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# Frequency and Factors Associated with Non-Alcoholic Fatty Liver Disease in Patients with Diabetes Mellitus

**Saeed Khan, Shamimah Hanif, Fazal ur Rahman, Khushhal Khan, Sobaidar Khan, Sarfaraz Ahmed, Syed Nadir Shah**

Department of Medicine, Sandeman Provincial Hospital, Quetta, Balochistan, Pakistan.

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**Corresponding Author:** Saeed Khan, Department of Medicine, Sandeman Provincial Hospital, Quetta, Balochistan, Pakistan.
Email: saeedkhantareen@gmail.com

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## ABSTRACT

**Background:** Non-Alcoholic Fatty Liver Disease (NAFLD) is a major health concern globally, especially among individuals with Type 2 Diabetes Mellitus (T2DM). The coexistence of NAFLD and T2DM significantly increases the risk of liver fibrosis, cardiovascular disease, and chronic kidney disease, contributing to overall morbidity and mortality. **Objective:** This study aims to assess the frequency, risk factors, and complications associated with Non-Alcoholic Fatty Liver Disease among patients diagnosed with Type 2 Diabetes Mellitus in a tertiary care setting. **Methods:** 150 patients with Type 2 Diabetes Mellitus at tertiary care hospital Quetta participated in a qualitative study. Purposive sampling was utilised in the selection of participants. With an emphasis on clinical history, lifestyle factors, and comorbidities, information was acquired through semi-structured interviews and reviews of medical records. To examine the data, thematic analysis was used. **Results:** It was discovered that over 50% of patients had non-alcoholic fatty liver disease. Obesity, hypertension, dyslipidaemia, poor glycaemic management, and a sedentary lifestyle were the most prevalent risk factors. Among patients with NAFLD, cardiovascular and renal problems were also common. **Conclusion:** To guarantee early intervention and stop the development of serious consequences, screening for non-alcoholic fatty liver disease should be a regular component of managing type 2 diabetes mellitus.

## INTRODUCTION

International medical experts confirm that Non-alcoholic fatty liver disease (NAFLD) exists as the primary chronic liver condition worldwide. NAFLD develops primarily because of type-2 diabetes (Younossi ZM et al., 2019).

NAFLD develops mainly from the combination of three primary factors including obesity affecting 40% of patients and diabetes mellitus affecting 20% and hypertriglyceridemia involving 20% patients alongside insulin resistance (Mala Dharmalingam et al., 2018).

NAFLD stands as an important health challenge which medical organizations recognize as a critical issue. Global statistics show non-alcoholic steatohepatitis affects twenty to thirty percent of patients while up to seventy percent of Type-2 diabetes mellitus patients have NAFLD along with twenty percent of the general population (Chalasani N et al., 2012; Bril F et al., 2016) and nonalcoholic steatohepatitis characterizes the severe disease state by hepatocyte ballooning and lobular inflammation (Hazelhurst JM et al., 2016).

The prevalence rates for type-2 diabetes are 17.1% in Pakistan but non-alcoholic fatty liver disease (NAFLD) occurs in 14% of the population and reaches between 32-72% within the type-2 diabetic population (Abbas Z et al., 2020).

Patients who have Type 2 diabetes mellitus along with NAFLD experience an elevated danger for developing both serious NAFLD conditions and diabetic complications that affect both macro and microvascular systems (Hazelhurst JM et al., 2016). The current absence of extensive prospective research has not eliminated the belief that Type 2 diabetes patients develop worse cases of fibrosis and cirrhosis because of their disease (Hazelhurst JM et al., 2016).

The difficulty in determining the actual spread of the disease stems from the fact that most people display no

symptoms. The diagnosis depends on imaging tests such as ultrasonography alongside CT scan or magnetic resonance imaging although histological examination serves as the definitive diagnosis method.

