

Original Research Article


Prevalence of non-alcoholic fatty liver disease in type 2 diabetes mellitus patients in a tertiary care hospital of Bihar

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Abstract

Background: Macrovesicular fat accumulation in more than 5% of hepatocytes without significant alcohol consumption is the defining criteria of Non-alcoholic fatty liver disease (NAFLD). Non-alcoholic fatty liver disease is often associated with diabetes mellitus which is associated with a 60-70% of frequency of Non-alcoholic fatty liver disease. The prevalence of NAFLD among the Type 2 Diabetes mellitus (T2DM) patients is higher compared to non-diabetics. Type 2 Diabetes mellitus and Non-alcoholic fatty liver disease are common conditions that commonly co-exist and can act reciprocally to bring adverse outcomes.

Aim and objectives: The aim of this study was framed to determine the prevalence of Non-alcoholic fatty liver disease in Type 2 Diabetes mellitus patients and also to study the risk factors.

Material and methods: The present cross sectional, prospective study was conducted at Indira Gandhi Institute of Medical Sciences, Patna, a tertiary care hospital of Bihar, over a period of 5 months. A total of 140 patients with Type 2 Diabetes mellitus that satisfied inclusion criteria were included in the study. All patients included in the study were subjected to ultrasonography and relevant history, thorough clinical examinations and biochemical tests were performed and recorded.

Results: Out of 140 patients participated in the study, 44 (31.43%) were found to have Non-alcoholic fatty liver disease (NAFLD). The most common ultrasonographic grade of NAFLD was grade I (mild) fatty liver disease 30(21.43%), followed by grade II (moderate) fatty liver disease 13 (9.29%). The grade III (severe) fatty liver disease was found in 1 (0.71%) of the diabetic patients. NAFLD patients were compared with those with normal liver ultrasonographic findings. The risk factors of NAFLD

were also evaluated. The highest prevalence of NAFLD was recorded in the age group of 51-60 years and it was more prevalent among females than males.

Conclusion: An observation into the predisposing factors of Non-alcoholic fatty liver disease, revealed a higher prevalence of obesity, hypertension, hyperlipidemia, hyperglycemia and sedentary lifestyle in the subjects with NAFLD. Type 2 Diabetes mellitus patients having non-alcoholic fatty liver disease are at increased risk of developing progressive forms of the disease. The liver disorder constitutes another potential complication in T2DM patients that requires early and prompt intervention in the associated risk factors and prevents the emergence of chronicity of NAFLD.

Key words

Non-alcoholic fatty liver disease, Type 2 Diabetes mellitus, Prevalence.

Introduction

The term non-alcoholic fatty liver disease (NAFLD) is used to describe a wide spectrum of fatty changes in liver which ranges from simple steatosis to non-alcoholic steatohepatitis, cirrhosis and hepatocellular carcinoma in the absence of significant alcohol use (consumption of < 20 to 40 g of alcohol per day). The defining feature of non-alcoholic fatty liver disease is presence of accumulation of macrovesicular fat in more than 5% of hepatocytes in the absence of significant necroinflammation or fibrosis. Non-alcoholic fatty liver disease has emerged as the most common cause of chronic liver disease in western nations [1]. NAFLD, and specifically non-alcoholic steatohepatitis, is often associated with diabetes mellitus, which is associated with a 60% to 76% frequency of non-alcoholic fatty liver disease and a 22% frequency of non-alcoholic steatohepatitis [2, 3]. Non-alcoholic fatty liver disease is considered to be the hepatic manifestation of metabolic syndrome [4, 5]. The main features of metabolic syndrome such as the abdominal obesity, hypertriglyceridemia, low high density lipoprotein levels, hypertension and elevated plasma glucose are the predisposing factors for NAFLD [6]. Type 2 diabetes mellitus patients are at increased risk of developing NAFLD than non-diabetic subjects and obviously have higher risk of developing complications such as fibrosis and cirrhosis. The prevalence of NAFLD is rising in concert with rising rates of obesity and diabetes mellitus, with an estimated 33.8% of the population meeting

criteria for obesity and 10.6% for type 2 diabetes mellitus [7].

The association of microvascular and macrovascular complications of type 2 diabetes mellitus is well established, but association of type 2 diabetes mellitus with non-alcoholic fatty liver disease as a major concern has been recently recognised. Hence the present study was conducted to determine the prevalence of non-alcoholic fatty liver disease in type 2 diabetes mellitus subjects.

