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Original Research Article

Comparative Efficiency of APRI vs. FIB-4 in Detecting Advanced Liver Fibrosis in NAFLD and NASH

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Abstract: *Non-alcoholic fatty liver disease (NAFLD) and non-alcoholic steatohepatitis (NASH) are significant causes of chronic liver disease, with the progression to advanced fibrosis (F3–F4) significantly impacting prognosis.* ***Objective:*** *To compare the diagnostic accuracy of APRI and FIB-4 scores in detecting advanced liver fibrosis (F3–F4) in NAFLD and NASH patients, using transient elastography (FibroScan) as the reference standard.* ***Methods:*** *This cross-sectional, observational study was conducted at Fauji Foundation Hospital from March 2024 to March 2025. A total of 120 adult patients aged between 18 and 70 years with a confirmed diagnosis of NAFLD or NASH were included in the study. All data were collected using a standardized form. Variables recorded included patient demographics (age, sex, body mass index), comorbidities such as diabetes and hypertension, and relevant laboratory values, specifically serum AST, ALT, and platelet counts.* ***Results:*** *Out of 120 patients, 42 (35%) had advanced fibrosis on fibroscan. The FIB-4 score showed superior diagnostic performance with an AUROC of 0.86 (95% CI: 0.79–0.91), sensitivity of 78.5%, specificity of 85.9%, PPV of 75.6%, and NPV of 87.5%. APRI showed an AUROC of 0.79 (95% CI: 0.71–0.86), sensitivity of 71.4%, specificity of 80.8%, PPV of 66.7%, and NPV of 84.4%. Subgroup analysis confirmed the consistent superiority of FIB-4 across age and diabetic status. FIB-4 also had a lower misclassification rate (15.8%) compared to APRI (21.7%).* ***Conclusion:*** *It is concluded that while both APRI and FIB-4 are practical non-invasive tools for assessing liver fibrosis in NAFLD/NASH, FIB-4 is more accurate in detecting advanced fibrosis. Its greater diagnostic power and stability across subgroups support its use as the preferred first-line fibrosis assessment tool in routine clinical practice.*

Keywords: Non-alcoholic Fatty Liver Disease, Liver Cirrhosis, Fibrosis, Elastography Biomarkers

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Introduction

Non-alcoholic fatty liver disease (NAFLD) has become a dominant cause of chronic liver disease worldwide, affecting an estimated 25–30% of the global population. NAFLD includes a variety of liver disorders, ranging from just having fat in the liver to having non-alcoholic steatohepatitis (NASH), which causes inflammation and damage to the liver cells (1). With the progression of NASH, the liver can develop advanced fibrosis, become cirrhotic, fail, and eventually give rise to cancer. A key point is that the severity of fibrosis, not inflammation or fat amounts, is the most critical factor in determining both liver and overall survival rate in those with NAFLD/NASH (2). It is essential to identify liver fibrosis early and correctly, mainly when it reaches F3–F4, to help with prognosis, grouping patients by risk, deciding on treatments, and ranking them for clinical trials (3). Liver biopsy is still the best way to stage fibrosis. Because biopsy is invasive, not always reliable, costly, and can only be done a few times, using it for mass screening and regular monitoring isn't reasonable (4). Because of this, scientists have focused on non-invasive ways to assess fibrosis, which are now included in nearly every international clinical guideline (5). The Aspartate Aminotransferase to Platelet Ratio Index (APRI) and the Fibrosis-4 (FIB-4) index are commonly accessible and highly used non-invasive fibrosis indices. To work out APRI, use the levels of AST and platelets, but FIB-4 uses age, AST, ALT, and platelet count. They are helpful because they are not costly, can be produced repeatedly, fit into daily practice, and rely on standard parameters commonly measured in such units. They are also helpful for dividing patients into groups with low, medium, or high risk for severe fibrosis, which can help decide if more tests or specialist advice are required. Initially, the scores were validated in patients with chronic hepatitis C; however, they can now be applied to NAFLD, as supported by additional studies (7). But, because of the pathophysiology, liver enzymes and platelet activity can change with each disease, the accuracy of these indices can fluctuate (8). In particular, damage as measured by AST changes less in NAFLD than in viral hepatitis, so the APRI might not be very effective. Likewise, adding age, which is part of FIB-4, may make this score incorrectly predict fibrosis in some older patients, reducing its accuracy (9). Different studies have had mixed outcomes in seeing APRI and FIB-4's usefulness in patients with NAFLD. FIB-4 performs better at excluding advanced fibrosis, but literature indicates that APRI is as accurate as FIB-4 in some particular groups (10). The conclusions from meta-analyses and cohort studies are still mixed, mainly because test accuracy tends to decline in risk levels between mild and severe ones. For this reason, a side-by-side comparison using patient experiences helps find out which choice is more reliable for NAFLD and NASH, since many parts of the world experience these illnesses despite usually having few hepatology specialists, especially in low- and middle-income settings.
Thus, the objective of the study is to compare the diagnostic accuracy of the APRI and FIB-4 scores in detecting advanced liver fibrosis among patients with NAFLD and NASH.

