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A cross sectional study of hepatic derangements in type 2 diabetes mellitus patients of a tertiary care teaching hospital in Karnataka

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Abstract
Introduction: Nonalcoholic fatty liver disease is one of the major cause for chronic liver disease globally. Type 2 diabetes is a thought to increase the risk of mortality in patients with NAFLD (Non Alcoholic Fatty Liver disease). Hence diagnosis of fatty liver is important in diabetes mellitus. The objective was to assess the proportion of patients with nonalcoholic fatty liver disease in diabetes and also to study the biochemical derangements in them.
Materials and Methods: A total of 200 diabetic patients were selected randomly from a tertiary care teaching hospital. Patients were examined and blood investigations were done on them after obtaining written informed consent and permission from ethical committee.
Results: 65% of the patients had nonalcoholic fatty liver disease. Patients with fatty liver disease had elevated total cholesterol, LDL levels, triglycerides and decreased HDL. The Mean SGOT/SGPT ratio was more than 1 in them. The mean BMI was also found to be higher when compared to those without fatty liver disease.
Conclusion: The proportion of patients with NAFLD in diabetes is higher and deranged lipid and hepatic parameters in diabetic patients may point to the diagnosis of NAFLD.

Keywords: NAFLD, NASH, Hepatic derangement, Lipid profile

Introduction
Type 2 Diabetes Mellitus (T2DM), characterised by hyperglycemia and dyslipidemia poses an enormous public health challenge because of its pandemic nature and also because of the direct and indirect cost incurred secondary to the disease [1]. The decline in life expectancy among the diabetics is not just because of the associated vascular complications and renal disease but may also be because of cirrhosis and hepatocellular carcinoma [2]. Recently, the term "Hepatogenous diabetes" has gained new interest among the clinicians and researchers [3].
The liver has a unique role in regulation of blood glucose. Insulin resistance in T2DM results in an increased gluconeogenesis by the liver and this becomes a major contributor to hyperglycemia and subsequent organ damage [4].
Hepatic derangements manifested as abnormal Alanine Amino Transferase (ALT), Aspartate Amino Transferase (AST), Alkaline Phosphatase (ALP) and Gamma Glutamyl Transpeptidase (GGT) along with cirrhosis of liver, fatty liver, hepatocellular carcinoma and acute liver failure are a common occurence in Type 2 Diabetes Mellitus [5, 6].
NAFLD represents a spectrum of diseases from simple fatty liver (steatosis) that occurs in people who drink little or no alcohol. Nearly 70-80% of T2DM patients have been reported to have hepatic fat accumulation referred to as NAFLD. Nonalcoholic fatty liver disease (NAFLD), a common cause for chronic liver disease, is thought to be a cause for insulin resistance and diabetes [7].
Thus, it is probable that the patients with diabetes have a high prevalence of liver disease and patients with liver disease have a high prevalence of diabetes [8].
The objective of the present study is thus to assess the proportion of nonalcoholic fatty liver disease in patients with Type 2 Diabetes Mellitus and also study the selected biochemical parameters and its derangements in them.

Materials and Methods
A hospital based cross sectional study was conducted among 200 patients with Type 2 Diabetes Mellitus selected randomly from a tertiary care teaching hospital in Dakshina Kannada district of Karnataka between January 2018 to January 2019 after obtaining institutional ethical clearance and written informed consent from the patients. Patients with history of alcohol consumption, history of jaundice or any form of hepatic disease in the past, history of intake of hepatotoxic drugs, history of major abdominal surgeries in the past, history of chronic renal failure and severe ischemic heart disease were excluded from the study.Patients will be subjected to an ultra sound examination to find out whether they have a fatty liver disease. Peripheral blood will also be collected from them to check for blood sugars, HbA1C SGOT, SGPT levels and Lipid profile.

Statistical Analysis
The data was entered in Microsoft Office Excel 2007 and SPSS version 21 was used for analysis. T test was used to find if there was a significant difference between two means and chi square test was used to find the statistical significance in categorical data.

Results
A total of 200 patients were studied of which 130 (65%) were males and 70 (35%) were females. Most of them

(48%), belonged to age group 55-60 years, followed by 23.5% in the 50–55 years category. 65% of the total patients had fatty liver disease. The mean age of the patients in those who had fatty liver disease was 53.39 whereas in those who did not have fatty liver disease, it was 52.94.There was no statistically significant difference in the duration of diabetes between the group which had fatty changes in the liver from those who did not have it. The mean BMI of those who had fatty liver changes was high when compared to those who did not have such change. This difference was also statistically significant.

Patients who had fatty liver changes had a high total cholesterol, high LDL and high triglycerides. This difference was statistically significant with p value less than 0.001. Mean HDL levels were low in those who had fatty changes. Among those 70 patients who had no fatty liver disease, all of them had a total cholesterol less than 250 mg/dl whereas 57.69% of the 130 people who had fatty liver disease had a cholesterol level more than 250 mg/dl. 93.07% and 87.69% of the total 130 patients who had fatty liver disease had triglyceride levels more than 160 mg/dl and LDL levels more than 140mg/dl respectively. 94.61% of those who had a fatty liver disease had HDL levels less than 45 mg/dl.

