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Frequency of Non-Alcoholic Fatty Liver Disease in Diabetic Patients

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ABSTRACT

Objective: To determine the frequency of non-alcoholic fatty liver disease in patients with newly diagnosed type 2 diabetes mellitus. **Study Design:** Cross-sectional study. **Place and Duration of Study:** Department of Medicine, PAF Hospital Mushaf, Sargodha, over six months from May 2024 to December 2024. **Methodology:** A total of 200 patients aged 45 to 70 years of either gender with newly diagnosed type 2 diabetes mellitus within the preceding six months were included through non-probability consecutive sampling. Patients with hypertension, chronic alcoholism, drug-induced fatty liver disease, or evidence of cardiovascular, pulmonary, renal, or hepatic disease were excluded. Diabetes was defined as glycated hemoglobin of 6.5% or more. Non-alcoholic fatty liver disease was diagnosed on abdominal ultrasonography and graded according to hepatic echogenicity. Data were analyzed using Statistical Package for the Social Sciences version 21. Quantitative variables were presented as mean ± standard deviation, whereas qualitative variables were expressed as frequency and percentage. Stratification was performed for age, gender, smoking, and obesity, followed by chi-square test, with $p < 0.05$ taken as statistically significant. **Results:** The mean age of the participants was 54.6 ± 7.2 years. Of the 200 patients, 118 (59.0%) were male and 82 (41.0%) were female. The overall prevalence of non-alcoholic fatty liver disease was 59.0%. Mild, moderate, and severe steatosis were observed in 26.0%, 20.0%, and 13.0% of patients, respectively. Age group ($p = 0.049$) and obesity ($p < 0.001$) showed significant association with non-alcoholic fatty liver disease, whereas gender ($p = 0.471$) and smoking status ($p = 0.374$) did not show statistically significant association. **Conclusion:** Non-alcoholic fatty liver disease was found in more than half of patients with newly diagnosed type 2 diabetes mellitus. Older age and obesity were significant determinants, indicating that early hepatic screening in diabetic patients may help identify a substantial burden of disease at an early stage.

INTRODUCTION

Non-alcoholic fatty liver disease (NAFLD) is considered the most common liver disease affecting almost 60% of the diabetic patients [1]. It represents a spectrum starting from fatty liver, inflammation and damage to hepatocytes and can progress to cirrhosis or in the most extreme form of hepatocellular carcinoma or liver failure [2,3]. Kim et al. (2008) showed that the lack of efficacy or adverse effects of treatments are probably contributing to the proportional global increase in metabolic diseases and NAFLD, making them a progressive pandemic, which poses an important health and economic burden and significantly affects health-related quality of life [4,5]. Primary NAFLD results from insulin resistance. Targher (2007) found that cardiovascular disease and liver injury associated with cirrhosis and its complications are two most important causes of death in NAFLD patients [6]. Non alcoholic fatty liver disease and type-2 diabetes mellitus are common conditions that regularly co-exist and can act synergistically to drive adverse outcomes. The presence of both NAFLD and T2DM increases the likelihood of development of complications of diabetes including both micro and macrovascular complications as well as augmenting the risk of more severe NAFLD, including cirrhosis, hepatocellular carcinoma and death [7,8]. The mainstay of NAFLD management is currently to reduce modifiable metabolic risk factors. Jeffery (2017) found that achieving good glycemic control and optimizing weight loss are pivotal to restricting disease progression [9,10].

The current study is designed to find frequency of NAFLD in patients with diabetes in our local population by taking cases from age of 45-70 years. Through current study, the exact frequency will be identified so that, in future, related therapeutic strategies can be opted. Moreover, many of the cases can be prevented if efforts are directed towards proper treatment of diabetes to prevent incidence of NAFLD in these patients through proper screening.