Materials and methods

The present cross sectional, prospective study was conducted at Indira Gandhi Institute of Medical Sciences, Patna, Bihar, India for a period of 5 months. The study included a total of 140 patients with type 2 diabetes mellitus in the age group of 20-70 years, attending medical outpatient clinic. The patients with history of alcohol consumption, chronic liver disease of any cause (hepatitis B or C, autoimmune hepatitis, hemochromatosis, Wilson's disease), type 1 diabetes mellitus, history of intake of hepatotoxic drugs, other hepatic diseases and refusal of the patient's to participate in the study were excluded from the present study. Demographic data like age, gender were obtained along with relevant history and recorded in predesigned and pretested proforma. A thorough clinical examination was performed and the findings were recorded. Anthropometric (waist circumference and body mass index) and metabolic parameters such as fasting blood

sugar, post prandial blood sugar, liver function test (serum bilirubin, serum glutamic oxaloacetic transaminase, serum glutamic pyruvic transaminase, serum alkaline phosphatase, serum total protein), serum uric acid, fasting lipid profile, blood urea and serum creatinine were measured. All patients participated in the present study underwent ultrasonography to detect any fatty changes in the liver, performed by single experienced radiologist to avoid inter-observer variation using a high resolution B-mode ultrasonographic system having an electric linear transducer mid frequency of 2-5 MHz. On the basis of ultrasonography, fatty liver was defined as the features consistent with bright liver of increased echogenicity with ultrasonographic contrast between hepatic and renal parenchymal vessel blurring and narrowing of the lumen of hepatic vein in the absence of features suggestive of chronic liver disease.

Classification of NAFLD on the basis of standard ultrasonographic criteria:

- Grade -I (Mild steatosis) slightly increased liver echogenicity with normal vessel and absence of Posterior attenuation.
- Grade - II (Moderate steatosis) moderate increase in liver echogenicity with partial

dimming of vessel and early posterior attenuation.

- Grade – III (severe steatosis) echogenicity of liver diffusely increased with absence of visible vessel and heavy posterior attenuation.

Results

Out of 140 patients participated in the study, 44 (31.43%) were found to have Non-alcoholic fatty liver disease (NAFLD). In the present study a total of 140 Type 2 diabetes mellitus patients were enrolled, 55 (39.29%) were males and 85 (60.71%) were females (**Table – 1**). The highest prevalence of NAFLD was recorded in the age group of 51-60 years and it was more prevalent among females than males. Out of 140 Type 2 diabetes mellitus patients 10 were aged < 40 years, 35 patients were aged between 41-50 years, 53 were aged between 51-60 years and 42 were in the age group of 61-70 years (**Table – 2**). The most common ultrasonographic grade of NAFLD was grade I (mild) fatty liver disease 30 (21.43 %), followed by grade II (moderate) fatty liver disease 13 (9.29%). The grade III (severe) fatty liver disease was found in 1 (0.71%) of the diabetic patients (**Table – 3**). NAFLD patients were compared with those with normal liver ultrasonographic findings. The risk factors of NAFLD were also evaluated.

Table – 1: Sex distribution of NAFLD in type 2 diabetes mellitus patients (N=140).

Sex	T2DM (%)	Fatty Liver (%)	Non fatty Liver (%)
Male	55 (39.29%)	17 (12.14%)	38 (27.14%)
Female	85 (60.71%)	27 (19.28%)	58 (41.43%)
Total	140	44 (31.43%)	96 (68.57%)

Table – 2: Age distribution of NAFLD in type 2 diabetes mellitus patients (N=140).

Age in years	T2DM Patients (%)	Fatty liver group (%)	Non fatty liver group (%)
<40	10 (7.14%)	3 (2.14%)	7 (5%)
41 – 50	35 (25%)	12 (8.57%)	23 (16.43%)
51 – 60	53 (37.86%)	19 (13.57%)	34 (24.29%)
61 – 70	42 (30%)	10 (7.14%)	32 (22.86%)
Total	140 (100%)	44 (31.43%)	96 (68.57%)

Table – 3: Distribution of fatty liver disease in type 2 diabetes mellitus patients.

USG Liver	Male (%)	Female (%)	Total (%)
Normal liver	38 (69.09%)	58 (68.24%)	96 (68.57%)
Fatty liver grade I	12 (21.81%)	18 (21.18%)	30 (21.43%)
Fatty liver grade II	5 (9.09%)	8 (9.41%)	13 (9.29%)
Fatty liver grade III	0 (0%)	1 (1.17%)	1 (0.71%)
Total	55	85	140

Table – 4: Comparison of demographic and laboratory variables in diabetic patients with and without fatty liver.

