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Original Research Article

Assessment of Liver Function Tests among Type 2 Sudanese Diabetic Patients in Khartoum State

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Abstract: Type 2 diabetes is associated with large number of liver disorders including elevated liver enzymes, fatty liver disease, cirrhosis, hepatocellular carcinoma, and acute liver failure, so this study aimed to evaluate liver function tests in type 2 diabetic patients in Khartoum-Sudan. This a cross sectional study was conducted in AL-arbaeen Hospital, Khartoum, Sudan from January 2016 to May 2016. A total of 35 type 2 diabetic patients and 35 healthy control subjects were selected to assess the liver function tests (LFTs) by measuring Alanine aminotransferase (ALT), Aspartate aminotransferase (AST), Gamma glutamyl transpeptidase (GGT), Total protein, Albumin, FBG and HbA1c. The mean values of ALT, AST and GGT were significantly higher in patients than in the control group ($P<0.05$). There was no statistical difference in Total protein and Albumin values between patients and control group ($P>0.05$), the means of ALT, AST, GGT, Total protein and Albumin were within the reference range. Liver enzymes (ALT, AST and GGT) in type 2 diabetic patients are found to be significantly higher when compared with normal healthy controls.
Keywords: Alanine aminotransferase (ALT), Aspartate aminotransferase (AST), Gamma glutamyl transpeptidase (GGT), Total protein, Albumin.

INTRODUCTION

Diabetes mellitus (DM) is group of metabolic disease characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both [1]. The most common form, which is accounting for 90% of all cases, is type 2 (DM) [2].

There exists a relationship between diabetes and liver injury. Liver is a vital organ of vertebrates, that is plays major role in metabolism including; plasma proteins synthesis, hormones production, detoxification of various metabolites, it is an accessory digestive gland and produces bile [3]. In addition of that liver has important role in regulation of glycogen storage and carbohydrate metabolism [4]. In poorly controlled diabetic patients the hepatocellular glycogen accumulation leads to hepatomegaly and liver enzymes abnormalities [5].

Nonalcoholic fatty liver disease (steatosis or accumulation of fat) is the main cause of chronic liver disease associated with diabetes and obesity [6]. Hepatomegaly and normal or mildly elevated transaminases are common findings in (NAFLD) [7]. In absence of treatment compensated steatosis in (NAFLD) can lead to decompensate steatosis with fibrosis and necroinflammation i.e. stage of non-alcoholic steatohepatitis (NASH), which is lead to end-stage liver disease and also a contributor of cardiovascular disease in type 2 diabetic patients [8]. The best therapeutic options for (NAFLD) are; physical exercise, hypo-caloric diets to correct obesity and controlling hyperglycemia with oral hypoglycemic agent, insulin or diet [9].

A study done in Sudan found that high serum alanine aminotransferase level is greater among type 2 diabetes, overweight or obese and men [4]. Another study done in Myanmar reported elevated ALT and AST are markers for associated non-alcoholic fatty liver disease in diabetes pateints [5]. All LFT measurements of type 2 diabetes patients were significantly increased when compared with control group in study done in Sudan also [6].

Sudan is believed to have one of the highest mortality rates for a non-infectious disease. There is 10% of adult patients deaths in hospitals due to diabetes [10]. Although there is initial study estimated the prevalence of diabetes in Sudan by 3.4%, but still the

current prevalence of disease is unknown [11]. The comprehensive study of diabetes mellitus and its impact is needed to be undertaken [4]. So this study was aimed to evaluate the liver functions in type 2 Sudanese diabetic patients.

MATERIALS AND METHODS

This study was a cross sectional descriptive study conducted at Al-arbaeen hospital in Khartoum-Sudan, between January 2016 and May 2016. A total of 35 subjects with diabetes type 2 and 35 apparently healthy subjects were selected as control for the study. For each subject clinical history, age, gender, height, weight and duration of diabetes were recorded on questionnaire sheet.