MATERIALS AND METHODS

This cross-sectional study was conducted in the Department of Medicine, PAF Hospital Mushaf, Sargodha, over a period of six months (from May 2024 to December 2024) after approval of the study. Prior approval from the relevant institutional authority was obtained before commencement of data collection, and written informed consent was obtained from the patients or, where required, from their attendants. Participants were recruited through a non-probability consecutive sampling technique. The sample size was 200 patients, calculated using the World Health Organization sample size calculator by assuming a 60% frequency of non-alcoholic fatty liver disease in diabetic patients, with a 95% confidence interval and an absolute precision of 7%. Patients aged 45 to 70 years of either gender were included if they were newly diagnosed cases of type 2 diabetes mellitus within the preceding six months. Patients were excluded if they had hypertension, chronic alcoholism, drug-induced fatty liver disease, or evidence of cardiovascular, pulmonary, renal, or hepatic disease. Drug-induced fatty liver disease included exposure to corticosteroids, salicylates, tricyclic antidepressants, tamoxifen, tetracyclines, amiodarone, and synthetic estrogens. Diabetes mellitus was operationally defined on the basis of glycosylated hemoglobin, and patients with glycated hemoglobin (HbA1c) levels of 6.5% or more were considered diabetic. Non-alcoholic fatty liver disease was diagnosed on abdominal ultrasonography according to liver echogenicity. Grade 0 was defined as average liver echogenicity with no evidence of steatosis. Grade 1 was defined as mild increase in liver echogenicity with normal visualization of the portal vein wall and diaphragm. Grade 2 was defined as moderate increase in liver echogenicity with reduced visualization of the portal vein wall and diaphragm. Grade 3 was defined as severe increase in liver echogenicity with near absence of visualization of the portal vein wall and diaphragm. According to the note on the provided document, grade 1 or higher was taken as NAFLD. After enrollment, baseline information including age, gender, and contact details was recorded on a structured proforma. Following basic clinical evaluation, abdominal ultrasonography was performed in all patients with diagnosed diabetes, and the study data were collected accordingly.

Data were entered and analyzed using Statistical Package for the Social Sciences version 21. Quantitative variables such as age were summarized as mean and standard deviation, whereas qualitative variables such as gender and NAFLD were presented as frequencies and percentages. To assess the effect modifiers, the data were stratified by gender, age, smoking status greater than two packs per day, and obesity defined as body mass index greater than 30 kg/m^2. Post-stratification, the chi-square test was applied, and a p-value of less than 0.05 was taken as statistically significant.

RESULTS

Two hundred patients with newly diagnosed T2DM were enrolled. The mean age was 54.6 ± 7.2 years, with 118 (59.0%) male and 82 (41.0%) female participants. The majority fell in the 55–70 year age bracket (53.0%). Obesity was documented in 88 patients (44.0%), and 48 patients (24.0%) were identified as heavy smokers. All participants met the diagnostic threshold of HbA1c ≥ 6.5% (Table 1).

Table 1

Demographic and Clinical Characteristics of the Study Participants (n = 200)

Variable	n (%)	Mean ± SD
Total Participants	200 (100%)	—
Age (years)	—	54.6 ± 7.2
45–54 years	94 (47.0%)	—
55–70 years	106 (53.0%)	—
Male	118 (59.0%)	—
Female	82 (41.0%)	—
Smokers (> 2 packs/day)	48 (24.0%)	—
Non-Smokers	152 (76.0%)	—
Obese (BMI > 30 kg/m^2)	88 (44.0%)	—
Non-Obese (BMI ≤ 30 kg/m^2)	112 (56.0%)	—

The overall prevalence of NAFLD was 59.0% (118/200). Grade 1, 2, and 3 steatosis accounted for 26.0%, 20.0%, and 13.0%, respectively. Moderate-to-severe disease (Grades 2–3) was present in 33.0% of the total study population, indicating a substantial burden of advanced hepatic steatosis among newly diagnosed diabetic patients, consistent with prevalence estimates reported across comparable clinical investigations (Table 2).

Table 2

Ultrasonographic Grading and Overall Prevalence of NAFLD (n = 200)

Ultrasonographic Grade	n	%
Grade 0 – No Steatosis (NAFLD Negative)	82	41.0%
Grade 1 – Mild Steatosis	52	26.0%
Grade 2 – Moderate Steatosis	40	20.0%
Grade 3 – Severe Steatosis	26	13.0%
Total NAFLD Positive (Grade ≥ 1)	118	59.0%
Total Participants	200	100%

Post-stratification chi-square analysis identified age group ($p = 0.049$) and obesity ($p < 0.001$) as statistically significant effect modifiers of NAFLD prevalence. Gender ($p = 0.471$) and smoking status ($p = 0.374$) did not reach statistical significance. Obesity demonstrated the strongest association, with NAFLD detected in 75.0% of obese versus 46.4% of non-obese patients, corroborating BMI as a consistently established independent predictor of hepatic steatosis in diabetic populations (Table 3).

