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ASSESSMENT OF AST AND ALT AMONG DIFFERENT CLINICAL CATEGORIES OF HBV INFECTED INDIVIDUALS AT KHARTOUM STATE-SUDAN

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ABSTRACT

Alanine transaminase (ALT) and aspartate transaminase (AST) are commonly tested to reflect the general liver health status because they increased in liver diseases. This study aimed to assess the levels of AST and ALT among different categories of HBV patients. A ninety sera were collected from HBV patients, 30(33.3%) of the participants were suffering from liver cirrhosis, 30 (33.3%) carriers, 19 (21.2%) acute HBV patients and 11 (12.2%) recently infected. 8(26.7%) of the carriers were positive for HBeAg as active chronic carriers. The serum levels of AST and ALT were measured by full automated chemistry analyzer. There were significant mean differences of AST and ALT among different study groups (P values 0.000 and 0.003 respectively). Both enzymes were elevated in recent HBV infected group then acute hepatitis, HBV with liver cirrhosis and HBV carriers. AST elevation was predominant among cirrhosis and elevated ALT does not accurately predict significant liver injury.

KEYWORDS: AST, ALT, HBV, Live cirrhosis.

INTRODUCTION

Hepatitis B virus (HBV) is hepadnavirus that belongs to genus *Orthohepadnavirus* of *hepadnaviridae* family. It is the causative agent of hepatitis B. The virus is transmitted sexually, vertically and via blood transfusion, or through sharing of sharp objects specially needles during drug abuse. The disease can be manifested as acute or chronic or even asymptomatic hepatitis.[1]

The basic pathogenesis of HBV is non-cytopathic, and all noted inflammation of the liver and subsequent complications such as cirrhosis are mediated by immune system.[2] The virus infects the liver cell and replicates, then the virus antigens are expressed on the cell surface. This leads to stimulation of cyto-toxic T cells to interact with the infected cells causing inflammation and necrosis of liver tissues.[3]

About third of world population are show serological evidence of infection or last infection with hepatitis B virus, and more than 257 million of them have a chronic disease which may progress to liver cirrhosis and hepatocellular carcinoma (HCC).[4] Liver enzymes such as alanine transaminase (ALT) and aspartate transaminase (AST) are commonly used with other laboratory tests to reflect the general liver health status because they increased in liver diseases.[5] ALT is more specific in reflection of hepatocellular injury because it is found in its highest concentrations in the liver in contrary to AST which present in liver, cardiac muscle skeletal muscle, kidneys, brain, pancreas, lungs, leucocytes, and red cells.[6] Both of the enzymes considered non-invasive test to predict liver cirrhosis,[7,8,9] but their ideal cutoff values and accuracy are unclear.[10]

This study aimed to assess the levels of liver enzymes AST and ALT among different categories of HBV infection.

MATERIALS AND METHODS

During the period from June 2016 to June 2017 a total of 90 HBV infected patients attending Ibn Sina specialized hospital-Khartoum town-Sudan were enrolled in this study. All the participants were confirmed to be positive for HBV infection serologically by detection of HBsAg using ELISA. One third of the participants were suffering from liver cirrhosis as confirmed by ultrasound and histopathology.

After having a written consent of each patient to participate in the study, 5 milliliter of venous blood was collected from the antecubital area under aseptic condition. The blood specimens were drawn into plain blood containers, allowed to clot, then centrifuged and the sera separated and stored at -20ºC until used.

A total of ninety sera were collected from HBV infected patients, 30(33.3%) of the participants were suffering from liver cirrhosis and the rest were subdivided as the following; 30 (33.3%) HBV carriers, 19 (21.2%) acute HBV patients and 11 (12.2%) recent HBV infected. 8(26.7%) of the carriers group were positive for HBeAg as active chronic carriers.

The serum levels of AST and ALT were measured by full automated chemistry analyzer (Mindray Bs120 ™) using (BioSystem™) reagent kits.