Patients with history of liver disease, the alcoholic, pregnant women, patients with infectious disease, post-operative patients, patients on drugs (except antidiabetic therapy), genetic disorders and age <20 years and >90 years were excluded from study. Permission to conduct this study was obtained from University of Khartoum faculty of medical laboratory sciences and verbal consent was obtained from volunteers.

Venous blood was obtained from each volunteer, between 8 and 9 AM after overnight fast (10-12 hours) using a disposable plastic syringe into three tubes heparin, fluoride oxalate and EDTA. The samples were then analyzed for total protein, albumin, ALT, AST, GGT, FBG by Selectra E chemistry analyzer (MEDEX) using Biosystems kits and HbA1c by cobas c 111 analyzer (Roche).

Statistical analysis was performed using the Microsoft Office Excel (Microsoft Office Excel for windows; 2007) and SPSS (SPSS for windows version 16).

RESULTS

A total of 35 patients diagnosed as type 2 diabetes with duration from 1–20 years and 35 healthy individuals as control group were selected to perform this study. HbA1c was used to sort diabetic patients to controlled and uncontrolled. 17 patients (48.6%) were controlled (HbA1c < 7.0%) [13] And 18 patients (51.4%) were uncontrolled (HbA1c > 7.0%). The average age was 47±17.1 years, ranging between 20 and 82 years in control group and 51±17.3 years, ranging from 20–90 years among the patients group. 17 patients were males representing (48.6%) and 18 were females representing (51.4%), on the other hand, 20 of the control group were male (57%) and 15 were female (43%). The mean duration of diabetes was 10.18 ± 5.17 years. In general 26 patients (74.3%) had body mass index (BMI) <25 kg/m2; 6 patients (17.1%) had BMI between 25 and 30 kg/m2 and 3 patients (8.6%) with BMI >30 kg/m2 (Table 1).

Table 1: Demographic and clinical characteristics of diabetic patients and healthy controls

Characteristic	Patients (n = 35)	Control (n = 35)
Mean age (years)	51	47
Male/female (No.)	17⁄18	20⁄15
Underweight (BMI < 18.50)	0	2
Normal (BMI 18.50 – 24.99)	26	22
Overweight (BMI ≥ 25.00)	6	8

The mean± SD value of ALT level was 14.2 ± 4.01 U/L in healthy control subjects, 18.7 ± 5.9 U/L in all patients, 19.20±6.06 U/L in uncontrolled diabetic patients and 18.23±5.87 U/L in controlled diabetic patients as shown in Table 2,3. ALT level showed significant increase (P<0.05) in patients when compared to healthy control subjects (Table2). There was no statistical difference (P>0.05) in ALT level when controlled diabetic patients compared to uncontrolled diabetic patients (Table3).

The mean± SD value of AST level was 16.8 ± 5.6 U/L in healthy control subjects, 23.7 ± 8.11 U/L in all patients, 20.88±5.34 U/L in uncontrolled diabetic patients and 26.76±9.52 U/L in controlled diabetic patients as shown in Table 2,3. AST level showed significant increase (P<0.05) in patients when compared to healthy control subjects (Table2) and significantly higher (P<0.05) in controlled diabetic patients compared to uncontrolled diabetic patients (Table3).

The mean± SD value of GGT level was 24.6 ± 6.14 U/L in healthy control subjects, 34.9 ± 8.03 U/L in all patients, 33.05±7.87 U/L in uncontrolled diabetic patients and 37.00±7.92 U/L in controlled diabetic patients as shown in Table 2,3 GGT level showed significant increase (P<0.05) in patients when compared to healthy control subjects (Table2). There was no statistical difference (P>0.05) in GGT level when controlled diabetic patients compared to uncontrolled diabetic patients (Table3).

The mean± SD value of Total protein level was 6.91 ± 0.84 g/dl in healthy control subjects, 6.67 ± 0.70 g/dl in all patients, 6.611±0.75 g/dl in uncontrolled diabetic patients and 6.735±0.66 g/dl in controlled diabetic patients as shown in Table 2,3. The statistically non-significant results was observed (P>0.05) when patients compared to healthy control subjects (Table2) or controlled diabetic patients compared to uncontrolled diabetic patients (Table3).