Methodology

This cross-sectional, observational study was conducted at Fauji Foundation Hospital from March 2024 to March 2025. A total of 120 adult patients aged between 18 and 70 years with a confirmed diagnosis of NAFLD or NASH were included in the study. NAFLD/NASH diagnosis was established based on clinical history, liver imaging (ultrasound or elastography), and laboratory investigations, by the American Association for the Study of Liver Diseases (AASLD) guidelines.

The study included adult participants aged over 18 years who had been diagnosed with non-alcoholic fatty liver disease (NAFLD) or non-alcoholic steatohepatitis (NASH). Eligibility required the availability of recent laboratory values, including aspartate aminotransferase (AST), alanine aminotransferase (ALT), and platelet count. All participants were required to provide informed written consent before enrollment. Individuals were excluded if they had co-existing liver diseases such as hepatitis B or C, autoimmune hepatitis, or Wilson's disease. Additional exclusion criteria included alcohol consumption exceeding 20 grams per day for females or 30 grams per day for males, a history of liver transplantation, presence of decompensated cirrhosis or hepatocellular carcinoma, hematological disorders that could affect platelet counts, or incomplete or missing laboratory or baseline data.

All data were collected using a standardized form. Variables recorded included patient demographics (age, sex, body mass index), comorbidities such as diabetes and hypertension, and relevant laboratory values, specifically serum AST, ALT, and platelet counts. These parameters were used to compute APRI and FIB-4 scores using established formulas. The APRI score was calculated as ((AST/ULN) ÷ Platelet count (10^9/L)) × 100, with the upper limit of normal (ULN) for AST set at 40 U/L, as per the institutional laboratory reference range. The FIB-4 score was calculated using the formula: (Age (years) × AST (U/L)) ÷ (Platelet count (10^9/L) × √ALT (U/L)). These scores were then categorized into diagnostic risk zones based on standard threshold values to evaluate their performance. The primary outcome measure was the diagnostic accuracy of APRI and FIB-4 scores in identifying advanced liver fibrosis. The effectiveness of each scoring system was evaluated in terms of sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV). To assess the accuracy of these scores in detecting advanced fibrosis, liver stiffness measurement (LSM) by transient elastography (FibroScan) was used as the reference standard. Fibrosis staging was determined based on validated LSM thresholds for NAFLD/NASH patients. The following cut-off values were applied: F0–F1 defined as LSM < 7.0 kPa, F2 as 7.0–9.5 kPa, F3 as 9.6–12.5 kPa, and F4 as >12.5 kPa. Advanced fibrosis was defined as LSM ≥ 9.6 kPa (F3–F4). The performance of APRI and FIB-4 scores was evaluated against these LSM values.

Data were analyzed using IBM SPSS Statistics version 25. Continuous variables were summarized using means and standard deviations, while categorical variables were expressed as frequencies and percentages. The Youden Index was employed to determine optimal cut-off points for the detection of advanced fibrosis. Sensitivity, specificity, PPV, and NPV were calculated accordingly. A p-value of less than 0.05 was considered significant.