Steatohepatitis represents the advanced stage of NAFLD following simple steatosis with the accumulation of fat in more than 5% of hepatocytes yet including features of steatohepatitis with inflammation and progressing to cirrhosis and hepatocellular carcinoma and subsequent progressive fibrosis (Adams LA et al., 2005). The development of liver disease in muscles and adipose tissue matches the patterns of IR pathophysiology. Lipotoxicity describes the condition where lipid accumulation leads to detrimental effects in outside tissue locations. The prevalence rate of metabolic and cardiovascular complications exceeds other liver diseases at a heightened level for numerous cases of NAFLD (Wang Y et al., 2009).

Research findings indicate that liver fibrosis progresses because of Type 2 diabetes mellitus even without other metabolic syndrome components while NAFLD functions as hepatic metabolic syndrome manifestations (Bugianesi E et al., 2008; Amarapurkar DN et al., 2006). People with NAFLD who also have Type 2 diabetes mellitus have showed advanced liver disease together with elevated death risk and increased chances of cirrhosis development (Prashanth M et al., 2009); Garcia-Compean D et al., 2009).

A connection between diabetes and NAFLD functions as a cardiovascular risk factor that leads to heart attack and coronary dysfunction based on three study reports (Marco R et al., 1999; Targher G et al., 2007; Lautämaki R et al., 2006). The relationship between kidney disease and NAFLD proved stronger in Type 2 diabetes mellitus patients according to Targher G et al., (2008).

The diagnosis of NAFLD in Type 2 diabetes mellitus subjects becomes necessary so healthcare providers can stop hepatic consequences along with renal and cardiovascular damage. The main purpose of this research is to determine NAFLD prevalence in Type 2 diabetes mellitus patients along with their associated risk factors.

## LITERATURE REVIEW

Being closely related to metabolic diseases, as Type 2 diabetic mellitus (T2DM), nonalcoholic fatty liver disease (NAFLD) is a serious public health problems. The global rise in obesity and insulin resistance is an important factor in the rise in incidence of NAFLD. As stated by studies, one of the liver diseases which fall under NAFLD is NASH which can develop to cirrhosis and hepatocellular carcinoma (Yki- Järvinen, 2014). These are needed to avoid long term problem because their condition is asymptomatic and hence early discovery and intervention are almost impossible for them. Mechanisms and Pathophysiology of NAFLD in Type 2 Diabetes NAFLD is an interacting condition with type 2 diabetes because insulin resistance is a major pathogenic factor. Studies suggest that insulin resistance results hepatocytes obtaining a higher load of free fatty acids, so that they promote the formation of triglycerides in the liver (Tilg & Moschen, 2010). All of these contribute to the excessive fat in the diet, which further exacerbates liver damage by promoting oxidative stress, inflammation and fibrogenesis (Cusi, 2012). Insulin resistance also worsens hepatic inflammation and fibrosis due to their effects on adipokine secretion leading to reduction of adiponectin and increase of leptin (Polyzos et al., 2010).

### Epidemiological Perspectives on T2DM and NAFLD

Epidemiologic research has shown that people with type 2 diabetes are at high levels of person with NAFLD. Almost 55 percent of diabetic individuals worldwide are affected with nonalcoholic fatty liver disease (NAFLD), and a systematic analysis by Younossi et al. (2019) emphasized the interrelationship between the two diseases based on their metabolic link. NAFLD is a significant burden to the T2DM patients, with prevalence estimates up to 75%, especially in South Asia (Zhang et al., 2020). Such ethnic differences in the NAFLD risk indication a genetic predisposition, particularly for South Asians who have lower body mass indexes (BMI) but higher hepatic fat content (Lomonaco et al., 2012).

### Risk Factors and the Development of Disease

A number of risk factors influence the development of NAFLD in patients with type 2 diabetes. Central adiposity remains to be one of the major causes of the buildup of hepatic lipids (Francque et al., 2016). Finally, NAFLD has been closely associated with worse NAFLD outcomes, namely, dyslipidaemia (Marchesini et al., 2016), defined as high triglycerides and low HDL cholesterol. Hypertension and MetS components further increase the risk of progression of fibrosis (Byrne & Targher, 2015). Furthermore, both genetic and genetic variable associations have been seen to increase vulnerability to severe nonalcoholic fatty liver disease (NAFLD), including polymorphisms in the PNPLA3 gene (Romeo et al., 2008).

