels being 258.2±91.73, 79.66±28.63, and 50.73± 8.4 respectively as compared to normal control (11±3.42)

Aspartate aminotransferase levels were significantly raised in viral hepatitis, alcoholic liver disease and cirrhosis patients. The levels being 157.80±67.8, 164±54.35, and 62±12.17 respectively as compared to normal control (13±3.54)

Alkaline phosphatase levels were significantly raised in viral hepatitis, alcoholic liver disease and cirrhosis patients. The levels being 208±54.4, 180.33±33.29, and 116±11.98 respectively as compared to normal control (36.20±9.54)

Gamma glutamyle transpeptidase levels were significantly raised in viral hepatitis, alcoholic liver disease and cirrhosis patients. The levels being 115.33±28.31, 181.33±60.66, and 248.66± 43.52 respectively as compared to normal control (26.73.±4.03).

Table 1: Enzymes value (Mean±SD) among patients' viral hepatitis, Alcoholic liver disease and liver cirrhosis

	Control (n=15)	Viral Hepatitis (n=15)	Alcoholic Liver Diseases (n=15)	Liver cirrhosis (n=15)
ALT	11.20±3.43	258.20±91.73 P^1= .000*	79.66±28.63 P^1= .000* P^2= .000*	50.73±8.40 P^1= .000* P^2= .000* P^3= .001*
AST	13.00±3.54	157.80±67.81 P^1= .000*	164.00±54.35 P^1= .000* P^2= .784	62.13±12.17 P^1= .000* P^2= .000* P^3= .000*
ALP	36.20±9.54	208.00±54.40 P^1= .000*	180.33±33.30 P^1= .000* P^2=. .000*	116.00±11.98 P^1= .000* P^2=. .000* P^3= .000*
GGT	26.73±4.02611	115.33±28.31 P^1= .000*	181.33±60.66 P^1= .000* P^2=. .001*	248.66±43.5 P^1= .000* P^2=. 000* P^3= .002*

P value [1] comparing patients with viral hepatitis, Alcoholic liver disease and Liver cirrhosis to healthy controls.
P value [2] comparing patients with Alcoholic liver disease and Liver cirrhosis to viral hepatitis.
P value [3] comparing patients with Liver cirrhosis to Alcoholic liver disease.
*P<0.05 significant

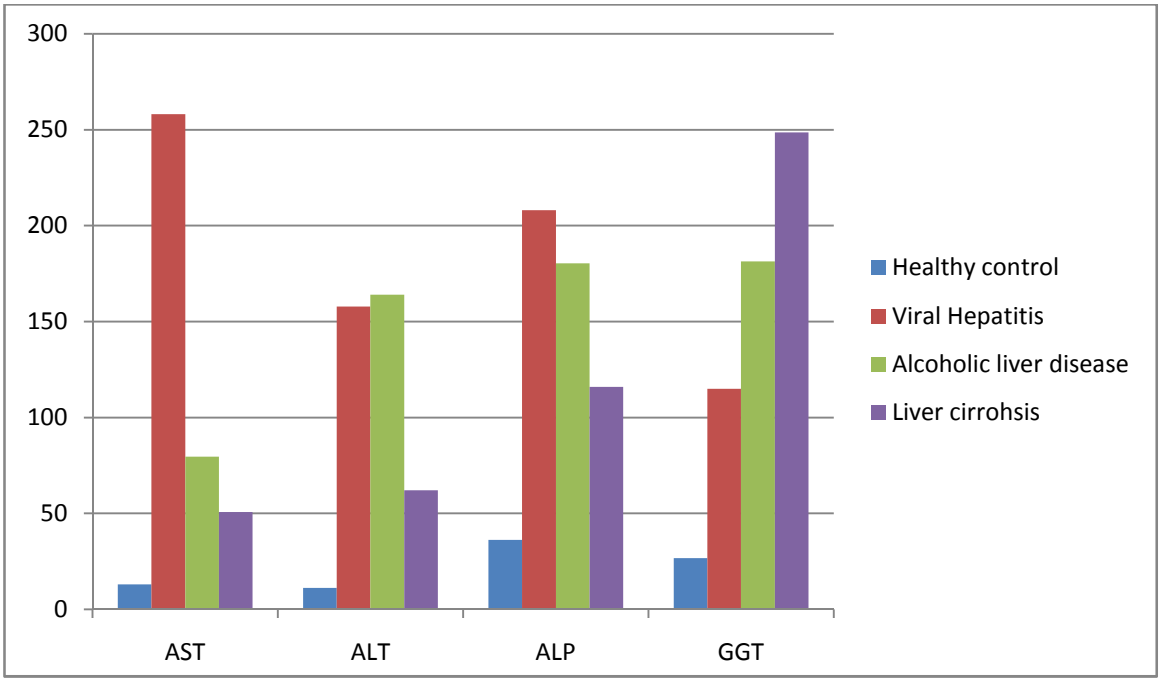

Fig 1: AST, ALT, AST and GGT levels in different groups

Table 2: Ratio of Enzyme values between Healthy control to viral hepatitis, Alcoholic liver disease and liver cirrhosis

