

## Prevalence of non- alcoholic fatty liver disease among type-2 diabetes mellitus patients – A cross-sectional hospital based study

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**Abstract:** *Background:* The prevalence of non-alcoholic fatty liver disease (NAFLD), has been estimated to be between 20% and 30% in the general population, but this value is much higher (approximately 70-80%) in type 2 diabetes patients, who are also at higher risk of developing advanced fibrosis and cirrhosis. As a result of epidemic increase in obesity, hyperlipidemia and diabetes mellitus patients, the prevalence of NAFLD in the general population is increasing. *Objective of the study:* The objective of this study was to determine the prevalence of NAFLD in type 2 diabetes mellitus patients. *Methods:* A cross sectional hospital based study was conducted on a total 1750 type - 2 diabetes mellitus patients attending Diabetes Centre, KLES Dr. Prabhakar Kore Hospital & Medical Research Centre, Belagavi. Patients with known chronic liver disease and history of alcohol intake were excluded. These patients were evaluated by abdominal ultrasonography to determine the presence of fatty liver. They were divided into fatty liver group and non fatty liver group; and were further evaluated by measurement of body mass index, HbA1c, liver function tests and lipid profile. The data obtained was analyzed using SPSS version 14.0. *Results:* Out of 1750 patients, screened for the presence of NAFLD, males were 1152 and females 598. Group A comprised NAFLD patients (10.51%) and Group B Non-NAFLD patients (7.02%). *Conclusion:* Our study showed that the NAFLD is an integral part of cluster of abnormalities such as dysglycemia, dyslipidemia, hypertension and obesity. Age and duration of diabetes are also important contributing factors in occurrence of NAFLD.

**Keywords:** Type-2 diabetes mellitus, Non-alcoholic fatty liver, Dyslipidemia, Dysglycaemia, Hypertension, Liver enzymes.

### Introduction

Non-alcoholic fatty liver disease (NAFLD) is the most common liver disease and the third leading indication for liver transplantation [1]. The prevalence of NAFLD has been reported to be 15-30% in the general population [1-2] and in type-2 diabetes mellitus population, the prevalence is 70-75% [3]. NAFLD has been proposed as one of the components of metabolic syndrome [4]. It has been found to be a composite of confirmed cases with central obesity, type -2 diabetes mellitus and dyslipidemia. Studies have shown the major role of obesity and insulin resistance in NAFLD [5]. However, regardless of body-mass index (BMI), the presence of type 2 diabetes mellitus significantly increases the risk and severity of NAFLD [6]. Only recently liver disease has been recognized as a major complication of type -2 diabetes mellitus with

increased mortality rates for cirrhosis greater than that for cardiovascular disease [7-8]. Insulin resistance plays a central pathogenetic role in both type 2 DM and NAFLD with the latter being considered as the hepatic manifestation of the metabolic syndrome [9].

*Objective of the study:* We conducted a study to determine the prevalence of NAFLD as diagnosed by ultrasound examination of the liver among type 2 diabetes mellitus patients.

### Research Design and Methods

A cross sectional hospital based study conducted on a total 1750 type-2 diabetes mellitus patients attending Diabetes Centre, KLES Dr. Prabhakar Kore Hospital & Medical Research Centre, Belagavi to determine prevalence of NAFLD among type-

2 diabetes mellitus patients. A total of 184 patients (Group A) with NAFLD were compared with 123 patients (Group B) with normal liver status. Cases with known hepatic disease, HBs antigen or Anti-HCV positivity, ingestion of hepatotoxic drug(s) were excluded. All patients had their informed consent signed with the study protocol approved by the ethics committee of the hospital. Detailed physical examination was carried out with emphasis on blood pressure, height, weight, and waist-hip ratio. Clinical investigations included fasting and 2-hour post-prandial blood glucose, HbA1c, blood urea, serum creatinine, lipid profile (total cholesterol, LDL, HDL, and triglycerides), liver function tests (LFT).

All patients underwent ultrasound (USG) of the abdomen to detect fatty changes in the liver, performed by a professional radiologist, using a high-resolution B-mode ultrasonography system. The scanning was done for an average of 20 minutes with the images recorded and photographed. Fatty liver was defined as the presence of an ultrasonography pattern consistent with “bright liver,” with evident ultrasonographic contrast between hepatic and renal parenchyma, vessel blurring, and narrowing of the lumen of the hepatic veins in the absence of findings suggestive of chronic liver disease [10-11]. NAFLD was defined as any degree of fatty liver in the absence of alcohol intake.