80.76% with fatty liver disease had SGOT/SGPT ratio more than 1.Mean SGOT/SGPT ratio was also significantly higher in the group with fatty liver changes. There was no significant difference in fasting blood sugars, post prandial blood sugars or HbA1C levels between the two groups.

Table 1: General characteristics of the patients

S No.	Characteristics	No. of patients with fatty liver disease	No. of patients without fatty liver disease	T value	P value
1	No. of Patients	130 (65%)	70(35%)	-	-
2	Mean Age of Patients	53.39 ± 7.56	52.94 ± 6.87	0.4143	0.6791
3	No. of Males	83 (41.5%)	47 (23.5%)		
4	No. of Females	47 (23.5%)	23 (11.5%)	-	0.641
5	Mean duration of Diabetes	8.13 ± 4.73	9.37 ± 5.16	1.7215	0.0884
6	Mean Height of patients	163.71 ± 10.56	165.73 ± 11.74	1.2403	0.2163
7	Mean Weight of patients	69.43 ± 10.53	66.11 ± 7.51	2.3361	0.0205*
8	Mean BMI of patients	26.18 ± 5.76	24.35 ± 2.53	2.5278	0.0123*

Table 2: Biochemical parameters of the study population

S No.	Characteristics	No. of patients with fatty liver disease	No. of patients without fatty liver disease	t value	p value
1	Mean Total Cholesterol Levels	225.29 ± 36.54	169.74 ± 18.35	11.925	<0.0001*
2	Mean Triglyceride Levels	216.40 ± 64.29	137.08 ± 32.33	9.6769	<0.0001*
3	Mean HDL Levels	35.76 ± 6.15	41.58 ± 5.92	6.4667	<0.0001*
4	Mean LDL Levels	160.76 ± 31.63	113.53 ± 14.92	11.796	<0.0001*
5	Mean SGOT/SGPT Ratio	1.23 ± 0.22	0.88 ± 0.13	12.2041	<0.0001*
6	Mean FBS Levels	194.18 ± 97.75	196.65 ± 121.10	0.1565	0.8758
7	Mean PPBS Levels	267.42 ± 99.59	262.64 ± 97.42	0.3262	0.7446
8	Mean HbA1C Levels	9.31 ± 1.74	9.64 ± 2.84	1.0178	0.3100

Discussion

The study was done to assess the proportion of nonalcoholic fatty liver disease in patients with Type 2 diabetes and also to study the biochemical derangements in these patients. It was found that the 65% of the patients with Type 2 diabetes had nonalcoholic fatty liver disease in the present study. The prevalence of NAFLD varies widely among the diabetics. Studies have shown that the prevalence may be upto 70% in patients with diabetes [9, 10]. The prevalence of biopsy proven NASH (Nonalcoholic steatohepatitis) in asymptomatic diabetics with normal liver function test was 20% [11].

Obesity and decreased physical activity have been implicated in the etiology of diabetes and these two factors are also thought to be increasing an individuals risk of developing NAFLD [12]. In a study where patients underwent elective abdominal surgery, BMI was found to be strongly correlating with NASH which was diagnosed by liver biopsy [13]. In another study, it was proved that intraabdominal fat was associated with NASH [14]. Thus there is a strong association between NAFLD and diabetes risk. It is documented that an individuals risk of developing diabetes is increased approximately five folds if they have NAFLD [12]. But whether Type 2 diabetes increases the risk of developing NAFLD is still less clear. NAFLD also increases the risk of cardiovascular events by 1.87 folds in patients with diabetes [15].

In the present study, the mean SGOT/SGPT in patients with diabetes and nonalcoholic fatty liver was 1.23 when compared to 0.88 in those without fatty liver. Similar findings were observed in a study done by Shivananda Pai *et al* [16] where the ratio was found to be more than 1. NAFLD is commonly characterised by an increase in transaminases of which ALT is thought to be associated with liver fat accumulation and is often used as a surrogate marker for NAFLD [17].

Elevated total cholesterol, LDL, Triglycerides, and decreased HDL was found in patients with fatty liver disease when compared to those without fatty liver in diabetes. Similar observation was made by Shivananda Pai *et al* [16]. Dyslipidemia is reported in 20-92% of patients with NAFLD [18]. The mean BMI was also found to be elevated in patients with fatty liver disease. According to a study done by Williamson *et al*. [19] BMI, HbA1C and triglycerides are independant predictors of NAFLD in diabetes. But in the present study, there was no difference in HbA1C levels between the two groups.

Conclusion

The proportion of patients with NAFLD is higher in patients with Type 2 diabetes mellitus. The chance of NAFLD was high when BMI was high. Deranged lipid profile parameters in diabetics were found to be highly associated with

NAFLD. SGOT/SGPT ratio more than 1 was associated with increased incidence of fatty liver.

Limitations

As all patients were selected from a tertiary care teaching hospital there could have been a selection bias. Liver biopsy is the gold standard technique for identifying hepatic steatosis but this was not performed in patients for diagnosis as it was a invasive procedure.

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