RESEARCH PAPER

Aspartate Aminotransferase to Platelet Ratio Index Score as a Non-Invasive and Inexpensive Tool for Assessing Liver Parenchymal Disease: A Retrospective Analysis

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ABSTRACT

Background: Liver parenchymal diseases represent a major cause of morbidity and mortality, particularly in low- and middle-income countries where access to advanced diagnostic tools is limited. Ultrasonography is the most widely used modality for evaluating liver parenchymal disease in routine clinical practice, but its availability remains inconsistent in resource-limited settings. The APRI (AST to Platelet Ratio Index) score is a simple, non-invasive index derived from routine blood parameters, endorsed by the World Health Organization for liver fibrosis assessment. However, its utility as a diagnostic correlate of liver parenchymal disease using ultrasonography as the reference standard — mirroring real-world clinical practice — remains underexplored.

Objectives: To evaluate the sensitivity and specificity of APRI score in diagnosing liver parenchymal abnormalities, to explore the clinical and biochemical profiles of patients with varying APRI scores, and to analyze the correlation between APRI score and ultrasonographic findings in patients with suspected liver parenchymal disease.

Methods: This hospital-based retrospective analytical study was conducted at Sri Venkateshwaraa Medical College Hospital and Research Centre, Puducherry. A total of 200 patients with documented ultrasonographic evidence of liver parenchymal disease and complete laboratory data including AST and platelet count were included. Patients were categorized into three ultrasonographic groups: fatty liver, liver parenchymal disease (LPD), and LPD with features suggestive of portal hypertension. APRI scores were calculated and compared across groups using one-way ANOVA. Pearson correlation analysis was performed between APRI and biochemical parameters. ROC curve analysis was conducted to determine diagnostic performance, and comparative AUC analysis was performed for APRI, FIB-4, and AAR scores.

Results: The study population had a mean age of 49.57 ± 12.08 years with male predominance (71.5%). Mean APRI scores showed a progressive and statistically significant increase across USG categories: fatty liver (0.541 ± 0.203), LPD (1.072 ± 0.454), and LPD with portal hypertension (2.436 ± 1.278) (ANOVA: $F = 129.348$, $p < 0.001$). APRI correlated strongly with AST ($r = 0.829$) and platelet count ($r = -0.755$), and moderately with bilirubin ($r = 0.633$) and albumin ($r = -0.635$), all statistically significant ($p < 0.001$). ROC analysis yielded an AUC of 0.910 (95% CI: 0.867–0.954) with an optimal cutoff of 0.730, giving a sensitivity of 83.7%, specificity of 87.0%, PPV of 84.6%, and NPV of 86.2%. APRI outperformed FIB-4 (AUC = 0.852) and AAR (AUC = 0.674) on comparative analysis.

Conclusion: The APRI score demonstrates excellent performance in discriminating between ultrasonographic categories of liver parenchymal disease with ultrasonography as the reference standard, at a study-specific optimal cutoff of 0.730. It reliably tracks disease severity across the ultrasonographic spectrum and outperforms FIB-4 and AAR in this cohort. APRI is a simple, inexpensive, and reproducible tool well-suited for first-line liver disease assessment in resource-limited settings.

Keywords: APRI score, liver parenchymal disease, ultrasonography, non-invasive marker, FIB-4, AAR, ROC analysis, resource-limited settings

How to cite this article: Joseph SS, Praveenkumar P, Arunkumar G, Suresh K. Aspartate Aminotransferase to Platelet Ratio Index Score as a Non-Invasive and Inexpensive Tool for Assessing Liver Parenchymal Disease: A Retrospective Analysis. Int J Drug Deliv Technol. 2026;16(67s):1202-1209. DOI: 10.25258/ijddt.16.67s.106

INTRODUCTION

Liver parenchymal disease encompasses a broad spectrum of conditions ranging from hepatic steatosis and non-alcoholic fatty liver disease to progressive fibrosis, cirrhosis, and portal hypertension. These conditions are among the leading causes of non-communicable disease mortality worldwide, with a particularly heavy burden in South and Southeast Asia where alcohol-related liver disease, metabolic syndrome, and nutritional factors converge to accelerate disease progression.[1,2] In India, chronic liver disease and cirrhosis together account for a substantial proportion of medicine admissions at tertiary care centers, and the epidemiological shift toward alcoholic and metabolic etiologies over the past two decades has further increased this burden.

