Study of Liver function Tests in Diabetes Type-2 patients in Ramadi City, Iraq

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Abstract

Diabetes mellitus is a group of metabolic disorders and major diverse disease around the world. Unusual liver function tests are often observed in patients with diabetes mellitus, and are associated with severe complications. This study was conducted in the Al-Ramadi Teaching hospital between June 2017 and June 2018, with the participation of 100 type-2 diabetic patients and 100 age-matched healthy subjects in order to detect the liver function test abnormality in type-2 diabetic patients. Parameters like serum albumin, serum total bilirubin, alkaline phosphatase (ALP), serum aspartate aminotransferase (AST) and serum alanine aminotransferase (ALT) were used. The results showed that liver function test parameters including ALP, AST, and ALT were significantly elevated in type-2 diabetic patients when compared to healthy subjects (p < 0.001), serum albumin was significantly lower in type-2 diabetic patients (p < 0.001), while serum bilirubin was not significantly different between the two groups (p value was 0.917). Despite the differences were statically significant, the means of all the parameters in this study were within the normal range. 46% of the patients had at least one or more abnormal liver function test.

Key words: Liver function tests, Diabetes mellitus, Serum albumin, Alkaline phosphatase (ALP)

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Introduction

Diabetes mellitus (DM) refers to a group of metabolic disorders characterized by hyperglycemia plus disorder in carbohydrate, lipid, and protein metabolism due to defects in insulin secretion, insulin action or both (1). In Iraq, it has been reported that the number of cases of diabetes to be estimated about 3.5 million in 2013. The total number of diabetics is expected to increase from 171 million in 2000 to 366 million in 2030 (2). Type-2 diabetes is present in the scope of 85-95% of all diabetic cases within high-income countries (3). Most patients with diabetes are prone to increase risk of nephropathy, neuropathy, retinopathy, heart disease and stroke; however only a few understand that their diabetes is also raising their risk of having both liver diseases and liver cancer. The liver is a vital organ in metabolism plays a central and critical role in regulation of carbohydrates metabolism and maintaining glucose homeostasis, it has the ability to store glucose as glycogen and to synthesize glucose from non-carbohydrate sources this role makes the liver more sensitive to disease in subject with metabolic disease like DM (4). In hyperglycemia, intracellular glycogen accumulates in hepatocytes in response to increase glycogen synthesis. This cause an injury where there is a mild increase in aminotransferase (5). Liver related diseases recognized in diabetes include elevated aminotransferase, fatty liver diseases, cirrhosis, liver carcinoma and liver failure (6). Several studies from around the world indicate altered liver biochemical findings in diabetic patients but such studies from Iraqi people are rare so the aim of this study is to examine and compare various liver parameters between type 2 diabetic patients and non diabetic subjects attending the Al-Ramadi teaching hospital in the city of Ramadi, Iraq.
Materials and Methods:
A prospective study was performed on 100 T2DM patients and 100 aged- matched healthy subjects visiting Al-Ramadi Teaching Hospital from June 2017 to June 2018. Demographic parameters such as age, height, weight and body mass index (BMI) were recorded for all the patients.

Inclusion criteria: Patients with confirmed T2DM diagnosed as per the criteria set by American Diabetes Association (ADA) in 2016. Fasting plasma glucose (FPG) ≥ 126 mg/dl, or random or two hour post prandial plasma glucose (PPG) of ≥ 200 mg/dl were included in the present study.

Exclusion Criteria: People who were confirmed to have hepatitis B and C virus illness (HBsAg positive plus HCV antibody positive) were eliminated from this study. The diabetic in the midst of the past of alcohol drinking, hepatotoxic medication, anti-tuberculoses medication, not willing to participate in study, having liver and/or biliary diseases and pregnant females with gestational diabetes were also excluded.

Blood collection: Ten ml of venous blood were taken from every diabetic and healthy subjects via a disposable plastic syringe. The blood was teeming in a test tube and after that centrifuged following it clotted. The serum was reserved at -40°C in the refrigerator until applied. Fasting blood sugar (FBS) and parameters deciding liver function such us serum albumin, Total bilirubin, serum alkaline phosphatase (ALP), serum aspartate aminotransferase (AST) and serum alanine aminotransferase (ALT) were estimated by a multi chemical fully automated chemistry analyzer using different reagent kits from Randox (France).

Statistics: Mean and standard deviations were calculated. All the statistical analysis was performed using SPSS ver. 20.0. Student’s t-test was used to analyze the differences parameters between both groups. P value <0.001 was considered as significant.

Result: The study includes 200 participated subjects aged 40-65 years in the AL-Ramadi Teaching Hospital. Of whom 108 were male and 92 were female. The mean age of the participants was 56±12. The number of type 2 diabetic patients and that of the control group was 100 people.

The results showed an increased level of ALT (15%), AST (13%), ALP (9%), total bilirubin (3%) and decreased level of albumin (6%) in the diabetic population (Table 1).