Parameters	Fatty liver group (n = 44) (Mean ± SD)	Non fatty liver group (n = 96) (Mean ± SD)	P value
FBS (mg/dl)	152.94 ± 60.63	117.58 ± 38.76	0.000
PP Blood sugar (mg/dl)	240.19 ± 91.27	180.26 ± 69.38	0.000
HbA1C	9.13 ± 8.54	6.94 ± 1.21	0.01
Body Mass Index (kg/m ²)	29.54 ± 2.67	28.71 ± 2.65	0.025
Waist circumference (cm)	101.63 ± 8.36	98.02 ± 7.89	0.001
Total cholesterol (mg/dl)	203.74 ± 27.18	183.49 ± 25.9	0.000
Triglyceride (mg/dl)	205.82 ± 50.29	159.95 ± 51.21	0.000
LDL (mg/dl)	125.43 ± 26.57	107.69 ± 25.79	0.000
HDL (mg/dl)	39.3 ± 24.3	34.1 ± 9.1	0.115
T ₂ DM (years)	3.88 ± 2.32	2.95 ± 1.76	0.001
ALT (IU/L)	25 ± 14.2	24 ± 14.0	0.709
AST (IU/L)	31 ± 14.4	29.5 ± 16.4	0.582

Various parameters observed in the present study were compared in the diabetic patients with and without fatty liver. The significant parameters of the diabetic patients with fatty liver were shown in the **Table - 4**. The variable shown in the table 4 shows a higher prevalence and significant association of fatty liver disease in diabetics, obese and dyslipidemic patients.

Discussion

Non-alcoholic fatty liver disease (NAFLD) is a common disorder that was less diagnosed earlier due to low index of suspicion, but now its prevalence has been increasing globally. Hepatic steatosis and steatohepatitis can occur in association with a numerous disease affecting the liver including hepatitis A, hepatitis B and C, autoimmune hepatitis, hypothyroidism and hemochromatosis, however, much of the increase in prevalence of NAFLD is driven by its pathophysiologic and epidemiologic connection to type 2 diabetes mellitus and obesity. NAFLD

and type 2 diabetes mellitus when exist together have poorer prognosis in terms of higher frequency of cirrhosis, morbidity and mortality [8]. The purpose of this cross sectional study is to report on prevalence of non-alcoholic fatty liver disease in type 2 diabetes mellitus in this part of country. In this study, the overall prevalence of T2DM patients, screened for the evidence of fatty liver by ultrasonography was 31.43%. Earlier studies reported that approximately 21-72% of patients with diabetes have NAFLD and around 10-75% of NAFLD patients reported to have type 2 diabetes mellitus [9]. In our study the prevalence rate of NAFLD was highest in the 51-60 years age group, subsequently followed by 41-50 years age group. The present study also discloses that prevalence of non-alcoholic fatty liver disease is higher in female patients (19.28%) with T2DM compared with male population (12.14%). The more number of female cases included in the study population may account for the female

predilection observed in this study. The mean ALT and AST levels were 25 ± 14.2 and 31 ± 14.4 respectively in NAFLD patients. There was no significant difference found in the levels of ALT and AST in our study. The body mass index in NAFLD patients was above normal (29.54 ± 2.67), compared to that of patients without fatty liver (28.71 ± 2.65). This was statistically significant with a p value of 0.025, making obesity an important association. Our study revealed triglyceride, total cholesterol and LDL level of (205.82 ± 50.29), (203.74 ± 27.18) and (125.43 ± 26.57) in patients with NAFLD and found to be significant as compared to patients without fatty liver. In our study the diagnosis of NAFLD was based on ultrasonography, which is by far the commonest way of diagnosing this liver disease in clinical practice. Radiologic imaging has a good threshold for diagnosing NAFLD [10]. This study substantiates the need of early diagnosis and further intervention of non-alcoholic fatty liver disease in patients with type 2 diabetes mellitus.

Conclusion

Non-alcoholic fatty liver disease is a common hepatic disorder, the prevalence of it in our study in type 2 diabetes mellitus patients was found to be 31.43%. NAFLD patients are at increased risk of developing cirrhosis, end stage liver failure and hepatocellular carcinoma, therefore early diagnosis of NAFLD patients and early institution of treatment is necessary. NAFLD is considered to be the hepatic manifestation of metabolic syndrome and the results from this study have established a prevalence pattern of non-alcoholic fatty liver disease in type 2 diabetes mellitus patients, drawing attention for the need of framing preventive strategies.

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