The mean± SD value of Albumin level was 4.10 ± 0.43 g/dl in healthy control subjects, 3.85 ± 0.97 g/dl in all patients, 3.616±0.91 g/dl in uncontrolled

diabetic patients and 4.105±0.99 g/dl in controlled diabetic patients as shown in Table 2,3. The statistically non-significant results was observed (P>0.05) when patients compared to healthy control subjects (Table2) or controlled diabetic patients compared to uncontrolled diabetic patients (Table3).

The mean± SD value of Fasting blood glucose level was 89.23 ± 6.8 mg/dl in healthy control subjects, 152.9 ± 69.4 mg/dl in all patients, 192.5±68.94 mg/dl in uncontrolled diabetic patients and 111.0±39.66 mg/dl in controlled diabetic patients as shown in Table 2, 3. FBG level showed significant increase (P<0.05) in patients when compared to healthy control subjects (Table2) and significantly higher (P<0.05) in uncontrolled diabetic patients compared to controlled diabetic patients (Table3).

Table 2: shows the Mean values of the biochemical parameters in diabetic patients and control group.

Parameters	Patients	Control	P. Value
ALT U/L	18.7 ± 5.9	14.2 ± 4.01	0.000
AST U/L	23.7 ± 8.11	16.8 ± 5.6	0.000
GGT U/L	34.9 ± 8.03	24.6 ± 6.14	0.000
Protein g/dl	6.67 ± 0.70	6.91 ± 0.84	0.202
Albumin g/dl	3.85 ± 0.97	4.10 ± 0.43	0.179
FBG mg/dl	152.9 ± 69.4	89.23 ± 6.8	0.000

Table 3: Shows the mean values of the biochemical parameters in controlled and uncontrolled diabetic patients.

Parameters	Controlled	Uncontrolled	P. Value
ALT U/L	18.23±5.87	19.20±6.06	0.629
AST U/L	26.76±9.52	20.88±5.34	0.030
GGT U/L	37.00±7.92	33.05±7.87	0.149
T.Protein g/dl	6.735±0.66	6.611±0.75	0.609
Albumin g/dl	4.105±0.99	3.616±0.91	0.140
FBG mg/dl	111.0±39.66	192.5±68.94	0.000

DISCUSSION

The type 2 diabetes patients have been reported to be associated with higher incidence of abnormal liver function tests compared to the individuals without diabetes, elevated ALT being the most common abnormality [12].

The result showed that ALT, AST and GGT were significantly higher in patients when compared with control group (P<0.05). No statistically significant difference (P>0.05) was observed in total protein and albumin in patients compared with control group. None statistically significant results was observed (P>0.05) in LFTs between controlled and uncontrolled diabetic patients, except AST which is significantly elevated in controlled diabetic patients. All mean values of ALT, AST, GGT, Total protein and Albumin were within the normal range.

A study done in Sudan by Idris et al, 2011, reported that ALT, AST and GGT were significantly higher in type 2 diabetes patients (P<0.001).Total protein and albumin concentrations in patients were lower compared to control group (P<0.01). However, the mean values were within the normal range [4] which is agreed with our results.

Another study done in Myanmar by Han Ni *et al.;* 2012, found the means of ALT, AST and GGT were within normal range among 81 diabetes patients. Raised ALT and AST were noted in 18.5% and 14.8% respectively [5] which is in agreement with our findings.

All LFT measurements of type 2 diabetes patients were significantly increased when compared with control group but still within the normal range which was observed in study done in Sudan by Hind M. Elmahi *et al.;* 2014 [6] which also supportive findings for us.

CONCLUSION

Based on the findings of this study, type 2 diabetic patients' ALT, AST and GGT values were significantly higher than that of controls'. LFTs should be evaluated in patients with type 2 DM to monitor any liver function abnormalities.More studies are needed to ensure this association.

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