ANOVA test and independent t-test were used for statistical analysis of this study, and calculated by SPSS® version 21.

RESULTS

Table (1) shows significant mean differences of AST among different study groups (P value 0.000), the AST level was elevated in recent HBV infected group (120.000±113.298) then acute hepatitis B (99.211±79.934), HBV with liver cirrhosis (58.800±45.995) and HBV carriers (36.950±18.796).

Same table shows significant mean difference of ALT (P value 0.003), with marked elevation of ALT among recent HBV infected (101.091±147.280), then acute hepatitis B (55.947±30.961), HBV with liver cirrhosis (39.200±29.656) and HBV carrier (27.293±12.080).

AST was insignificantly increased (P value 0.365) in HBV infected individuals without liver cirrhosis (72.483±75.275) in comparison to infected individuals without liver cirrhosis (58.800±45.995). Also ALT showed insignificant elevation (0.418) in non cirrhosis HBV patients (50.064±69.871) comparing to cirrhosis HBV infected group (39.200±29.656) (Table2).

Tables (3A-3F) illustrate the significant mean difference of AST among recent HBV infected group in comparison to HBV carrier (P value 0.000) and HBV with liver cirrhosis (P value 0.005). Another AST significant means differences were shown between acute hepatitis B

with HBV carrier (P value 0.001) and cirrhosis (P value 0.025). In the other hand, ALT was significantly elevated among recent HBV infected group in comparison with acute hepatitis B (P value 0.034), HBV carriers (P value 0.000) and HBV with liver cirrhosis (P value 0.002) (Tables 4A-4F).

Table (5) shows the overall statistics of AST and ALT for all study population were (67.528±66.591) with range of (15-345) for AST and (46.331±59.118) with range of (9-520) for ALT.

AST was normal in 41(45.6%) and abnormal with 49(54.4%) whereas ALT were normal with 77(85.6%) and abnormal with 13(14.4%) (Table 6).

13(43.3%) of HBV with liver cirrhosis group with normal AST and all of them were have normal ALT level whereas 22 (73.3%) of the HBV carriers have normal AST and most of the HBV carriers 29(96.7%) have normal ALT (Tables 7 and 8).

Out of the 30 participants of the carrier group, 8(26.7%) were positive for HBeAg as active carrier and 22(73.3%) were negative for HBeAg (inactive carriers). 18 out of the 22 inactive carriers (81.8%) presented with normal AST whereas 4 out of the 8 active carriers (50%) presented with normal AST. The entire 22 inactive carrier presented with normal ALT and 7(87.5%) of the active carriers presented with normal ALT. (Tables 9 and 10).

Table 1: Statistics and mean differences of viral load, AST and ALT among recently infected, acute, carriers and cirrhotic groups.

Variable	Recent infection	Acute	Carriers	Cirrhosis	P value
AST	120.000±113.298 (20.00-345.00)	99.211±79.934 (36.00-300.00)	36.950±18.796 (15.00-90.00)	58.800±45.995 (16.00-210.00)	**0.000**
ALT	101.091±147.280 (17.00-520.00)	55.947±30.961 (20.00-115.00)	27.293±12.080 (9.00-59.00)	39.200±29.656 (15.00-170.00)	**0.003**

Table (2): Statistics and mean differences of AST and ALT among HBV infection with liver cirrhosis (Case) and HBV infection without liver cirrhosis (Control) groups.

Variables	HBV infection with liver cirrhosis (Case)	HBV infection without liver cirrhosis (Control)	P value
Mean AST IU/L of serum	58.800±45.995 (16.00-210.0)	72.483±75.275 (15.00-345.00)	0.365
Mean ALT IU/L of serum	39.200±29.656 (15.00-170.00)	50.064±69.871 (9.00-520.00)	0.418

Tables (3A-3AF). Mean differences of AST among different groups of study population

Table (3A-).

Dependent Variable	Recent HBV infection	Acute HBV infection	P value
Mean AST IU/L of serum	120.0 ±113.298	99.211±79.934	.367

Table (3-B).

