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Assessment of Liver Enzymes Level in Sudanese Hypertensive Patients

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ABSTRACT

Hypertension is believed to have a wide range of effects on body's physiology with a controversial data on the association between hypertension and elevation of liver enzymes. Liver enzymes such as aspartate aminotransferase (AST), alanine aminotransferase (ALT), and gamma-glutamyltransferase (GGT) are considered as markers of liver function. To investigate the proposed association of hypertension with liver enzymes. fifty-eight hypertensive patients were enrolled in this study with a mean age of 28-76 and another age-matched group of 42 individuals selected as a control group, demographic data were collected in a predesigned form, then the liver enzymes were measured for the patients as well as the individuals of the control group. Statistical analysis was performed using SPSS, version 16. The means of plasma AST, ALT, ALP and GGT levels among patients were 20.79, 12.69, 81.72, and 20.48, respectively and among control group were 18.45, 9.53, 81.14 and 16.28 respectively, in spite of this obvious variations in liver enzymes among hypertensive patients when compared to the controls, this variation was found to be statistically insignificant. The study also showed that the plasma levels of AST (r=0.05, P value=0.089). and ALT (r=0.004, P value=0.972),ALP (r=0 .128,P value=0.214) were negatively correlated with BMI while the GGT(r=0.343, P value=0.000)was positively correlated with BM. The levels of liver enzymes in hypertensive patients were not significantly elevated compared to control group. While there is a correlation between BMI and plasma enzymes GGT. Levels of transaminases AST and ALT revealed significant association with the duration of hypertension.

Keywords: AST, ALT, Hypertension, Sudan

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INTRODUCTION

Hypertension (HTN) is defined as Systolic Blood Pressure (SBP) higher than 140 mmHg and/or Diastolic Blood Pressure (DBP) higher than 90 mmHg.[1]. The proportion of the global burden of disease attributable to hypertension has significantly increased from about 4.5 percent (nearly1 billion adults) in 2000 2, to 7 percent in 2010 [3]. In the Eastern Mediterranean Region, the prevalence of hypertension averages 26% and it affects approximately 125 million individuals [4].

Hypertension has the highest prevalence among the major non-communicable diseases (NCDs) in Sudan (prevalence of 23.6 in Khartoum state)[5]. Hypertension is classified as either primary (essential) hypertension or secondary hypertension. About 90–95% of cases are categorized as primary hypertension, defined as high blood pressure with no obvious underlying cause.[6]. Essential hypertension is associated with the metabolic syndrome, insulin resistance and the development of fatty liver. Fatty liver disease is a spectrum of liver diseases ranging from simple hepatic steatosis through steato-hepatitis to cirrhosis and hepatoma.[7]. There are controversial data on the association between hypertension and elevation of liver enzymes, Liver enzymes such as aspartate aminotransferase (AST), alanine aminotransferase (ALT), and gamma-glutamyltransferase (GGT) are considered as surrogate markers of liver function.

An association between abnormal liver function tests and hypertension was identified by Ramsay,who found that up to 15% of all male hypertensive patients had abnormal liver function tests.[8]. Alanine Aminotransferase (ALT) and Aspartate Aminotransferase (AST) constitute a group of enzymes that catalyzes inter conversion of amino acid to 2-oxoacid. Activity of ALT and AST increases inalcoholichepatitis, hepatic cirrhosis, infectious disease of liver, ascites and portal hypertension.[9]. Many studies have found increased levels of ALT, AST and GGT due to Alcohol and HTN. [10-14].Two studies have found no significant association between AST,ALT and GGT 15and the second found no significant association between AST and HTN1. Gamma glutamlytransferase (GGT) is a protein found in many tissues, has a particular affinity as marker of liver dysfunction, making it invaluable as diagnostic marker for hepatobiliarydiseases [16,17].