Results

Data were collected from 120 patients. The mean age of the participants was 52.8 ± 10.4 years, with a slight male predominance: 68 males (56.7%) and 52 females (43.3%). The average body mass index (BMI) was 29.7 ± 3.8 kg/m², indicating that the majority of patients were overweight or obese. Regarding comorbid conditions, 72 patients (60%) had type 2 diabetes mellitus, 54 (45%) had hypertension, and 49 (40.8%) had dyslipidemia, reflecting the strong metabolic profile typically associated with NAFLD/NASH. On liver elastography, 78 patients (65%) had non-advanced fibrosis (F0–F2), whereas 42 patients (35%) were found to have advanced fibrosis (F3–F4), emphasizing the need for reliable non-invasive screening tools in this high-risk group. (Table 1). The comparative analysis of the APRI and FIB-4 scores revealed that FIB-4 had better diagnostic performance in identifying advanced liver fibrosis among NAFLD/NASH patients. The mean APRI score was 0.82 ± 0.40, while the mean FIB-4 score was higher at 2.13 ± 0.95. Using cut-off values of 0.7 for APRI and 2.67 for FIB-4, the FIB-4 index demonstrated higher sensitivity (78.5% vs. 71.4%) and specificity (85.9% vs. 80.8%) compared to APRI. FIB-4 achieved better predictive values, with a positive predictive value (PPV) of 75.6% and a negative predictive value (NPV) of 87.5%, while APRI had a PPV of 66.7% and an NPV of 84.4%. The area under the receiver operating characteristic curve (AUROC) was also higher for FIB-4 at 0.86 (95% CI: 0.79–0.91), compared to APRI's AUROC of 0.79 (95% CI: 0.71–0.86), indicating that FIB-4 is a more accurate and reliable non-invasive tool for detecting advanced fibrosis in this population. (Table 2).

Among patients aged over 60 years (n=28), FIB-4 demonstrated a sensitivity of 82.4% and specificity of 79.3%, compared to APRI's sensitivity of 70.0% and specificity of 80.0%. This suggests that while APRI retained stable specificity, FIB-4 was more sensitive in detecting advanced fibrosis in older adults. In diabetic patients (n=72), FIB-4 again showed superior diagnostic metrics, with a sensitivity of 80.6% and specificity of 84.2%, whereas APRI recorded a sensitivity of 72.2% and specificity of 79.5%. (Table 3).

FIB-4 demonstrated a higher sensitivity (78.5%) and specificity (85.9%) compared to APRI, which showed a sensitivity of 71.4% and specificity of 80.8%. This indicates that FIB-4 was more effective both in detecting actual positive cases of advanced fibrosis and in correctly identifying patients without it. Moreover, the positive predictive value (PPV) of FIB-4 was 75.6%, higher than APRI's 66.7%, while its negative predictive value (NPV) reached 87.5%, slightly better than APRI's 84.4%. The area under the receiver operating characteristic curve (AUROC) also favored FIB-4 (0.86 vs. 0.79), confirming its superior discriminatory ability in identifying advanced liver fibrosis among NAFLD/NASH patients. (Table 4).

Table 1: Baseline Characteristics

Variable	Value
Total Patients	120
Mean Age (years)	52.8 ± 10.4
Gender	
– Male	68 (56.7%)
– Female	52 (43.3%)
Mean BMI (kg/m²)	29.7 ± 3.8
Comorbidities	
– Type 2 Diabetes Mellitus	72 (60.0%)
– Hypertension	54 (45.0%)
– Dyslipidemia	49 (40.8%)
Fibrosis Stage	
– F0–F2 (Non-advanced Fibrosis)	78 (65.0%)
– F3–F4 (Advanced Fibrosis)	42 (35.0%)

Table 2: Diagnostic Performance of APRI and FIB-4 for Detecting Advanced Liver Fibrosis

Metric	APRI	FIB-4
Mean Value	0.82 ± 0.40	2.13 ± 0.95
Cut-off Value	0.7	2.67
Sensitivity	71.4%	78.5%
Specificity	80.8%	85.9%
Positive Predictive Value (PPV)	66.7%	75.6%
Negative Predictive Value (NPV)	84.4%	87.5%
AUROC (95% CI)	0.79 (0.71–0.86)	0.86 (0.79–0.91)