Dependent Variable	Recent HBV infection	HBV carriers	P value
Mean AST IU/L of serum	120.0 ±113.298	36.950±18.796	**.000**

Table (3-C).

Dependent Variable	Recent HBV infection	HBV infection with liver cirrhosis	P value
Mean AST IU/L of serum	120.0 ±113.298	58.80±45.995	**.005**

Table (3-D).

Variable	Acute HBV infection	HBV carriers	P value
Mean AST IU/L of serum	99.211±79.934	36.950±18.796	**.001**

Table (3-E).

Variable	Acute HBV infection	HBV infection with liver cirrhosis	P value
Mean AST IU/L of serum	99.211±79.934	58.80±45.995	**.025**

Table (3-F).

Variable	HBV carriers	HBV infection with liver cirrhosis	P value
Mean AST IU/L of serum	36.950±18.796	58.80±45.995	.166

Tables (4A-4F). Mean differences of ALT among different groups of study population.

Table (4A).

Variable	Recent HBV infection	Acute HBV infection	P value [1]
Mean ALT IU/L of serum	101.091±147.280	55.947±30.961	**.034**

Table (4-B).

Variable	Recent HBV infection	HBV carriers	P value [1]
Mean ALT IU/L of serum	101.091±147.280	27.293±12.080	**.000**

Table (4-C).

Variable	Recent HBV infection	HBV infection with liver cirrhosis	P value [1]
Mean ALT IU/L of serum	101.091±147.280	39.200±29.656	**.002**

Table (4-D).

Variable	Acute HBV infection	HBV carriers	P value
Mean ALT IU/L of serum	55.947±30.961	27.293±12.080	.081

Table (4-E).

Variable	Acute HBV infection	HBV infection with liver cirrhosis	P value [1]
Mean ALT IU/L of serum	55.947±30.961	39.200±29.656	.305

Table (4-F).

Variable	HBV carriers	HBV infection with liver cirrhosis	P value [1]
Mean ALT IU/L of serum	27.293±12.080	39.200±29.656	.407

Table (5): The Statistics of Ast And Alt Among Study Populations.

Variable	Minimum	Maximum	Mean	Std. Deviation
AST IU/L	15.00	345.00	67.5278	66.59142
ALT IU/L	9.00	520.00	46.3311	59.11776

Table (6): The frequencies of AST and ALT.

		Frequency	Percent
AST IU/L	Normal	41	45.6
	Abnormal	49	54.4
	Total	90	100.0
ALT IU/L	Normal	77	85.6
	Abnormal	13	14.4
	Total	90	100.0

Table (7). Distribution of AST among study groups.

Study groups	AST status				
	Number examined	Normal		Abnormal	
		Frequency	Percent	Frequency	Percent
Recent infection	11	2	18.2	9	81.8
Symptomatic acute	19	4	20.1	15	78.9
Carriers	30	22	73.3	8	26.7
Cirrhosis	30	13	43.3	17	56.7
Total	90	41	45.6	49	54.4

Table (8). Distribution of ALT among study groups.

Study groups	ALT status				
		Normal		Abnormal	
		Frequency	Percent	Frequency	Percent
Recent infection	11	7	63.6	4	36.4
Symptomatic acute	19	11	57.9	8	42.1
Carriers	30	29	96.7	1	3.3
Cirrhosis	30	30	100.0	0.0	0.0
Total	90	77	85.6	13	14.4

Table (9). Frequencies of AST among active and inactive carriers.

HBeAg	Number Examined	AST status			
		Normal		Abnormal	
		Frequency	Percent	Frequency	Percent
Positive	8	4	50	4	50
Negative	22	18	81.8	4	18.2
Total	30	22	73.3	8	26.7

Table (10). Frequencies of ALT among active and inactive carriers.