	Viral Hepatitis : Control	Alcoholic Liver Diseases : Control	Liver cirrhosis : Control
ALT	**23.0**	**7.11**	**4.5**
AST	**12**	**12.6**	**4.7**
ALP	**5.7**	**5**	**3.2**
GGT	**4.3**	**6.7**	**9.3**

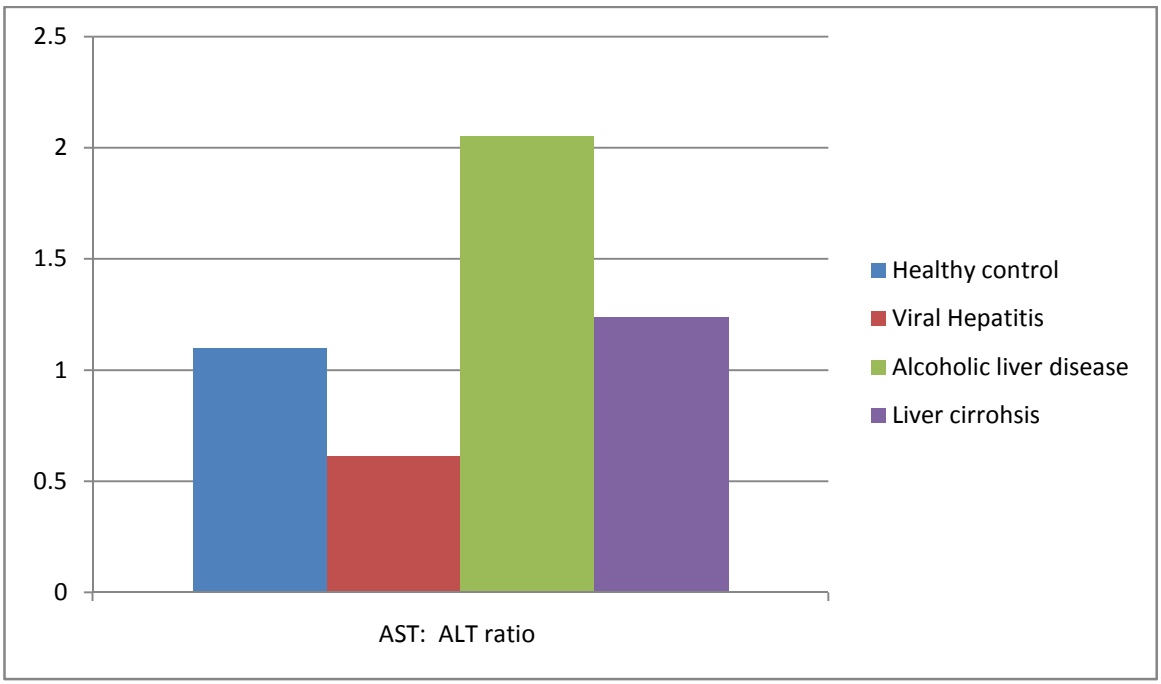

Fig: 2 AST: ALT ratios in different groups

Table 3: Ratio calculated between AST and ALT

	Control	Viral Hepatitis	Alcoholic Liver Diseases	Liver cirrhosis
AST/ALT Ratio	**1.1**	**0.61**	**2.05**	**1.24**

DISCUSSION

The liver associated enzymes, Alanine aminotransferase (ALT), Aspartate aminotransferase (AST), and gamma glutamyl transferase (GGT) are measures of liver homeostasis [14]. Serum amino transferases such as alanine aminotransferase (ALT) and aspartate aminotransferase (AST) indicate the concentration of hepatic intracellular enzymes that have leaked into the circulation. These are the markers for hepatocellular injury [15].