Table 3: Subgroup Analysis

Subgroup	FIB-4 Sensitivity	FIB-4 Specificity	APRI Sensitivity	APRI Specificity
Age > 60 years (n=28)	82.4%	79.3%	70.0%	80.0%
Diabetic Patients (n=72)	80.6%	84.2%	72.2%	79.5%

Table 4: Diagnostic Accuracy Comparison

Diagnostic Metric	APRI Score	FIB-4 Score
Sensitivity	71.4%	78.5%
Specificity	80.8%	85.9%
Positive Predictive Value (PPV)	66.7%	75.6%
Negative Predictive Value (NPV)	84.4%	87.5%
AUROC	0.79	0.86

Discussion

This study evaluated and compared the diagnostic performance of two widely used non-invasive fibrosis scoring systems, APRI and FIB-4, in identifying advanced liver fibrosis among patients with NAFLD and NASH. We find that in our group of patients with proven fibrosis, FIB-4 shows a better overall accuracy for both identifying and excluding advanced fibrosis (F3–F4) (12). The discrimination between patients with and without advanced fibrosis was greater in the FIB-4 model, as measured by the AUROC (0.86). Besides, FIB-4 showed a better ability to detect hepatitis B-related fibrosis (sensitivity, 78.5% vs. 71.4%), miss fake cases (specificity, 85.9% vs. 80.8%), and make correct predictions (both positive and negative). Regardless of whether the analyses involved older adults or patients with diabetes, FIB-4 still worked better, though its specificity lowered a bit because of higher baseline FIB-4 for those groups (13).

The results match up with earlier studies. Shah et al. have reported in their meta-analysis that FIB-4 is a better predictor of advanced fibrosis in NAFLD than APRI, with each having pooled AUROC values of 0.84 and 0.76 (14). We found that the NPV for FIB-4 was 87.5% compared to 84.4% seen with APRI, suggesting that it helps screen large populations. Even so, both tools were found to have moderate rates of misclassification. For every 100 cases, APRI incorrectly classified 21.7, including 14 positives that shouldn't have been positive and 12 negatives that should have been positive, but FIB-4 missed only 15 cases (15). Yet, these discoveries point out that we cannot depend purely on biochemical markers in patients with score fluctuations or additional hematologic changes involving platelets (16). A key highlight from the study was that APRI performed stably for individuals of all ages. Although the rate of false negatives became better in the elderly patients who took part, the formula's ability to determine true positives was slightly reduced, as expected. Because APRI ignores the effect of age, it may not overestimate in the case of elderly patients. Nevertheless, our findings show that diagnostic yields from LC-MS are usually lower. The findings from this area have significant consequences for clinical practice (17). In locations where it is hard to access liver biopsy or advanced elastography methods like FibroScan, FIB-4 becomes the first screening approach of choice (1). Its ability to identify more patients accurately with high fibrosis risk avoids unnecessary procedures or unwanted referrals for those with a low risk of fibrosis. In some cases where an abundance of data isn't available or when evaluating young people, APRI may have a place in clinical practice (19). Despite the positives of this study, some limitations still need to be pointed out. For one, the sample included enough people, but the findings might not apply as well to a broader number of groups. Using this kind of study, we are unable to use the test scores to monitor how fibrosis progresses as time goes on. Third, the thresholds used here were not flexible, while new data shows that using different values for different populations could boost the accuracy.

Conclusion

It is concluded that both APRI and FIB-4 are clinically sound, cost-effective, and accessible non-invasive tools for the assessment of liver fibrosis in patients with NAFLD and NASH. However, among the two, FIB-4 exhibits superior diagnostic performance in identifying advanced fibrosis (F3–F4), as evidenced by higher sensitivity, specificity, predictive values, and AUROC. Its ability to more accurately discriminate between early and advanced fibrosis stages makes it a more reliable choice, especially in settings where liver biopsy is not feasible.

Declarations

Data Availability statement
All data generated or analysed during the study are included in the manuscript.
Ethics approval and consent to participate
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Conflict of interest

The authors declared the absence of a conflict of interest.

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All authors reviewed the results and approved the final version of the manuscript. They are also accountable for the integrity of the study.

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