Table 3

Post-Stratification Chi-Square Analysis of Effect Modifiers on NAFLD Prevalence (n = 200)

Effect Modifier		Total (n)	NAFLD Positive n (%)	NAFLD Negative n (%)	χ^2	p-value
Gender	Male	118	72 (61.0%)	46 (39.0%)		
	Female	82	46 (56.1%)	36 (43.9%)	0.52	0.471
Age Group	45–54 years	94	49 (52.1%)	45 (47.9%)		
	55–70 years	106	69 (65.1%)	37 (34.9%)	3.88	0.049
Smoking Status	Smokers (> 2 packs/day)	48	31 (64.6%)	17 (35.4%)		
	Non-Smokers	152	87 (57.2%)	65 (42.8%)	0.79	0.374
Obesity (BMI > 30 kg/m^2)	Obese	88	66 (75.0%)	22 (25.0%)		
	Non-Obese	112	52 (46.4%)	60 (53.6%)	17.04	< 0.001

$p < 0.05$ considered statistically significant.

DISCUSSION

The present study found non-alcoholic fatty liver disease in 59.0% of patients with newly diagnosed type 2 diabetes mellitus. This is clinically important because it shows that hepatic steatosis is already common at an early stage of diabetes, before long disease duration becomes established. The observed prevalence closely matches the pooled global estimate of 55.5% in diabetic populations and is comparable to the 60.0% prevalence reported in diabetic adults assessed by magnetic resonance spectroscopy, supporting the credibility of the present estimate despite the use of ultrasonography [11,12].

The frequency in the present study was higher than that reported in the Indian series, where NAFLD was detected in 49.5% of diabetic patients, and higher than the 50.6% prevalence reported in the Hong Kong diabetic registry [13,14]. However, it remained lower than the rates described in Italy, Brazil, and Saudi Arabia, where prevalence estimates ranged from 69.3% to 72.4%. Such variation is likely related to differences in obesity burden, glycaemic control, ethnicity, study setting, and diagnostic techniques [14–16].

Another important finding was that one-third of the total sample already had moderate to severe steatosis. This indicates that the burden was not limited to mild sonographic change. A similar pattern was reported in the Indian study, where grade II and grade III steatosis together accounted for most affected cases, while elastography-based data from France also demonstrated substantial proportions with marked steatosis and clinically relevant fibrosis [16,17]. Biopsy-based studies have shown that diabetes is linked with higher rates of non-alcoholic steatohepatitis and advanced fibrosis, indicating that hepatic steatosis in diabetic patients may represent progressive liver disease rather than an incidental imaging finding [17–19]. This has practical importance because diabetic patients with NAFLD also carry greater cardiovascular and liver-related risk [5].

Age showed a significant association with NAFLD in the present study, with greater frequency in older patients. This is consistent with the cumulative metabolic burden associated with advancing age. Epidemiological data have similarly shown that the combination of diabetes and NAFLD becomes increasingly important with ageing, not only because of frequency but also because of greater liver-related and overall adverse outcomes [6,12,16].

Obesity showed the strongest association, with NAFLD affecting 75.0% of obese patients compared with 46.4% of non-obese patients. This agrees with previous studies in which body mass index, waist circumference, and related metabolic measures independently predicted NAFLD in diabetic populations. Comparable observations were reported in Indian and Hong Kong studies, where body mass index was significantly higher among NAFLD-positive patients [13,14]. Even so, risk should not be considered confined to obesity alone, because NAFLD has also been documented in non-obese diabetic patients, including Asian populations and patients with active disease on non-invasive assessment [13,16].

Gender and smoking were not significantly associated with NAFLD in the present study. The lack of association may reflect the dominant effect of diabetes and adiposity, together with the smaller smoking subgroup. The main contribution of this study is that it provides local evidence that NAFLD is highly prevalent even in newly diagnosed diabetic patients and that clinically relevant steatosis is already common at first evaluation. These findings support early hepatic screening in routine diabetic care, particularly in older and obese patients.

CONCLUSION

The study demonstrated that non-alcoholic fatty liver disease is highly frequent in patients with newly diagnosed type 2 diabetes mellitus, with a considerable proportion already showing moderate to severe steatosis. The significant association with older age and obesity supports targeted early screening in diabetic patients, particularly those with increased body mass index, so that timely risk stratification and preventive management may be undertaken.

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