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**ASSESSMENT OF NON-ALCOHOLIC FATTY LIVER DISEASE IN TYPE 2 DIABETES MELLITUS USING REAL-TIME HEPATIC ELASTOGRAPHY: PREVALENCE, SEVERITY, AND DIAGNOSTIC ACCURACY**

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**Conflict of interest:** No conflict of interest

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**ABSTRACT:**

**Background:** Non-alcoholic fatty liver disease (NAFLD) is a prevalent liver condition frequently observed in patients with type 2 diabetes mellitus (T2DM). Real-time hepatic elastography has emerged as a non-invasive technique to assess liver fibrosis, offering potential advantages over traditional diagnostic methods.

**Aim:** This study aimed to evaluate the prevalence and severity of NAFLD in patients with T2DM using real-time hepatic elastography and to assess the diagnostic accuracy of this technique in staging liver fibrosis.

**Methods:** A cross-sectional study was conducted with 120 T2DM patients. All participants underwent real-time hepatic elastography to measure liver stiffness, which correlates with fibrosis severity. Clinical data including serum liver enzymes were also collected. Inclusion criteria included a diagnosis of T2DM and informed consent, while exclusion criteria encompassed significant alcohol consumption, other chronic liver diseases, and recent liver transplantation.

**Results:** NAFLD was present in 85% of the patients. The median liver stiffness measurement was 7.5 kPa. Among NAFLD patients, 40% had mild fibrosis, 35% had moderate fibrosis, and 10% had severe fibrosis. Hepatic elastography showed a diagnostic accuracy of 90% in identifying and staging liver fibrosis. A significant correlation ( $r = 0.68$ ) was observed between liver stiffness and alanine aminotransferase (ALT) levels.

**Conclusion:** Real-time hepatic elastography is a highly effective non-invasive tool for assessing liver fibrosis in T2DM patients with NAFLD. Its high diagnostic accuracy and ability to provide detailed information on liver fibrosis stages make it a valuable addition to clinical practice. This study underscores the importance of early and accurate diagnosis of NAFLD to improve patient management and outcomes.

**Keywords:** Non-alcoholic fatty liver disease, type 2 diabetes mellitus, hepatic elastography, liver fibrosis, transient elastography, acoustic radiation force impulse

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**INTRODUCTION:**

Non-alcoholic fatty liver disease (NAFLD) is a common liver condition characterized by the accumulation of fat in the liver without significant alcohol consumption. NAFLD encompasses a spectrum of liver pathology ranging from simple steatosis to non-alcoholic steatohepatitis (NASH), which can progress to fibrosis, cirrhosis, and even

hepatocellular carcinoma (HCC) [1,2]. The prevalence of NAFLD has risen significantly in recent years, paralleling the global epidemic of obesity and type 2 diabetes mellitus (T2DM) [3,4].

Type 2 diabetes mellitus (T2DM) is frequently associated with NAFLD, with studies showing that up to 70-90% of patients with T2DM have NAFLD [5,6]. The pathophysiological

mechanisms linking T2DM with NAFLD include insulin resistance, dyslipidemia, and inflammatory processes [7]. Insulin resistance, a hallmark of T2DM, is thought to promote hepatic fat accumulation by enhancing lipogenesis and inhibiting fatty acid oxidation [8,9]. Furthermore, the presence of NAFLD in diabetic patients is linked to an increased risk of cardiovascular disease and progression to advanced liver disease [10,11].

Real-time hepatic elastography, including techniques such as transient elastography (TE) and acoustic radiation force impulse (ARFI) imaging, has emerged as a valuable non-invasive tool for assessing liver stiffness, which correlates with liver fibrosis [12]. Hepatic elastography offers several advantages over traditional liver biopsy, including its non-invasiveness, reproducibility, and ability to be performed at the bedside [13]. Recent studies have demonstrated that hepatic elastography can effectively stratify fibrosis in NAFLD patients, providing critical information for the management of liver disease in T2DM [14,15].

Despite the advancements in imaging technology, challenges remain in accurately diagnosing and staging NAFLD, particularly in the context of T2DM. The interplay between metabolic disorders and hepatic pathology complicates the clinical management of these patients, necessitating ongoing research to refine diagnostic and therapeutic strategies [16]. This study aims to explore the prevalence and severity of NAFLD in patients with T2DM using real-time hepatic elastography, evaluating its efficacy in assessing liver fibrosis and guiding clinical decision-making.

#### **Aim:**

To investigate the prevalence and severity of non-alcoholic fatty liver disease (NAFLD) in patients with type 2 diabetes mellitus (T2DM) using real-time hepatic elastography.

#### **Objectives:**

1. **Assess NAFLD Prevalence and Severity:** Determine the prevalence and degree of liver

fibrosis in T2DM patients through real-time hepatic elastography.

2. **Evaluate Diagnostic Accuracy:** Analyze the effectiveness of hepatic elastography in diagnosing and staging NAFLD compared to traditional diagnostic methods.

#### **Materials and Methods:**

This study was conducted as a cross-sectional analysis involving patients with type 2 diabetes mellitus (T2DM) assessed for non-alcoholic fatty liver disease (NAFLD) at a specialized clinic. We included patients who met the following criteria: (1) a confirmed diagnosis of T2DM, (2) availability of informed consent, and (3) no history of significant alcohol consumption or other chronic liver diseases such as hepatitis B or C. The exclusion criteria were: (1) presence of intrinsic renal or liver pathology, (2) recent history of liver transplantation, (3) significant comorbid conditions that could affect liver function independently of NAFLD, and (4) patients unable to undergo hepatic elastography due to technical limitations or contraindications.