HBeAg	Number Examined	ALT status			
		Normal		Abnormal	
		Frequency	Percent	Frequency	Percent
Positive	8	7	87.5	1	12.5
Negative	22	22	100	0	0.0
Total	30	29	96.7	1	3.3

DISCUSSION

The present study showed the overall statistics of AST and ALT for all study population were 67.5278±66.59142 with range of (15-345) for AST and 46.3311±59.11776 with range of (9-520) for ALT. This finding is closer to the work of *Esmaeelzadeh et al* who found the statistics were 60.5±87 (6 - 819) and 75.6±89 (10 - 661) for AST and ALT respectively.[11]

This study showed in significant difference in AST (P value 0.365) and ALT (P value 0.418) between cirrhosis and non cirrhosis groups, with significant mean differences of AST and ALT among study population (P value 0.000 and 0.003 respectively). Both enzymes were very high among recently infected group, then acute, cirrhotic and carriers. The highest concentration of AST among recently infected group gives significant mean differences between them and carriers (P value 0.000) and cirrhotic group (P value 0.005). Similar significant result also obtained from the mean differences of AST of acute and carriers (P value 0.001) and cirrhotic group (P value 0.025) and there were insignificant difference in AST between recently infected and acute (P value 0.367).

The increased concentration of ALT among recently infected group gives significant mean differences between them and acute (P value 0.034) carriers (P value 0.000) and cirrhotic group (P value 0.002). There were insignificant differences between ALT of acute, carriers and cirrhotic group.

This indicate that the enzymes were started their elevations with beginning of the infection, then their concentration fall down with the course of infection to carriers stage when reached

their lowest levels, then started the elevation with liver cirrhosis but still lower than recently infected and acute.

Out of our ninety participant, AST was normal in 41(45.6%) and abnormal with 49(54.4%) whereas ALT were normal with 77(85.6%) and abnormal with 13(14.4%). This finding is not far from the work of *Abulude et al* who found abnormal AST with 58% and ALT with 72.7% of his study population.[12] Other study by *Dore et al* reported up to 40–50% of all HBeAg-positive patients may have normal ALT levels for prolonged periods.[13]

In the other hand, 13(43.3%) of our cirrhosis group with normal AST and all of them were have normal ALT level. This agreed with *McCormick et al* and *Gobel et al*, they reported Although ALT reflects liver inflammation, its correlation with necro-inflammation is not satisfactory and even poorer for fibrosis.[14,15] Also the works of *ter Borg et al*, *Lai et al* and *Kumar et al*, they found between 10 to 37% of CHB patients with normal ALT already having significant necro-inflammation, fibrosis and even cirrhosis on liver biopsy, and the work of *Seto et al*, found An elevated ALT does not accurately predict significant liver injury and not predictive of significant fibrosis for both HBeAg-positive and negative diseases.[16,17,18,19]

Our finding showed 17(56.7%) of the cirrhotic patients with abnormal AST level, this agreed with *Dufour et al* and *Green et al* they reported elevated AST levels are usually predominant in liver cirrhosis.[7,8]

In this study, out of the 30 participants of the carrier group, 8(26.7%) were positive for HBeAg as active carrier and 22(73.3%) were negative for HBeAg (inactive carriers). 18 out of the 22 inactive carriers (81.8%) presented with normal AST whereas 4 out of the 8 active carriers (50%) presented with normal AST. The entire 22 inactive carrier presented with normal ALT and 7(87.5%) of the active carriers presented with normal ALT. These findings similar to finding of *Ijaz et al*, who found AST were normal in 99.6 of inactive carriers and 36.6 of active carriers, and ALT were normal among all inactive carriers and 4.7% of active carriers.[20]

CONCLUSIONS

There were significant differences in mean serum level of, AST and ALT among different categories of HBV infected patients.

AST was more elevated than ALT in all HBV patients in this study and AST also is elevated in the majority of the liver cirrhosis patients (56.7%) in contrary to ALT which within the normal range among all HBV patients with liver cirrhosis, this indicate AST elevation was predominant among cirrhosis and elevated ALT does not accurately predict significant liver injury.

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