Elevated plasma GGT level has been shown to be associated with hypertension and its development in Japanese [12,18-20] Therefore, theyhypothesized that plasma markers of liver injury other than GGT may also be elevated in hypertension and predict the future risk of hypertension. One previous sex-combined study reported that ALP was significantly associated with hypertension [21], as well as [22] who reported a weak but statistically significant association of ALP with blood pressure. On the other hand, serum ALP levels are influenced by alcohol consumption [23,24], which has been positively associated with hypertension [25].

MATERIALS AND METHOD

This is a case-control hospital based study. The study was conducted at International Hospital–Khartoum Bahri, Khartoum state in the period from October to November 2015, the study approved by two ethical committees. The aim of the study is to assess the liver enzymes activity and to study the correlations between these enzymes in Sudanese Hypertensive patients.

Patients:

A total number of 100 subjects were studied, 58 known hypertensive patients and 42 volunteers as healthy controls were introduced in the study. The average age rangewas (28-76) years of patients, mean (52±16.9), and (27-76) years, mean (51.5±11.65) for controls.The duration of Hypertension Mean (5.15±4.5) year. The Weight had been measured while the volunteers minimally clothed without shoes using digital weight scale ,While height was measured in standing position without shoes using tape measure while the shoulder in normal state. BMI was calculated by dividing the weight (Kg) by the height squared (m2) andwere categorized on the basis of the World Health Organization classification 26 are: Normal weight (BMI 18.5 – 24.9 Kg/m2), Overweight (BMI ≥ 25 – 29.9 kg/m2) and Obesity (BMI ≥ 30 kg/m2).BMI of Hypertensive (Mean ± SD) (28.69±3.9kg/m2) and the BMI of control (Mean ± SD) (27.36±3.8kg/m2).

Selection criteria:

All volunteer participants were from Khartoum state, and they fulfilled exclusion and inclusion criteria:

Inclusion Criteria:

HTN patients and age and sex matched control groups, who attended the InternationalHospital during the study period and gave theirvoluntary written informed consent for the study.

Exclusion Criteria:

• Pregnant and lactating mothers.

•If the patient is suffering from any ofthe following conditions:

1. Diabetes Mellitus
2. Renal Disease
3. Liver Disease
4. Cardiac Disease
5. Active Infection
6. Any malignancy

7.alcoholics

8.smoker

9.hepatotoxic drugs like a statin and antibiotic drugs

Biochemical measures :From each participant, 5.0 ml of venous blood were collected using antiseptic for the skin (70% alcohol) in heparinized container. Blood samples were then centrifuged for 3-5 min immediately and plasma was separated and the activity of the enzymes AST, ALT ,ALP and GGT were measured by using special enzyme kits. Application of the assay was according to the manufacturer's guidelines, using automated machine (Mindray, BS-200, China).

Statistical analysis:

Statistical analysis was performed using SPSS (SPSS, version 16), data were expressed as mean and standard deviation (M±SD), the means were compared using independent T. test and Pearson's correlation analysis was used for correlation of parameters measured, P-value < 0.05 was considered as statistically significant.

Ethical consideration:

This study was approved by faculty of medical laboratory sciences, Al Neelain University, Khartoum, Sudan, and ethical clearance was obtained from ministry of health. All participant patients and control group signed an informed consent before samples collection.

RESULTS AND DISCUSSION

One hundred (100) subjects were introduced in this study, fifty eight suffering from hypertension (patients), and forty two (42) apparently healthy individuals as control group. Age range of Hypertensive patients was (28-76) years, and the Mean was (52±16.9), andfor controls (27-76) years and the mean was (51.5±11.65). The duration of the disease was (5.15±4.519) years, and the mean of BMI was (28.69±3.9) (27.36±3.8) year of patients and controls, respectively.

The means of plasmaAST, ALT, ALP and GGT levels among patients were 20.79, 12.69, 81.72, and 20.48, respectively and among control group were 18.45, 9.53, 81.14 and 16.28 respectively shown in Table 1. Although there was a moderately increased liver enzymes (AST, ALT,ALP and GGT) among patients when compared to control groupbut their increase was statistically insignificant .