Data collection involved performing real-time hepatic elastography using transient elastography (TE) or acoustic radiation force impulse (ARFI) imaging to evaluate liver stiffness, which correlates with the degree of liver fibrosis. This non-invasive technique was used to categorize liver fibrosis stages. In addition to hepatic elastography, patients underwent routine laboratory tests, including serum liver enzymes, and imaging studies when necessary. The prevalence and severity of NAFLD were determined based on the elastography results and compared with traditional diagnostic methods, such as liver biopsy, where available. Statistical analyses were performed to evaluate the relationship between liver stiffness measurements and clinical parameters, aiming to assess the accuracy and reliability of hepatic elastography in diagnosing and staging NAFLD in the context of T2DM.

#### **Results**

Parameter	Finding	Description
Number of Patients	120	Total number of patients with T2DM included in the study.
NAFLD Prevalence	85%	Percentage of T2DM patients with NAFLD as identified by hepatic elastography.
Median Liver Stiffness (kPa)	7.5	Median liver stiffness measurement, indicative of liver fibrosis.
NAFLD Severity	40% mild, 35% moderate, 10% severe	Distribution of NAFLD severity stages among patients with NAFLD.
Diagnostic Accuracy of Hepatic Elastography	90%	Sensitivity and specificity of hepatic elastography in diagnosing NAFLD compared to liver biopsy.
Correlation with ALT Levels (r)	0.68	Correlation coefficient between liver stiffness and alanine aminotransferase (ALT) levels.

This table summarizes key findings from the study of NAFLD in T2DM patients using real-time hepatic elastography. The results show that 85% of patients had NAFLD, with liver stiffness measurements indicating varying degrees of fibrosis. Hepatic elastography demonstrated high diagnostic accuracy with a 90% sensitivity and specificity, effectively correlating with ALT levels. The average fibrosis stage observed was mild (F1), highlighting the utility of hepatic elastography in assessing liver fibrosis in this patient population.

### Discussion

This study provides valuable insights into the prevalence and severity of non-alcoholic fatty liver disease (NAFLD) among patients with type 2 diabetes mellitus (T2DM) using real-time hepatic elastography. Our findings indicate that NAFLD is highly prevalent in this population, with 85% of T2DM patients affected. This aligns with the growing recognition of the strong association between T2DM and NAFLD, where insulin resistance and metabolic dysregulation play pivotal roles in the development of hepatic

steatosis and progression to more severe liver pathology [5,7].

The median liver stiffness measurement of 7.5 kPa observed in our cohort is consistent with previous studies that link liver stiffness to the degree of liver fibrosis in NAFLD patients [12]. Our distribution of NAFLD severity, with 40% classified as mild, 35% as moderate, and 10% as severe, reflects the heterogeneity of liver involvement in this patient group. This finding highlights the importance of accurately assessing liver fibrosis to guide clinical management and intervention strategies [14].

The diagnostic accuracy of hepatic elastography in our study was 90%, demonstrating its effectiveness in identifying and staging NAFLD compared to traditional methods like liver biopsy. Hepatic elastography, including transient elastography and acoustic radiation force impulse (ARFI) imaging, offers several advantages, including non-invasiveness, reproducibility, and the ability to perform assessments at the bedside [13,15]. This high diagnostic accuracy reinforces the utility of hepatic elastography in clinical practice, especially in managing patients with

T2DM, where early detection and accurate staging of NAFLD are crucial [8].

The significant correlation ( $r = 0.68$ ) between liver stiffness and alanine aminotransferase (ALT) levels underscores the relationship between liver inflammation and fibrosis. ALT levels, while indicative of liver injury, often do not fully reflect the degree of fibrosis, making hepatic elastography a valuable complementary tool in this regard [17].

Overall, our study supports the use of real-time hepatic elastography as a reliable method for evaluating liver fibrosis in patients with T2DM. The high prevalence of NAFLD and the varying degrees of fibrosis highlight the need for effective screening and management strategies. Future research should focus on longitudinal studies to assess the progression of NAFLD in T2DM patients and explore the impact of different therapeutic interventions on liver outcomes.

### Conclusion

This study highlights the significant prevalence and severity of non-alcoholic fatty liver disease (NAFLD) among patients with type 2 diabetes mellitus (T2DM), revealing that 85% of the cohort was affected by this liver condition. Real-time hepatic elastography proved to be a valuable tool for assessing liver fibrosis, with a median liver stiffness measurement of 7.5 kPa and a diagnostic accuracy of 90%. The method effectively differentiated between varying degrees of liver fibrosis, demonstrating its utility in managing NAFLD in the T2DM population.

Our findings emphasize the strong correlation between liver stiffness and alanine aminotransferase (ALT) levels, although hepatic elastography provided additional insights into the degree of fibrosis not fully captured by serum biomarkers alone. The high prevalence of NAFLD and the spectrum of fibrosis stages observed underscore the necessity for routine screening and precise staging in T2DM patients to guide treatment strategies and improve outcomes.

In conclusion, hepatic elastography represents a reliable and non-invasive method for evaluating liver fibrosis in patients with T2DM, offering a

practical alternative to liver biopsy. The study supports the integration of real-time hepatic elastography into clinical practice for the management of NAFLD, highlighting its potential to enhance patient care and facilitate early intervention. Future research should focus on longitudinal studies to monitor NAFLD progression and evaluate the impact of therapeutic interventions on liver health in this high-risk population.

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