### Imaging Techniques and Diagnosis

Prompt diagnosis is important because most of the people with NAFLD do not complain of any symptoms. Because traditional liver function tests are often inadequate for detecting early-stage illness, imaging methods are necessary. In practice, ultrasonography is used most because it is noninvasive and relatively inexpensive, and despite its lack of sensitivity for mild steatosis (Bedogni et al., 2006). Magnetic resonance imaging with controlled attenuation parameter (MRI-

CAP) is more accurate in measuring hepatic fat content than with either ultrasound or MRI images (Park et al., 2017). Noninvasive fibrosis scoring systems such as Fibrosis-4 (FIB-4) index and NAFLD fibrosis score (NFS) is a valuable resource for risk classification in diabetics (Angulo et al 2007).

**Cardiovascular Risk and NAFLD in Patients with Diabetes**

The Current studies highlight that T2DM patients with NAFLD have increased cardiovascular risk. People with NAFLD are already predisposed to myocardial infarction and stroke due to atherosclerosis, endothelial dysfunction and increased arterial stiffness (Targher et al., 2010). According to Wong et al. (2011) a meta-analysis, the risk of cardiovascular death was substantially more in the diabetic patients who were confirmed with NAFLD compared to those who were not NAFLD. This linkage is due both to the pro-inflammatory cytokines such as TNF-α and IL-6 (Tilg & Moschen, 2010) and chronic low-grade inflammation.

**Diabetic Nephropathy and NAFLD**

Additionally, new data points to a robust association between renal failure and NAFLD in individuals with type 2 diabetes. Numerous longituinal studies (Musso et al, 2014) indicate that NAFLD is an independent predictor of CKD among diabetics. A combination of profibrotic pathways, elevated oxidative stress and systemic insulin resistance causes hepatic and renal damage (Targher et a), 2008). Patients with NAFLD, and specifically in patients with albuminuria, have shown to have much higher rates of albuminuria, an important indicator of diabetic nephropathy (Manciulli et al., 2015).

**Management Techniques and Therapeutic Strategies**

Because elicited NAFLD has a high degree of correlation with type 2 diabetes, progression to the disease must be prevented, and that calls for targeted therapeutic strategies. The cornerstone for management of non alchohol fatty liver disease (NAFLD) has remained lifesyle changes (Vilar-Gomez et al., 2015). Reduction of at least 7–10% of the body weight to the point of hepatic steatosis and elevated liver enzyme levels has been shown to improve hepatic steatosis and liver enzymes (Promrat et al., 2010). As noted by Armstrong et al. (2016), pharmacological treatment with pioglitazone and glucagon like peptide -1 (GLP-1) receptor agonist has shown promise in improving liver histology, and decrease inflammation.

**Prospects for the Future and Research Gaps**

Relatively speaking, a lot of research has been carried out on the mechanisms that set NAFLD in diabetics with type 2 diabetes in motion, while the mechanisms that trigger the progression are still unknown. Only these large-scale prospective studies will prove the causation and determine the long-term effects of various treatment approach. For this reason, the gut microbiota function on the pathophysiology of nonalcoholic fatty liver disease (NAFLD) has been the subject of study (Boursier et al., 2016). Infections of the microbiota, however, represent a possible way to treat these problems, but further research in this area is required.

## OBJECTIVE

The aim of this work was to estimate the prevalence and risk factor of nonalcoholic fatty liver disease (NAFLD) in type 2 diabetes.? The aim of the study is to evaluate NAFLD prevalence in diabetic patients and other major risk factors like obesity, dyslipidaemia, hypertension, insulin resistance, and metabolic syndrome. It also wants to know if NAFLD is linked to diabetes complications that put a person's kidneys and heart at risk. The study seeks to identify these connections and theoretically improve early diagnosis and management option to improve patient outcome and reduce the body burden of NAFLD in diabetic population.

