Comparative Study of Renal Function Tests and Liver function Tests in Type2 Diabetes Mellitus
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Abstract:
Introduction: diabetes is a metabolic disorder characterized by increased levels of blood glucose due to impairment in insulin action and/or insulin secretion. Liver is more susceptible to diseases as Liver plays a major role in the regulation of carbohydrate metabolism. Materials and methods: the study comprises of 100 subjects, out of whom 50 were diabetic cases and 50 non-diabetic control subjects. The subjects were those attending outdoor and indoor in New Medical College Hospital Kota, Rajasthan, India. Renal function test and Liver function test were estimated by various methods mentioned above on fully automatic analyzer. Quantitative data was summarized in the form of mean ± sd and differences in means of both the groups were analyzed by unpaired student’s t test using graph pad prism. P-value less than 0.05 were considered significant. Results: The mean activity of serum bilirubin, serum AST, serum ALT and serum ALP of diabetic patients shows significant difference from that of normal subjects. While Renal function of diabetic patients were at upper limit that of non-diabetic controls. Conclusion: the outcome of the present study shows that both liver and renal functions have altered level in diabetic patients than controls. In contrast to renal function, liver function shows visible disturbance. Thus screening for liver dysfunction along with renal function test in diabetics and subsequent workup may lead to early detection of co-morbidities and better management of diabetes.

Keywords: Renal Function; Liver function; LFT; RFT; AST; ALT; alkaline phosphatase; Urea; Creatinine; Diabetes Mellitus; NMCH; Kota.

I. INTRODUCTION

Diabetes mellitus (DM) is a metabolic disorder characterized by increased levels of blood glucose due to insulin resistance. It proceeds with long-term damage dysfunction and failure of various organs, especially the kidneys, liver, heart, nerves, eyes and blood vessels¹. The liver plays a main role of the regulation of carbohydrate metabolism, as it has the capability to uses glucose as a fuel and store as glycogen and also synthesizes glucose from non-carbohydrate sources. This makes the liver more susceptible to diseases. Liver function tests (LFTs) include the serum aminotransferases, bilirubin, alkaline phosphatase and albumin.

Aminotransferases such as Aspartate aminotransferase (AST) and Alanine aminotransferase (ALT) are measure the concentration of intracellular hepatocellular enzyme that have leaked into the circulation and serve as amarker of hepatocellular injury². In United States,Erbeyet al.³ were studied the increased level of ALT enzyme among type 2 diabetes was about 7.8% compared with 3.8% in those without diabetes. The metabolic disease has been seen with many diseases such as endothelial dysfunction, kidney disease and oxidative stress³.

Plasma ceratinine and urea are established markers of Glomerular filtration rate (GFR), While the lower serum creatinine is associated with high risk of type2 diabetes, which might reflect a lower volume of skeletal muscle⁴. Skeletal muscle is a major target tissue of insulin and a lower volume of it would mean fewer target sites for insulin which causes elevated in insulin resistance and leads to the progression of type2 diabetes⁴. Individuals with type 2 diabetes have a higher incidence of liver function test abnormalities than individuals who do not have diabetes. Mild chronic elevations of transaminases often reflect underlying insulin resistance.

II. AIMS AND OBJECTIVES

We aimed meta-analysis of data to
1) To study the derangements of liver function test (LFT) and Renal function test (RFT) in Diabetes cases
2) To compare the differences in LFT and RFT in diabetic cases and non-diabetics controls.
3) To find out relation in LFT and RFT in diabetic cases and non-diabetics controls.

III. MATERIALS AND METHODS

This study was carried out in the New Medical College Hospital Kota, Rajasthan, India. Fifty patients with known history of diabetes for past 2 years were included in study as cases, another fifty age matched non-diabetic healthy included as controls. Patients of known case of alcoholism, HIV infection, patients having chronic liver disease or using hepatotoxic drugs, cor-pumonale or congestive cardiac failure patients having proteinuria and pregnant women were excluded from study. Sample taken from all of the subjects. Serum separated after centrifuge and analyzed for LFT including AST, ALT, Bilirubin total and direct; and serum renal function tests (Urea and creatinine) levels. All samples were analyzed for LFT and RFT on ERBA EM-360 auto analyzer based on wet chemistry principle.

Statistical analysis: Quantitative data was summarized in the form of MEAN ± SD and differences in means of both the
groups were analyzed by unpaired student’s t-test using graph pad prism. P-value less than 0.05 were considered Significant.

IV. OBSERVATION AND RESULT

Table.1. The Comparison between levels of LFT and RFT

<table>
<thead>
<tr>
<th></th>
<th>AGE (Yrs)</th>
<th>GLU (mg/dl)</th>
<th>BIL T (mg/dl)</th>
<th>BIL D (mg/dl)</th>
<th>SGOT (U/L)</th>
<th>SGPT (U/L)</th>
<th>ALP (U/L)</th>
<th>PRO T (Gm/dl)</th>
<th>ALB (Gm/dl)</th>
<th>UREA (mg/dl)</th>
<th>CREAT. (mg/dl)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CASE</td>
<td>52.54</td>
<td>151.32</td>
<td>1.74</td>
<td>0.474</td>
<td>49.38</td>
<td>62.56</td>
<td>134.32</td>
<td>6.18</td>
<td>3.37</td>
<td>35.46</td>
<td>0.9</td>
</tr>
<tr>
<td>CONTROL</td>
<td>51.66</td>
<td>97.46</td>
<td>0.4</td>
<td>0.134</td>
<td>24.46</td>
<td>24.2</td>
<td>79.12</td>
<td>6.398</td>
<td>3.75</td>
<td>20.26</td>
<td>0.802</td>
</tr>
<tr>
<td>p-value</td>
<td>0.735</td>
<td>0.0001</td>
<td>0.0001</td>
<td>0.0001</td>
<td>0.0003</td>
<td>0.0001</td>
<td>0.1174</td>
<td>0.0002</td>
<td>0.001</td>
<td>0.031</td>
<td></td>
</tr>
</tbody>
</table>