The aminotransferases (transaminases) are sensitive indicators of liver cell injury and are most helpful in recognizing acute hepatocellular diseases such as hepatitis. The pattern of the aminotransferase elevation can be helpful diagnostically. In most acute hepatocellular disorders, the ALT is higher than or equal to the AST. An AST: ALT ratio>2:1 is suggestive while a ratio >3:1 is highly suggestive of alcoholic liver disease. The AST in alcoholic liver disease is rarely >300 U/L and the ALT is often normal. A low level of ALT in the serum is due to an alcohol-induced deficiency of pyridoxal phosphate. [16]. In this study, Table 3 shows the AST: ALT ratios 1 for normal, 0.65(<1) for viral hepatitis, consistent with F .DE RITIS et al[17], >2 for ALD group, which similar to reported by several other studies conducted earlier [18], and 1.24 in cirrhosis , > 1 but < 2 also documented by Nyblom et al [19] and others . This helps to differentiate ALD from other liver diseases.

In this study AST, ALT ALP, GGT levels were significantly raised in viral hepatitis, alcoholic liver disease and cirrhosis patients as compared to control. In viral hepatitis AST, ALT and ALP Levels were significantly high as compared to alcoholic liver disease and cirrhosis. Moreover alcoholic liver disease patients have more AST, ALT and ALP as compared to cirrhosis.

In viral hepatitis ALT is greater than AST. The peak levels of Transminases have been reported to vary from 400-4000 IU/l or more [20]. In alcoholic liver disease AST activity has been reported to be greater than ALT and usually does not exceed 300 IU/L. AST/ALT ratio is greater than 2 because of existing mitochondrial damage [20, 21].This study also confirms that in cirrhosis AST and ALT levels are normal or slightly elevated. If the etiological factors are present or with active alcohol abuse increases AST and ALT levels [20].

The ALP activity has been reported by various workers , minimally increased usually upto 200 -300 U/L in viral hepatitis and in alcoholic liver disease ALP usually up to 300 U/L.In cirrhosis ALP is either normal or slightly elevated [20], increased in serum ALP is associated with liver disease is caused by intra or extra hepatic cholestatis and some destruction of hepatic cell membrane .Elevation of ALP is observed in patients who have some form of extra hepatic and intra hepatic bile duct obstruction. Any mechanism that impaired excretion of ALP in bile will result in regurgitation of enzyme into circulation via the hepatic sinusoid. The increased ALP present in the patients with disease closely resembles the ALP that can be extracted from liver. The increased cholestatis stimulates the synthesis of ALP by the bile ductules cell providing more ALP which ultimately enters the bloods, the amphillic nature of bile salts facilitates the release of ALP from its membranes bound site and entry into blood [22] .

In Viral hepatitis GGT levels were significantly low as compared to cirrhosis and high as compared to alcoholic liver disease and cirrhosis , moreover GGT levels are high in case cirrhosis than alcoholic liver disease. GGT present in the cell membranes of hepatobiliary system, it is an extremely sensitive enzyme to identify cholestatis disease both intra and extra hepatic. In viral hepatitis in absence of cholestasis, it increases upto 5 times and in the presence of cholestatsis it increases upto 10 times of upper limits [23]. In the alcoholic liver disease it is 8-20 times the upper limits and persistence elevation of GGT may be an indicator if Cirrhosis [24] .In our study we observed the increasing pattern of GGT value in different folds among patients of Viral Hepatitis, Alcoholic liver diseases and Liver Cirrhosis respectively.

CONCLUSION

There are 12 fold elevations in mean value of AST in Viral hepatitis, 12.6 folds elevation in alcoholic liver disease and 4.7 fold in cirrhosis
ALT showed the elevation in mean value of 23 fold in viral hepatitis, 7.11 fold elevations in alcoholic liver disease and 4.5 fold in cirrhosis
In viral hepatitis ALT levels greater than AST and in alcoholic liver disease AST levels greater than ALT.
The serum ALP showed the elevation in mean value of 5.7 fold in viral hepatitis, 5 fold in alcoholic liver disease and 3.2 fold in cirrhosis.
The serum GGT showed elevation in mean value of 4 fold in viral hepatitis, 6 fold in alcoholic liver disease and 9 fold in cirrhosis

Liver associated enzymes tests are used to detect, specifically diagnose, and estimate the severity of hepatic disease. Recognizing the different patterns of liver injury can be used as a guide to direct further evaluation of diseases that affect the liver. In combinations with the physical examination and history, the evaluation of other serum enzymes should aid in differentiating the source of increased Liver associated enzymes level and ratio

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