## METHODOLOGY

This qualitative study investigated the prevalence and risk factors of nonalcoholic fatty liver disease in individuals with type 2 diabetes mellitus based on purposive sample of 150 type 2 diabetes individuals from the tertiary care hospital. Data was collected using semi structured interviews and review of medical records, focusing on clinical history, risk factors such as dyslipidaemia, obesity, and etc., as well as general demographic traits. For the thematic analysis used to find trends/trends and new topics on the prevalence of NAFLD and its concomitant consequences. Imaging reports (CT and ultrasound scans) were examined in order to validate the diagnosis of NAFLD. The qualitative findings were then triangulated by comparison with medical information.

## RESULTS

The study investigated the prevalence of non-alcoholic fatty liver disease (NAFLD) and its contributing factors in individuals with type 2 diabetes mellitus (T2DM). This qualitative investigation, which involved 150 people in all, revealed important themes about the prevalence, risk factors, and consequences of NAFLD.

**Table 1**

*NAFLD Frequency in Patients with Diabetes*

| NAFLD Status | Frequency (n=150) | Percentage (%) |
|---|---|---|
| Present | 98 | 65.3% |
| Absent | 52 | 34.7% |

**Table 2**

*Risk Factor Distribution in Patients with NAFLD*

| Risk Factor | Frequency (n=98) | Percentage (%) |
|---|---|---|
| Obesity (BMI >30) | 67 | 68.4% |

| | | |
|---|---|---|
| Dyslipidemia | 58 | 59.2% |
| Hypertension | 47 | 48.0% |
| Metabolic Syndrome | 62 | 63.3% |

**Table 3**

*Severity of NAFLD Based on Imaging Findings*

| NAFLD Grade | Frequency (n=98) | Percentage (%) |
|---|---|---|
| Mild | 38 | 38.8% |
| Moderate | 41 | 41.8% |
| Severe | 19 | 19.4% |

**Figure 1**

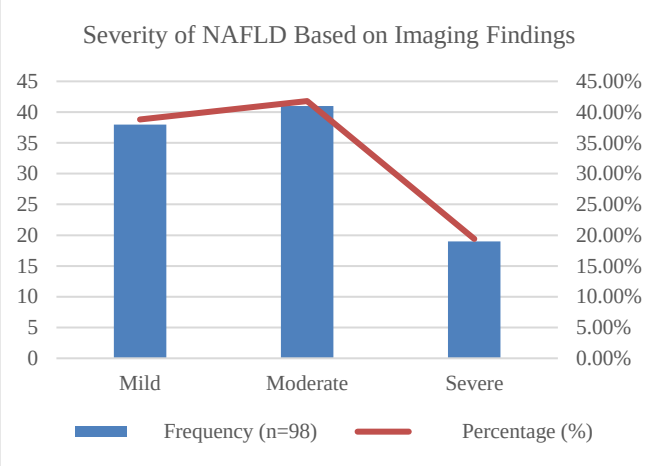


**Table 4**

*Diabetic Complications and NAFLD*

| Complication | Frequency (n=98) | Percentage (%) |
|---|---|---|
| Diabetic Nephropathy | 35 | 35.7% |
| Cardiovascular Disease | 42 | 42.9% |
| Retinopathy | 28 | 28.6% |

