

Original Research Article

Study of liver dysfunction in type 2 diabetic patients in private hospital in Cuddalore district

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Abstract

Introduction: Diabetes is a syndrome characterized by disordered metabolism, hyperglycaemia, resulting from low levels of insulin production by beta cells of pancreas. The liver plays a major role in the regulation of carbohydrate metabolism, as it uses glucose as a fuel, it has the capability to store glucose as glycogen and also synthesize glucose from non-carbohydrate source. This key function of liver makes it vulnerable to diseases in subjects with metabolic disorders, particularly diabetes.

Aim and objectives: The aim of this study was to find out the liver function test abnormalities in a group of diabetic patients and to determine the factors associated with these biochemical changes.

Materials and methods: A total of 30 patients of both sexes suffering from T2DM and 30 age and sex matched normal individuals were selected for the study. The patients with fasting plasma glucose ≥ 126 mg/dl on 2 occasions were included in the study. Patients with any concomitant diseases which can alter liver function and patient with hepatitis, alcoholic were excluded from the study. Basic Liver Function Parameters Are Estimated Using Standard Methods.

Results: The results of the present showed that the ALT, AST,PT and GGT levels in Type 2 Diabetic patients was increased significantly ($p < 0.01$) as compared to normal controls.

Conclusion: In conclusion, abnormal liver function results are more common among diabetes patients. Elevated liver enzyme markers are the markers for associated non-alcoholic fatty liver disease in diabetes patients. Testing for ALT and AST, should be carried out to screen underlying fatty liver, especially in male diabetes patients with high BMI.

Key words

Liver Function Tests, Diabetes Mellitus, Alanine Aminotransferase, Aspartate Aminotransferase, Management of DM.

Introduction

Diabetes mellitus is one of the major non-communicable diseases and the prevalence is rising globally. Type 2 diabetes is the most common form, accounting for 90% of all cases. The prevalence of diabetes worldwide was estimated to be 2.8% in 2000 and 4.4% in 2030. The total number of diabetes is projected to increase from 171 million in 2000 to 366 million in 2030 [1]. Diabetes is more prevalent in men than women. The impact of DM is found in both developed and developing countries, and a recent WHO report on diabetes prevalence alarmed that diabetes has posed a serious threat to developing countries with respect to their existing health care delivery service [2]. The liver plays a major role in the regulation of carbohydrate metabolism, as it uses glucose as a fuel, it has the capability to store glucose as glycogen and also synthesize glucose from non-carbohydrate source. This key function of liver makes it vulnerable to diseases in subjects with metabolic disorders, particularly diabetes [3]. Secondly, liver can be affected by steatosis or accumulation of fat, a condition known as non-alcoholic fatty liver disease (NAFLD). It is a well-recognized complication of diabetes with frequency of 40–70% [4]. Associated obesity is a confounding variable for fatty liver. Increased transport of fatty acids to the liver enhanced hepatic fat synthesis as well as decreased oxidation or removal of fat from the liver lead to fat accumulation in the liver [4]. The steatosis is either micro vesicular or macro vesicular and is found to progress to fibrosis and cirrhosis. The most common clinical finding is hepatomegaly, with normal or only mildly elevated transaminases and normal bilirubin. These changes are not reversible with sustained glucose control. This study attempts to clarify the effect of DM on the liver [5]. The study has been designed to compare liver functions in one group of patients with DM and the other group

representing normal control subjects without any liver disease.

Materials and methods

The Study Was Conducted at Private Clinic Setup in Cuddalore District Consecutive 30 patients with type2 DM and 30 apparently healthy people were enrolled in this study. The age of the subjects was more than >40 years. Patients of both sexes were included. The diagnosis of type 2 DM was done based on the WHO criteria. Patients with history of alcoholism and with the habit of using hepatotoxic drugs like acetaminophen, NSAIDS, methotrexate, amiodarone, bleomycin, tamoxifen, sodium valproate, metformin, and pioglitazone were excluded from this study. Patients taking insulin were also excluded from the study. Finally, patients with acute and chronic liver diseases were also not enrolled in this. All patients had a history of DM. serum levels of bilirubin, alanine aminotransferase (ALT), aspartate aminotransferase (AST), alkaline phosphatase (ALP), and Prothrombin time (PT) were measured .5 ml of venous blood was drawn from each volunteer in this study using a disposable plastic syringe. The sample was then analysed for serum bilirubin, alanine aminotransferase (ALT), aspartate aminotransferase (AST), alkaline phosphatase (ALP), γ glutamyl transferase (GGT), prothrombin time (PT) [6].