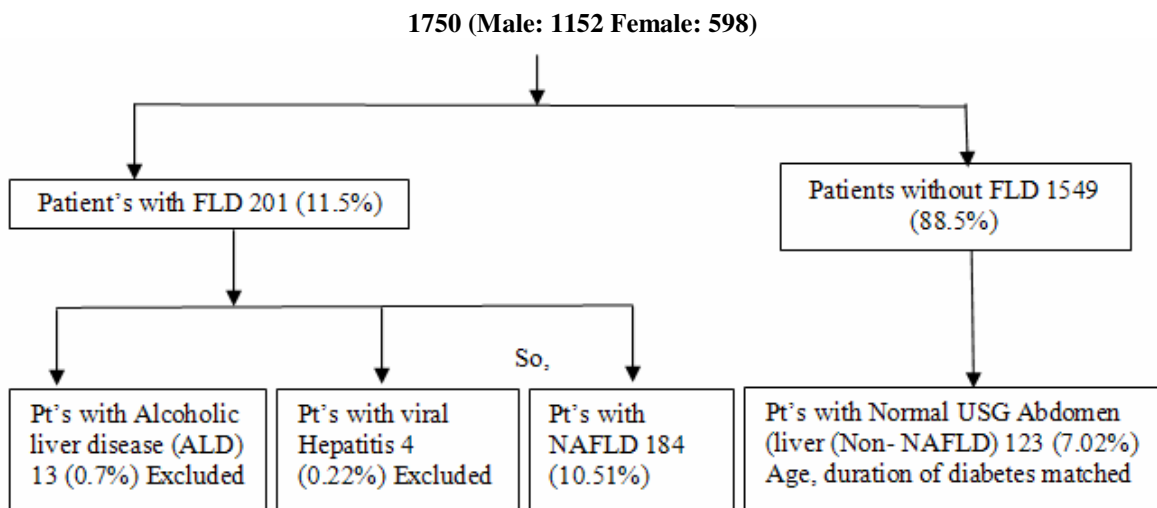
Obesity is defined if body mass index (BMI)  $\geq 25 \text{ kg/m}^2$  [12]. For given age, sex and body fat level Caucasians have higher BMI than Asians. It is generally recommended to consider Asians as obese if their BMI is  $\geq 25 \text{ kg/m}^2$ . Patients were considered centrally obese if the waist circumference was  $>80 \text{ cm}$  in females and  $>90 \text{ cm}$  in males [13]. Patients with one of the criteria: LDL-C  $>100 \text{ mg/dL}$ , total cholesterol  $>200 \text{ mg/dL}$ , triglycerides  $>150 \text{ mg/dL}$ , or HDL-C  $< 40 \text{ mg/dL}$  in males and  $<50 \text{ mg/dL}$  in females were considered to have dyslipidemia [14]. Metabolic syndrome was defined according to guidelines of IDF [13]. The diagnosis of hypertension was done when average systolic BP  $\geq 140 \text{ mm Hg}$ , or average diastolic BP  $\geq 90 \text{ mm Hg}$ , or use of antihypertensive medication was established [15].

*Data Analysis:* Data analysis was done by using SPSS statistical software package and p values  $< 0.05$  were considered significant.

**Results**

Out of the total 1750 patients screened for the presence of NAFLD, males were 1152 and females 598. Group-A comprised NAFLD patients (10.51%) and Group B Non-NAFLD patients (7.02%). Figure (1) flow chart shows the selection of study subjects.

**Figure-1:** Flowchart showing number of patients screened NAFLD with USG abdomen (liver)



NAFLD : (n=184; **10.51%**) Group “A”  
 Non-NAFLD : (n=123; **7.02%**) Group “B”

Table No 1, 2 and 3 show the prevalence of NAFLD to be 10.51% which increased with advancing age (38%) and longer duration of diabetes (49%). Results were statistically significant.

Sex	Group A	Group B	Total
Male	112 (51.6%)	105 (43.4%)	217
Female	72 (80%)	18 (20%)	90
Total	184 (10.51%)	123 (7.02%)	307

$X^2 = 21.347$ ;  $DF=1$ ;  $P=0.000$

Age group (yrs)	Group A	Group B	Total
30-40	27 (15)	49 (40)	76
41-50	39 (21)	36 (29)	75
51-60	48 (26)	34 (28)	82
≥ 61	70 (38)	04 (3.2)	74
Total	184	123	307

$X^2 = 57.909$ ;  $DF=3$ ;  $P=0.000$

Duration (Yrs)	Group A	Group B	Total
0 - 4	27 (15)	51 (41)	78
5 - < 9	66 (36)	48 (39)	114
≥ 9	91 (49)	24 (20)	115
Total	184	123	307

$X^2 = 38.668$ ;  $DF=2$ ;  $P=0.000$

Abnormalities	Group A (n=184)	Group B (n=123)	X <sup>2</sup>	P value
BMI (≥ 25kg/m <sup>2</sup> )	119 (65)	51 (41)	9.9	0.001
HTN (≥ 140/90 mm/Hg)	158 (86)	71 (58)	19.0	0.001
T. Cholesterol (≥ 200 mg/dl)	95 (52)	55 (45)	12.5	0.44
Triglycerides (≥ 150 mg/dl)	119 (67)	73 (59)	3.8	0.001
LDL (≥ 100 mg/dl)	108 (59)	67 (54)	6.5	0.001
HDL (≤ 40 mg/dl)	50 (27)	21 (17)	10.9	0.003
SGOT (≥ 35 IU/L)	55 (30)	10 (8)	0.8	0.039
SGPT (≥ 40 IU/L)	41 (22)	18 (15)	8.2	0.214