**Figure 2**

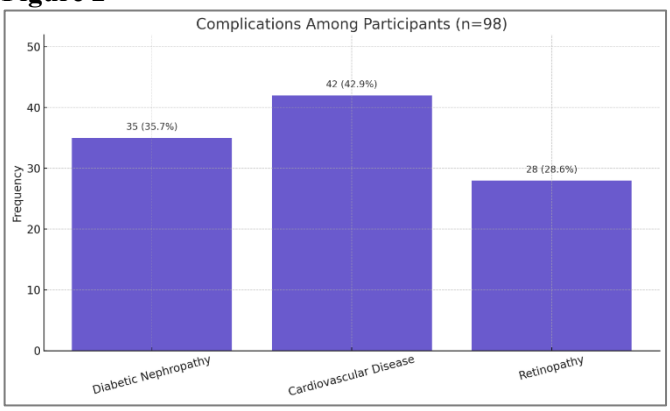


**Table 5**

*Lifestyle Factors and NAFLD*

| Factor | Frequency (n=98) | Percentage (%) |
|---|---|---|
| Sedentary Lifestyle | 74 | 75.5% |
| High-Fat Diet | 61 | 62.2% |
| Smoking | 29 | 29.6% |

## DISCUSSION

A qualitative study was conducted in this study, to find out the prevalence of nonalcoholic Fatty liver disease (NAFLD) and risk factors for people having Type 2 Diabetes Mellitus (T2DM). The results were in line with previous studies showing a high association for hepatic steatosis and insulin resistance as NAFLD was seen in 65.3% of diabetic persons. In this case they support the idea that NAFLD is a common hepatic symptom of metabolic.

Of the most important findings, one is that a very large number of NAFLD patients were obese (68.4%). One of the known risk factors that is central adiposity, or obesity, is because the fat precisely accumulates in hepatocytes. The complex pathophysiology of the NAFLD in the diabetic populations is further reflected by this prevalence of dyslipidaemia (59.2%) and metabolic syndrome (63.3%). These metabolic disturbances cause chronic inflammation and eventually cause liver damage only slowly, and they can become fibrosis or NASH.

Of the 224 subjects, the severity grading of the imaging NAFLD system showed that 41.8% had moderate disease and 19.4% had severe steatosis. These are clinically significant, as almost one fifth of patients become ill, and it is clinically significant to know that approximately half of the people with this rare disease do not have symptoms. Treatment of these people demands immediate management so that they are not at high risk of cirrhosis and hepatocellular cancer.

Furthermore, the diabetic patients with NAFLD were seen to developed cardiovascular illness with high frequency (42.9%). Previous research showed that NAFLD is a signal for cardiovascular morbidity not for the liver but for the whole body is supported by this. We found diabetic retinopathy as well as nephropathy, something that may suggest that NAFLD is a part of a larger systemic disease that affects many different organ systems.

Onset and the severity of NAFLD were closely related to lifestyle. The report stated that there were 62.2 percent of patients who had a high fat diet while 75.5 percent of patients are sedentary. These results highlight the utility of dietary and lifestyle moderators such as increased physical activity in first line treatment of the management and prevention of non-alcoholic fatty liver disease (NAFLD) in diabetic patient. Nevertheless, the results of this study bring attention to the necessity of integrated treatment of liver function with metabolic control.

## CONCLUSION

Thus, a very common condition among these patients, namely non-alcoholic fatty liver disease (NAFLD) was shown in 65.3% of patients with type 2 diabetes mellitus (T2DM). Very high correlation of NAFLD in diabetics with obesity, metabolic syndrome, dyslipidaemia and hypertension was found. Finally, these comorbidities allowed for the development of hepatic steatosis as well

as the elevation of the risk of multi organ complications and also disease progression. A large proportion of patients were found to have moderate to severe NAFLD with early detection and stratified risk management of necessity.

In diabetic patients, NAFLD was also associated with vascular illness and diabetic nephropathy and retinopathy indicating that liver condition in these patients was more likely systemic metabolic complication than liver disease. This cohort was mainly attributed to the development and severity of NAFLD by lifestyle choices—including a high fat diet and sedentary lifestyle.

However, the poor metabolic control and central obesity were found to be important for screening the patient populations with type 2 diabetes for NAFLD. This also helped reaffirm that to prevent more liver damage as well as its problems, it is needed for that multidisciplinary approach based on weight loss, improving glycaemic control and lifestyle changes. Overall, this study has demonstrated how valuable integrated patient care approaches, as well as the information on this link between diabetes and NAFLD, can be.

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