The study showed that the plasma levels AST(r=0.05, P value=0.089). and ALT (r=0.004, P value=0.972),ALP (r=0.128, P value=0.214)were negatively correlatedwith BMIand GGT(r=0.343, P value=0.000)was positively correlated with BMI (table 2)when calculated by Pearson's correlation study, and there is no such correlation among the control group.

Comparison of the duration of the hypertension in the two groups and liver enzymes when compared showed statistical significance withtransaminases AST (P value=0.000)and ALT (P value=0.000)(table 3).

Table 1.Comparison of biochemical parameters between hypertensive patients and control group.

Parameters	Hypertensive(n=58)	Control (n=42)	P Value
P.AST(U/L)	20.79±10.904	18.45±5.840	0.211
P.ALT(U/L)	12.69±12.187	9.53±3.894	0.112
P.ALP(U/L)	81.14±23.281	81.72±16.756	0.891
P.GGT(U/L)	20.48±17.834	16.28±7.348	0.156

Upper reference limits are 40 IU/l for AST, ALT, 115 IU/l for ALP and 50 IU/l for GGT, according to manufacturer leaflets.

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Table 2: Pearson correlation coefficient among BMI and liver enzymes

Enzymes	Pearson Correlation	p value
P.AST(U/L)	- 0.175	0.089
P.ALT(U/L)	0.004	0.972
P.ALP(U/L)	0 .128	0.214
P.GGT(U/L)	0.343**	0.000

Table 3: comparison between Duration of hypertension in two groups and liver enzymes in the patients.

Parameters	Duration of hypertension		p value
	Group 1 (1to 10)years	Group 2 (>10)years	
P.AST(U/L) (mean± SD)	17.24 ±7.420	33.00 ±14.986	0.000
P.ALT(U/L) (mean± SD)	9.29±4.882	24.25±18.445	0.000
P.ALP(U/L) (mean± SD)	80.45±19.755	93.00±21.394	0.701
P.GGT(U/L) (mean± SD)	24.39±24.407	24.00±20.591	0.963

The current case-control hospital based study estimated the mean values of AST, ALT, ALP& GGT in patients, and control group. The mean values ofthe plasma liver enzymes activity AST,ALT, ALP and GGT in hypertensive group were slightly higher than that of control group, but statistically insignificant (table1).This findings agreed with findings of the previous three researchers who had found such result outcomes among their patients (15,27-28), mean while many others have found an increased levels of AST, ALT and GGT among alcoholic patients and hypertension and may be mainly attributed to alcohol consumption (20-21,29-31). Our study showed a considerable association between males hypertension and liver function test 12.9%,similar to that reported by Ramsay et al 8 who said that, about 15% of the male hypertensive patients have abnormal liver function tests. previous study found GGT levels increases in intra hepatic-biliary obstruction, post hepatic biliary obstruction andfatty liver, due to alcohol consumption in hypertensive patients [32-35].

Our result findings in this study revealed positive correlation between BMI and increasedGGT levels (p.value 0.00), This study was in consistent with AzharIqpal et al 36, who found that GGT levels have been shown to be related with BMI in hypertensive patients, mean while Yan Zhu, et al [37] who said that the association between GGT level was significant in the groups with high (0.001) and median (0.016) BMI level in chinese. Our result data showed one positive correlation of hypertension with increased levels of plasma GGT enzyme, whereas AST, ALT and ALP reveal no correlations (table 3). These findings were completely different from that reported by 21,22,who found positive correlation only betweenhypertensives and ALP enzymes.This study reveals statistically significantly association of the transaminases enzymes levels and the long duration term (table 3) of hypertension mange the patientsin the two groups(p.value 0.00) rather than short duration term .

CONCLUSION

plasma levels of liver enzymes were not significantly elevated when compared with controls. Correlation was found positive between BMI and plasma enzymesGGT. Only levels of transaminases AST and ALT revealed significantly association when compared withduration of hypertensive groups p.value 0.00, 0.00), respectively, rather than ALP and GGT enzymes.

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