Table 1: Mean value of biochemical variables among Diabetic group (N=100)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Means±SD</th>
<th>NO. of patients outside the normal range (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALT (IU/L)</td>
<td>29.82 ± 4.03</td>
<td>15</td>
</tr>
<tr>
<td>AST (IU/L)</td>
<td>24.54 ± 2.3</td>
<td>13</td>
</tr>
<tr>
<td>ALP (IU/L)</td>
<td>74.54 ± 3.21</td>
<td>9</td>
</tr>
<tr>
<td>Albumin (gm%)</td>
<td>40.61 ± 0.62</td>
<td>6</td>
</tr>
<tr>
<td>TB(mg/dl)</td>
<td>0.892 ± 0.042</td>
<td>3</td>
</tr>
</tbody>
</table>

ALT, AST and ALP were significantly higher in diabetic population when compared to control (p<0.001). Whereas albumin was significantly decreased in diabetic patients (p<0.001). However, no significant difference in bilirubin level was observed between the two groups (p<0.917) (Table 2 and Figures 1-5).
Table 2: Comparison of liver function tests between diabetics and controls (N=200)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Control</th>
<th>Patients</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>FBS (mg/dl)</td>
<td>83.140 ± 0.847</td>
<td>249.30 ± 7.270</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>ALT (IU/L)</td>
<td>18.8 ± 2.5</td>
<td>29.82 ± 4.03</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>AST (IU/L)</td>
<td>17.4 ± 3.4</td>
<td>24.54 ± 2.3</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>ALP (IU/L)</td>
<td>50.43 ± 3.42</td>
<td>74.54 ± 3.21</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Albumin (gm%)</td>
<td>45.01 ± 0.887</td>
<td>40.61 ± 0.62</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>TB (mg/dl)</td>
<td>0.892 ± 0.042</td>
<td>0.742 ± 0.035</td>
<td>0.917</td>
</tr>
<tr>
<td>BMI</td>
<td>28.4± 0.322</td>
<td>28.64± 0.72</td>
<td>0.833</td>
</tr>
</tbody>
</table>

Figure 1: Comparison of ALT in diabetic Patients and controls

Figure 2: Comparison of AST in diabetic Patients and controls

Figure 3: Comparison of ALP in diabetic Patients and controls

Figure 4: Comparison of albumin in diabetic Patients and controls

Discussion: many studies around the globe show liver function abnormalities in individuals with type 2 diabetes mellitus (7,8,9,10). Bora et al in the district of Punjab in India deliberate the LFTs of 320 diabetic patients where 71.25% persons had a defect within at least one LFT, 46.8% had elevated ALT and 48.5% had elevated ALP levels(1). A Study conducted by Ghimire et al. in Nepal (11) reported a high prevalence of LFTs abnormalities of about 62.3% in 162 type 2 diabetic patients 57%, 46% and 7% for ALT, AST and ALP respectively. The present study showed that 46% of diabetic patients have at least one abnormal liver function test, 15% have increased ALT, 13% have increased AST and 9% have increased ALP. Similarly, study conducted by Idris et al from Sudan(12) wherever 50 diabetic patients plus 30 usual control persons were examined for their liver function, reported high prevalence of LFTs abnormalities of about 12% for ALT and AST. Ni et al.(13) performed a study on 81 type 2 diabetic patients in Malaysia reported that about 18%, 12% and 5% have abnormal liver function tests in ALT, AST and ALP respectively. Wang et al. (14) conducted a study on 571 Type 2 diabetic cases and 571 matched controls, the study reported that ALT was significantly associated with increased risk of type 2 diabetes in Chinese population. The cause of the elevation of these enzymes could be due to potent hepatotoxic effect of fatty acids on the hepatocytes as they are formed in excess amount as a result of chronic and relative insulin resistance(15). Mechanisms for this may include aggregation of free fatty acids, cell membrane disturbance at high concentration, mitochondrial dysfunction, toxin formation and oxidative stress which initiate an increase in proinflammatory cytokines such as Tissue Necrotic Factor (16). The present study data showed a statistically significant increase in ALT, AST and ALP with a significant decrease in albumin in diabetic group with the control (p≤ 0.001). Idris et al. also noticed a significant decrease in albumin level compared with the control (12). Blood plasma proteins are the first to acquire modified as they are directly exposed to elevated glucose concentration. Serum albumin is one of most abundant plasma proteins and is greatly glycated in diabetes(17), in diabetes albumin synthesis and secretion is decreased due to insulin deficiency, insulin has effect on the synthesis average of albumin in liver (18). In vivo in rats hepatocytes cultures insulin enlarged albumin gene transcription and mRNA synthesis within a dose-dependent way (19). On the other hand, plasma albumin concentration has been noticed to be inversely concerning with glycosylated haemoglobin (HbA1c) levels revealing a great proportion of weakly controlled diabetes in patients with lower plasma albumin concentrations (20). There is no significant difference in the bilirubin levels in type 2 diabetics and control participants in this study (p value was 0.917). This result was supported by a study done by Gohel et al. in Gujarat (21) on a total of 200 patients which also shows that there is no significant difference in bilirubin in diabetes and non-diabetics with p-value 0.7564, While it is not agree with the study of Luxmi et al (22) which shows that the value of total bilirubin concentration was significantly lower in contrast to that of the control group (p value 0.001).

Conclusion: Derangements in liver function are broadly concurrent with type-2 diabetes in Ramadi. Screening for liver dysfunction in diabetes is required for preventing further complications associated with liver.

References: