PREVALENCE AND CHARACTERISTICS OF NON-ALCOHOLIC FATTY LIVER DISEASE IN PATIENTS WITH FATTY LIVER DIAGNOSED BY ULTRASOUND

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Abstract

Objectives: To determine the prevalence and characteristics of non-alcoholic fatty liver disease (NAFLD), including steatosis and fibrosis, in patients with fatty liver detected by ultrasound. ***Methods:*** A cross-sectional study was conducted on 303 patients diagnosed with fatty liver by ultrasound at People's Hospital 115 from August 2019 to October 2020. Steatosis and fibrosis were assessed using FibroScan, employing the controlled attenuation parameter (CAP) and liver stiffness measurements (LSM). Statistical analysis was performed using SPSS version 22.0. ***Results:*** The prevalence of NAFLD in patients with fatty liver detected by ultrasound and assessed by FibroScan using CAP probe was 66%. Among patients with fatty liver on ultrasound who have NAFLD, the distribution of liver fat levels was as follows: S1 = 20.5%; S2 = 27%; S3 = 52.5%. The stages of liver fibrosis were: F0 - F1 at 74.5%; significant fibrosis at 25.5%, advanced fibrosis at 11%, and cirrhosis at 6%. NAFLD patients exhibited higher body mass index (BMI), waist circumference, cholesterol, triglyceride, type 2 diabetes mellitus (T2DM), and obesity rates compared to those without NAFLD. ***Conclusion:*** The study underscores the high prevalence of NAFLD in patients with fatty liver detected by ultrasound, with the highest proportion of patients in stage S3, while 25.5% of the cases are classified as significant fibrosis, which indicates a considerable level of liver damage.

Keywords: Fatty liver; Non-alcoholic fatty liver disease; Ultrasound; FibroScan; Steatohepatitis.

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INTRODUCTION

Non-alcoholic fatty liver disease has continued to rise as a predominant cause of chronic liver disease worldwide, particularly in light of the ongoing global obesity and T2DM pandemics [1]. Recent studies have shown an alarming increase in the prevalence of NAFLD, with an estimated 25 - 30% of the global population affected as of 2024 [2]. The increasing burden of NAFLD is particularly pronounced in Asia, where urbanization and lifestyle changes have driven higher rates of metabolic syndrome, a key risk factor for NAFLD [3]. Although abdominal ultrasound is a common method for detecting fatty liver, no studies have yet evaluated the prevalence of NAFLD in patients with fatty liver identified by ultrasound.

Fatty liver is increasingly detected by abdominal ultrasound, yet it often receives insufficient attention from both patients and healthcare providers. The most common cause of this condition is NAFLD. This disease can lead to serious complications such as liver fibrosis, cirrhosis, and hepatocellular carcinoma [4]. Additionally, NAFLD is recognized as an independent cardiovascular risk factor, leading to cardiovascular problems even in the absence of traditional risk factors like hypertension or dyslipidemia [5].

One of the new and effective non-invasive methods for assessing liver fat and fibrosis levels is FibroScan with the CAP probe. This technique, similar to conventional ultrasound, is simple and quick to perform, but it provides additional crucial information about the patient's liver condition without causing any complications. As a result, it has been recommended by major liver disease research associations worldwide, including the American Association for the Study of Liver Diseases and the European Association for the Study of the Liver, as a useful screening tool in the diagnosis of NAFLD [6]. Therefore, we conducted this study to: *Determine the prevalence and characteristics of NAFLD, including steatosis and fibrosis, in patients with fatty liver detected by ultrasound.*

MATERIALS AND METHODS

1. Subjects

Including 303 patients aged ≥ 18 who were diagnosed with fatty liver by ultrasound and visited People's Hospital 115 from August 2019 to October 2020.

The sample size is calculated using the following formula:

$$n = Z^2_{1-\frac{\alpha}{2}} \frac{p(1-p)}{d^2}$$

p is the proportion of the study variable, with d as the desired margin of error set at 5%. Since no existing

studies determine the prevalence of NAFLD in patients with ultrasound-detected fatty liver, p is assumed to be 0.5 → n > = 196.

* *Inclusion criteria:* All patients diagnosed with fatty liver by abdominal ultrasound within the last 6 months (Increased Echogenicity: Liver appears brighter than right, Vascular Blurring, Ultrasound beam weakens, making deeper liver areas harder to see [7]); aged ≥ 18 years; able to read and sign the consent form to participate in the study.

* *Exclusion criteria:* Unreliable FibroScan results: Patients with FibroScan results showing an interquartile range (IQR) > 30% or a success rate < 60%; elevated liver enzymes > 100 U/L; cholestasis, hepatic congestion, or presence of ascites; SCD (Exceed testing capacity) > 25mm (probe M) to rule out cases of excess abdominal fat in obese patients, an XL probe is required [8]; pregnancy; poor health status or inability to provide blood samples.

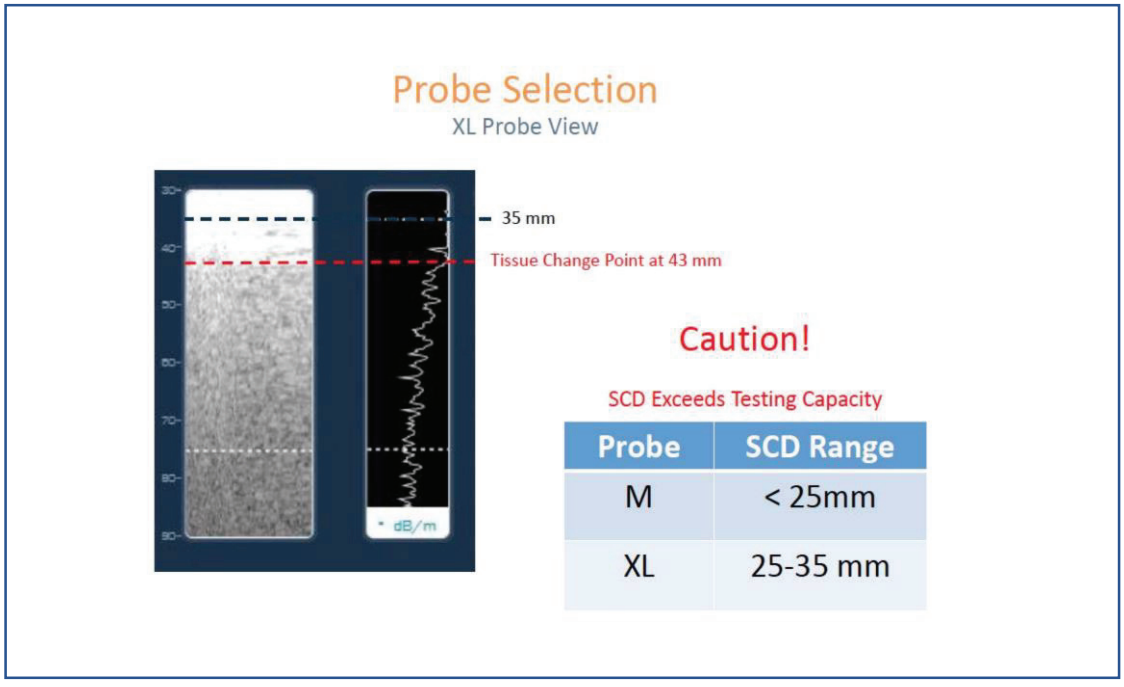

Figure 1. Probe selectition.

* *Location and time*: The study was conducted at People's Hospital 115. Patients who were diagnosed with fatty liver by ultrasound were recruited from August 2019 to October 2020.

2. Methods

* *Study design:* A cross-sectional study.

The FibroScan machine is manufactured by Echosens, a French medical technology company.

The patient fasted for at least 3 hours prior to the measurement. LSM was performed by a hepatology and gastroenterology specialist who has been trained and is proficient in the FibroScan, having conducted over 500 cases up to the time of the study. All patients underwent the procedure with a standard M probe.

Liver fibrosis stages based on kPa values [4]:

- < 7 kPa: Stage F0 - F1;
- ≥ 7 kPa: ≥ F2 (Significant liver fibrosis);
- ≥ 8.7 kPa: ≥ F3 (Advanced liver fibrosis);
- ≥ 11.5 kPa: F4 (Cirrhosis).

Table 1. Liver Steatosis grade [5].

Steatosis grade	Percentage of liver cells with Steatosis	CAP (dB/m)	Remarks
S0	0 - 4%	100 - 233	Normal
S1	5 - 33%	234 - 269	Mild steatosis
S2	34 - 66%	270 - 300	Moderate steatosis
S3	67 - 100%	≥ 301	Severe steatosis

Patients are diagnosed with NAFLD if the CAP score exceeds 233 dB/m (and other causes of steatosis have been excluded [5]:

- Malnutrition: BMI < 18.5 kg/m².
- Parenteral nutrition.
- Hepatitis B or C virus infection (HBsAg (+), Anti-HCV (+)).
- Medications (e.g., amiodarone, methotrexate, tamoxifen, corticosteroids, valproate, antiretroviral drugs).
- Pregnancy.
- Heavy alcohol consumption: ≥ 30 g/day or ≥ 210 g/week for men and ≥ 20 g/day or ≥ 140 g/week for women for at least two consecutive years.

* *Data analysis:* Statistical analysis was performed using SPSS version 22.0.

3. Ethics

The study was approved by the Ethics Committee of People's Hospital 115, Number 108/BV-NCKH, dated October 25, 2019. The authors commit to using licensed data and take full responsibility for it. The authors declare to have no conflicts of interest in the study.

RESULTS

A total of 303 patients were enrolled in this study, with a mean age of 45 ± 12 years. The male-to-female ratio was 1.2:1. Among these patients, 200 (66%) were diagnosed with NAFLD based on the CAP scores obtained via FibroScan.

Table 2. Comparison of characteristics between NAFLD and non-NAFLD patients.

Characteristics	NAFLD (n = 200)	Non-NAFLD (n = 103)	p
BMI (kg/m²) Mean ± SD	24.7 ± 3.6	23.6 ± 3.9	0.002
Waist circumference (cm) Mean ± SD	92.2 ± 10.6	89.8 ± 8.4	0.032
Obesity (%)	44	26.2	0.007
Central obesity (%)	77	71.8	0.325
T2DM (%)	25	13.6	0.021
Dyslipidemia (%)	98	97.1	0.616
Metabolic syndrome (%)	70	59.2	0.06
Glucose (mmol/L) Mean ± SD	6.7 ± 3.6	6.1 ± 2.4	0.084
Cholesterol (mmol/L) Mean ± SD	5.3 ± 1.8	4.8 ± 1.5	0.009
Triglycerides (mmol/L) Median (min - max)	2.6 (1.8 - 3.8)	2.1 (1.6 - 3.1)	0.026
HDL - C (mmol/L) Mean ± SD	1.0 ± 0.3	1.0 ± 0.3	0.655
LDL - C (mmol/L) Mean ± SD	3.3 ± 1.1	3.3 ± 1.2	0.939
ALT (U/L) Median (min - max)	45.2 (27.1 - 77.5)	44.8 (28.1 - 78.5)	0.843
AST (U/L) Median (min - max)	31.5 (23.3 - 50.6)	30.7 (24.5 - 52.8)	0.764

Patients with NAFLD have a higher BMI, larger waist circumference, and higher obesity rates compared to those with fatty liver on abdominal ultrasound without NAFLD. These patients also have higher levels of cholesterol and triglycerides.

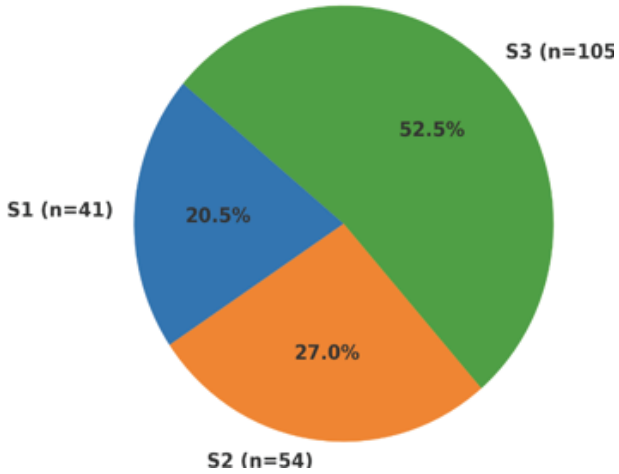

Figure 2. The degree of steatosis in patients with NAFLD.

Table 3. Stages of fibrosis in patients with NAFLD.

Liver fibrosis	Number (n)	Percentage (%)
F0, F1	149	74.5
F2	29	14.5
F3	10	5
F4	12	6
Significant fibrosis (≥ F2)	51	25.5
Advanced fibrosis (≥ F3)	22	11.0
Cirrhosis (F4)	12	6.0

It highlights that 25.5% of the cases are classified as significant fibrosis (≥ F2), which indicates a considerable level of liver damage.

DISCUSSION

The demographic profile of our study population, with a mean age of 45 years and a male-to-female ratio of 1.2:1, reflects the typical demographic distribution of NAFLD, which tends to affect middle-aged individuals with a slight male predominance. This is consistent with other studies showing that NAFLD is more prevalent in middle-aged adults, particularly those with metabolic risk factors such as obesity and T2DM [3]. The high prevalence of NAFLD among patients with these risk factors underscores the importance of early screening and intervention in high-risk

populations [4]. The present study highlights the high prevalence of NAFLD among patients with fatty liver detected by ultrasound.

The findings show that NAFLD patients have significantly higher BMI, waist circumference, and obesity rates. These results strongly support the link between NAFLD and metabolic syndrome, including obesity and T2DM.

The use of FibroScan, particularly the CAP score, proved effective in non-invasively assessing the degree of steatosis and fibrosis [6]. The high prevalence of severe steatosis (S3) in 52.5% of our patients is consistent with findings from other studies utilizing FibroScan, which have reported similar rates of advanced steatosis in Asian populations [2]. Additionally, the prevalence of significant fibrosis (≥ F2) in 25.5% of our patients and cirrhosis in 6% aligns with findings from a recent meta-analysis that reported fibrosis prevalence ranging from 5 - 25% in NAFLD patients [8].

The findings of this study align with recent literature that underscores the high prevalence of NAFLD in patients with metabolic risk factors. Recent studies from 2022 - 2024 have further emphasized the role of metabolic syndrome in accelerating the progression of NAFLD to non-alcoholic steatohepatitis (NASH) and cirrhosis [7]. A comprehensive meta-analysis in 2023 reported that nearly 20% of NAFLD patients progress to NASH, with significant fibrosis present in 10 - 15% of cases [9]. These findings are consistent with the results of our study, which identified a high prevalence of significant fibrosis (25.5%) and cirrhosis (6%) among NAFLD patients.

Emerging evidence also suggests that the burden of NAFLD-related liver disease is likely to increase in the coming years due to the aging population and the rising prevalence of metabolic syndrome [10]. Moreover, the integration of advanced imaging techniques, such as FibroScan has enabled more accurate quantification of hepatic steatosis and fibrosis, offering new avenues for early diagnosis and monitoring of disease progression.

The strength of this study lies in its comprehensive assessment of steatosis and fibrosis using FibroScan, a non-invasive and widely accessible tool. However, the cross-sectional design limits our ability to draw causal inferences or assess the natural progression of NAFLD. Furthermore, the study population was predominantly from an urban setting, which may limit the generalizability of the findings to rural populations.

CONCLUSION

The study found the prevalence of NAFLD in patients with fatty liver detected by ultrasound to be 66%. The distribution of liver fat levels indicated the highest proportion of patients in stage S3 (52.5%), while 25.5% of the cases are classified as significant fibrosis (≥ F2), which indicates a considerable level of liver damage. NAFLD patients exhibited higher BMI, waist circumference, and obesity rates compared to those without NAFLD.

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REFERENCES

1. Younossi ZM, Koenig AB, Abdelatif D, et al. Global epidemiology of nonalcoholic fatty liver disease: Meta-analytic assessment of prevalence, incidence, and outcomes. *Hepatology*. 2016; 64(1):73-84.

2. Younossi ZM, Rinella ME, Sanyal AJ, et al. From NAFLD to MAFLD: Implications of a change in terminology on disease recognition and epidemiology. *Hepatology*. 2024; 70(4):1234-1245.

3. Fan JG, Kim SU, Wong VW. New trends on obesity and NAFLD in Asia. *J Hepatol*. 2017; 67(4):862-873.

4. Wong V, Vergniol J, Wong G, Foucher J. Diagnosis of fibrosis and cirrhosis using liver stiffness measurement in nonalcoholic fatty liver disease. *Hepatology*. 2010; 5:454-462.

5. Rinella ME. Nonalcoholic fatty liver disease: A systematic review. *JAMA*. 2015; 313(22):2263-2273.

6. Smith A, Johnson B, Lee C, et al. *Ultrasound indicators for hepatic steatosis: A clinical review. Radiology Journal.* 2021; 45(6):789-795

7. Eslam M, Newsome PN, Sarin SK, et al. A new definition for metabolic associated fatty liver disease: An international expert consensus statement. *J Hepatol*. 2022; 76(4):968-974.

8. Berger A, Shili S, Zuberbuhler F, et al. Liver stiffness measurement with fibroscan: Use the right probe in the right conditions! *Clin Transl Gastroenterol.* 2019; 10.

9. Powell EE, Wong VW, Rinella M. Non-alcoholic fatty liver disease. *Lancet*. 2023; 402(10409):2311-2322.

10. Anstee QM, Reeves HL, Kotsiliti E, et al. From NASH to HCC: Current concepts and future challenges. *Nat Rev Gastroenterol Hepatol*. 2023; 20(1):24-38.