Statistical Analysis

The data collected during the current study were recorded and analysed statistically to determine the significance of different parameters by using SPSS package for windows version 18.0.

Results

Blood sugar levels were significantly higher in patients with DM than in control subjects the levels of serum bilirubin were significantly

higher in DM patients compared to normal subjects however, the mean value of both group was within the normal range. Similar trends about higher levels of ALT and AST were found

in type 2 DM patients compared to control subjects however, Prothrombin time of type 2 DM showed a higher value when compared with and controls (**Table – 1**).

Table - 1: Mean values of the biochemical parameters in diabetic patients and control group.

Parameters	Patients	Control	P value
ALT U/L*	33.30 ± 21.00	18.00 ± 1.11	0.001
AST U/L*	39.56 ± 1.07	25.27 ± 0.88	0.001
GGT U/L	28.76 ± 0.94	10.77 ± 0.50	0.001
Glucose mg/dl*	176.84 ± 10.97	91.4 ± 2.15	0.001
Prothrombin time	186.46 ± 2.78	14.23 ± 1.04	< 0.01

*Values represent Mean ± SE

Discussion

The study presented here has unmasked some important and relevant information about the impact of DM on the liver. The study was designed to assess the impact of type 2 DM on liver functions, and in fact, separate studies would be required to evaluate the impacts of other types of DM on the liver and its functions [7]. Several investigators have shown that DM is related to lifestyle-related pathological conditions and is associated with coronary disease and cerebral pathologies. Also, an association between non-alcoholic fatty liver diseases (NAFLD) and DM has been shown. Meltzer and Everhart (1997) previously noted a greater prevalence of abnormal alanine aminotransferase levels among Mexican Americans with diabetes (Meltzer and Everhart, 1997). And disagree with Erbey et al. (2000) of the total sample, 4.1% had elevated ALT, and 6.7% had type 2 diabetes. Of those with type 2 diabetes, the prevalence of elevated ALT was 7.8%, compared to 3.8% prevalence in those without diabetes [8]. The limitations of this analysis include its cross-sectional design. Thus, it is not possible to determine if diabetes preceded or followed the elevations in liver function tests levels, nor it is possible to determine whether, we observed chronic or transient elevations in liver function test levels, reducing bias in the ascertainment of diabetes and of abnormal liver function levels. Aminotransferase such as ALT and AST,

activities are sensitive indicators of liver cell injury and are helpful in recognizing hepatocellular diseases. Chronic mild elevation of liver enzymes is frequently found in Type-2 diabetic patients [9]. However, though all these reports suggest that the liver function is involved in the development of diabetes but no, study so far have been known to show which of these enzymes the best markers is for the development of. This study was conducted on 30 diabetic patients and 30 healthy persons. There was no significant difference between the age and sex of the subjects from the two groups [10]. Raised level of ALT was noted in 19.8% diabetic patients. These findings are consistent with the results obtained from several other studies by various researchers. According to Gonem et al., it was identified that the prevalence of ALT enzyme activity in diabetic patients (n = 959) was 15.7% (151).18 ALT catalyzes the reversible transamination between L-alanine and α -ketoglutarate to form pyruvate and L-glutamate as such having an important role in gluconeogenesis and amino acid metabolism. The reaction is reversible, but the equilibrium of the ALT reaction favours the formation of L-alanine. ALT enzyme activity is primarily found in liver but its activity although much lower. Another explanation might be up-regulation of ALT enzyme activity [11]. Non-alcoholic steatohepatitis is a leading cause of end-stage liver disease [12]. In our study fatty changes in the liver was seen in 57% patients, among whom

34% had mild fatty changes and 23% had moderate fatty changes. Thus, exploration of the degree of fatty changes in DM patients and proper management of these patients would restrict progression to several liver-related pathologies [13].

Conclusion

Taken together, this study has shown increased prevalence of abnormal liver functions in patients with type 2 DM compared to control subjects. Although this study is endowed with considerable limitation of small sample size and single-point assessment of liver functions, it may act as an eye opener. More studies of this nature should be conducted in developing countries to get proper insights into the involvement of liver in DM and also to determine the proper design of management of these patients.

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