The result shows that liver functions are elevated in diabetic cases (except albumin & protein). The levels of urea and creatinine in diabetes were also at higher side, which indicate that there is strong relationship between blood sugar level and urea level because hyperglycemia is one of the major cause of progressive renal damage and an increase in urea level is seen when there is damage in the kidney or the kidney is not functioning properly7.

Table.2. The Comparative levels of LFT and RFT in form of ratios.

<table>
<thead>
<tr>
<th></th>
<th>CREATININE (mg/dl)</th>
<th>ALB (Gm/dl)</th>
<th>BIL T (mg/dl)</th>
<th>UREA (mg/dl)</th>
<th>ALB/CREAT RATIO</th>
<th>BIL/CREAT RATIO</th>
<th>T/CREAT RATIO</th>
</tr>
</thead>
<tbody>
<tr>
<td>CASE</td>
<td>0.9</td>
<td>3.37</td>
<td>1.74</td>
<td>35.46</td>
<td>3.744</td>
<td>1.933</td>
<td>39.4</td>
</tr>
<tr>
<td>CONTROL</td>
<td>0.802</td>
<td>3.75</td>
<td>0.4</td>
<td>20.26</td>
<td>4.6875</td>
<td>0.5</td>
<td>25.325</td>
</tr>
</tbody>
</table>

Table.3. serum AST, ALT and AST/ALT ratio

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>AST (U/L)</th>
<th>ALT (U/L)</th>
<th>AST/ALT RATIO</th>
</tr>
</thead>
<tbody>
<tr>
<td>CASE</td>
<td>49.38</td>
<td>62.56</td>
<td>0.789322251</td>
</tr>
<tr>
<td>CONTROL</td>
<td>24.46</td>
<td>24.2</td>
<td>1.010743802</td>
</tr>
</tbody>
</table>

Figure.1. The Comparison between levels of LFT and RFT

Figure.2. Serum albumin, creatinine, and albumin/creatinine ratio
As shown above when comparing albumin or creatinine alone it doesn’t give clear idea of comparison but in albumin/creatinine ratio it is grossly visible the difference between diabetic cases and non-diabetic controls. The similar findings we observed when applied the idea of ratio presentation in bilirubin vs. creatinine, urea vs. creatinine.

Figure 3. serum bilirubin total, creatinine and bilirubine total/creatinine ratio

Figure 4. Serum urea, creatinine and urea/creatinine ratio

Figure 5. Serum AST, ALT and AST/ALT ratio
As shown in above figure our findings in study stat that albumin/creatinine ratio and AST/ALT ratio is lower in diabetic case in compare to non-diabetic controls; whereas bilirubine total/creatinine ratio is higher in diabetics.

V. DISCUSSION & CONCLUSION

In our study, we found gross difference in serum bilirubin level (1.74 compare to 0.4 of controls P<0.05). Though the diabetic patient were hepatic asymptomatic. Like bilirubin level of two groups if we compare the ALT, AST and alkaline phosphatase levels of the two patients, the distributions of ALT, AST, and alkaline phosphatase show similar significant difference. In all samples the average levels were greater in ‘diabetic’ group. The results of this study are in accordance with previously reported high prevalence rates of Altered Liver Enzymes in patients with type 2 diabetes mellitus in other populations. Raised ALT and AST are more common among the diabetes patients as compared to controls. Abnormal liver function tests among diabetes patients can be indicator of associated non alcoholic fatty liver disease (NAFLD). There has been a direct correlation between blood glucose and elevated liver enzymes, in accordance with previously reported high prevalence rates of Altered Liver Enzymes in patients with type 2 diabetes mellitus. These findings lend support to the practice of routine liver function monitoring in subjects with type 2 diabetes mellitus. Therefore, if LFT screening is to be adopted, it would be incumbent on the physician to ensure that abnormal findings are appropriately investigated, or that the patient be timorously referred to a tertiary institution with the necessary facilities. Though urine albumin/creatinine ratio is being used for microalbuminuria; author also recommend serum albumin/creatinine ratio to discriminate risk of diabetic complications.

VI. CONCLUSION

The higher levels of bilirubin and ALT and lower AST/ALT ratio are independent additive risk factors of T2DM. The serum bilirubin/creatinine ratio and urea/creatinine ratio are independent markers for T2DM. The individuals with diabetes mellitus have higher incidence abnormalities for renal and liver function than individuals who do not have diabetes. Although there are currently no consensus guidelines or recommendations regarding LFT screening in patients with type 2 diabetes mellitus, these findings lend support to the practice of routine liver function monitoring in subjects with type 2 diabetes mellitus. Therefore, if LFT screening is to be adopted, it would be incumbent on the physician to ensure that abnormal findings are appropriately investigated, or that the patient be timorously referred to a tertiary institution with the

VII. REFERENCES