Table no 4 shows prevalence of individual abnormalities among the study groups. Prevalence of Obesity (65%), Hypertension (86%) and Mixed Dyslipidemia (Hypercholesterolemia- 52%, Hypertriglyceridemia- 67%, High LDL- 59% and Low HDL- 27%) were significantly higher among subjects with NAFLD-Group A. Results were statistically significant. Contrary finding was that abnormal aminotransferase levels were found in NAFLD subjects

### Discussion

Non-alcoholic fatty liver disease (NAFLD) represents a continuum of disease, characterized histologically by excessive accumulation of hepatic fat in the absence of significant alcohol consumption; with or without inflammation, varying degree of fibrosis, and cirrhosis. A number of studies have found a positive relationship between hyperinsulinaemia, abnormal glucose tolerance, and NAFLD. Mishra *et al* found the

prevalence of metabolic syndrome and NAFLD to be 24% and 14.8%, respectively, in non-alcoholic North Indian men [16]. In a study by Mohan *et al* the prevalence of NAFLD (54.5%) was significantly higher in patients with diabetes compared to those with pre-diabetes (IGT or IFG) (33%), isolated IGT (32.4%), isolated IFG (27.3%) and normal glucose tolerance (NGT) (22.5%) [17]. Also, the prevalence of most cardio-metabolic risk factors was significantly higher in NAFLD patients. Gupte *et al* found that mild, moderate, and severe NAFLD in 65.5%, 12.5%, and 9.35% of otherwise asymptomatic type 2 diabetics, respectively [18].

Prashanth *et al* found a high prevalence of NAFLD and NASH (Non-alcoholic steatohepatitis) in type 2 diabetics which increased with multiple components of the metabolic syndrome [19]. Banerjee *et al* observed that, on histology, only fatty change in 43%, NASH in 40% and more advanced disease in 23% of cases [20]. In our study, the prevalence of NAFLD, as detected by ultrasound, was 10.51% which was comparable with the prevalence found in other studies (Gupte *et al* [18] Prashanth *et al* [19] Banerjee *et al* [20]). Although initial studies emphasized that NAFLD occurred mostly in women, more recent studies have shown that NAFLD occurs with equal frequency in men [21-22], as is also seen in our study (males: females; 51.6%: 80%).

Obesity in particular central obesity has been described as one of the strongest risk factors for NAFLD and fibrosis, with NASH being prevalent in 18.5% of the obese patients [23]. The association of diabetes and obesity may pose an added risk. In a study among severely obese patients with diabetes, 100% were found to have at least mild steatosis, 15% steatohepatitis and 19% cirrhosis [24]. In our study, 65% patients were obese with NAFLD. Hypertension has also been reported frequently in patients with NAFLD [25-26] but it is not an independent risk factor as is also found in this study. In our study, 86% HTN patients had NAFLD.

Dyslipidemia has been reported in 20 to 92% of patients with NAFLD [27]. We found that

Hypercholesterolemia- 52%, Hypertriglycerdemia- 67%, High LDL- 59% and Low HDL- 27%) were significantly higher among subjects with NAFLD-Group A. In a hospital based study from North India Prashanth *et.al* [19] found almost similar findings.

Our study on liver enzymes showed that 30% had abnormal SGOT and 22% abnormal SGPT. It is evident that the level of liver enzymes will provide little diagnostic or prognostic value when assessing NAFLD patients. They appear to be insensitive markers for NAFLD. A limitation of our study is that the diagnosis of NAFLD was based on ultrasonography and was not confirmed by liver biopsy. Ultrasonography is by far the commonest method of diagnosing NAFLD in clinical practice and has very good sensitivity and specificity. The sensitivity and specificity of ultrasound for detecting hepatic steatosis varies from 60 to 94% and 88 to 95%, respectively [10]. Studies suggest that liver biopsy is seldom necessary to diagnose NAFLD [28-29].

### Conclusion

We need long-term follow-up studies from India on patients with NAFLD to understand the temporal evolution of NAFLD, metabolic syndrome and coronary artery disease in our population. Our study showed that the NAFLD is an integral part of cluster of abnormalities such as dysglycemia, dyslipidemia, hypertension and obesity. Age and duration of diabetes are also important contributing factors in occurrence of NAFLD. The clinical implication is that patients with NAFLD are at higher risk and should undergo periodic cardiovascular risk assessments.

### Acknowledgement

We thank Mr. M.D. Mallapur, Biostatistician of Jawaharlal Nehru Medical College Belagavi-Karnataka for his valuable comments and technical support. The co-operation and support of staff of Diabetes Centre and the Medical Records & Biostatistics division of the hospital is gratefully acknowledged.

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