Early detection of liver parenchymal illness is crucial for prompt treatment, avoidance of consequences, and economical use of medical resources. Even though liver biopsies are the gold standard for histological staging, they are invasive, expensive, and come with hazards such sampling mistake and bleeding after the procedure.[3] The diagnostic workup for suspected liver illness usually starts with liver function tests and abdominal ultrasonography in regular clinical practice across Indian

hospitals. This is a practical combination that is widely accessible, non-invasive, and economical. The most common modality used to direct clinical decision-making in this context is ultrasound, which offers accurate macroscopic assessment of hepatic parenchymal change, including echotexture, liver size, surface irregularity, splenomegaly, and ascites [4].

In resource-constrained environments, particularly peripheral hospitals and rural health institutions, the diagnosis process is frequently hampered by a shortage of competent radiologists and ultrasound equipment. In such situations, a simple blood-based test that can reliably identify patients with severe liver parenchymal involvement and guide the appropriate referral would be quite helpful [5].

Serum AST and platelet count are two commonly available laboratory measures that are used to calculate the APRI (Aspartate Aminotransferase to Platelet Ratio Index) score, which was first reported by Wai et al. in 2003.[1] Its biological justification is strong: as portal hypertension develops, platelet count decreases due to hypersplenism and decreased thrombopoietin production, whereas AST increases with increasing hepatic damage. Thus, two distinct pathophysiological effects of progressive liver disease are captured by the APRI formula in a single numerical value. It is especially well suited for deployment in environments with limited resources because it is affordable, repeatable, and doesn't require any specific tools or training.

The World Health Organization has endorsed APRI as a tool for liver fibrosis assessment in resource-constrained environments, based on its acceptable diagnostic accuracy and universal accessibility.[5,6] In the Indian context, studies by Jain et al. and Reddy et al. have confirmed that APRI performs reliably in South Asian tertiary care populations, though these studies used liver biopsy as their reference standard and focused predominantly on cirrhosis staging rather than broader liver parenchymal disease assessment. [7,8]

Majority of recent studies on APRI have focused on specific fibrosis phases in individuals with hepatitis B, hepatitis C, or nonalcoholic fatty liver disease, comparing the score to liver biopsy histology. Despite being technically valid, this paradigm is not used in most Indian institutions, where liver disease is mostly assessed by ultrasound and biopsies are only occasionally carried out. The performance of APRI against an ultrasonographic reference standard—across the whole spectrum from early steatosis to established portal hypertension—and the creation of a workable, institution-specific diagnostic threshold have not been satisfactorily proven.[9,4]

Using ultrasonography as the reference standard, the current retrospective study was conducted to test the usefulness of the APRI score as a low-cost, non-invasive method for evaluating liver parenchymal disease at a tertiary care facility in South India. The study intends to determine an ideal cutoff for differentiating between ultrasonographic categories of liver parenchymal disease and to compare the performance of APRI with two other frequently used non-invasive indices, FIB-4 and AAR, by analyzing APRI performance across three ultrasonographic categories that represent a clinically meaningful disease severity continuum: fatty liver, liver parenchymal disease, and LPD with portal hypertension features.

AIM OF THE STUDY

• To evaluate the utility of the APRI score as a non-invasive and inexpensive tool for assessing liver parenchymal disease.

OBJECTIVES OF THE STUDY

• To identify the sensitivity and specificity of the APRI score in diagnosing liver parenchymal abnormalities.

• To explore the clinical characteristics and biochemical profiles of patients with varying APRI score.

• To analyze the correlation between APRI score and ultrasound findings in patients with suspected liver parenchymal disease.

MATERIALS AND METHODS

Study Design: A retrospective analytical study conducted at the Department of General Medicine in a tertiary care hospital at Ariyur, Puducherry after approval from the institutional ethical committee. Data were collected retrospectively from patients evaluated for a period of one year comprised patients with documented ultrasonographic evidence of liver parenchymal disease who had undergone liver function tests including serum AST and platelet count.

Inclusion Criteria: Patients aged 18 years or older, documented ultrasonographic evidence of liver parenchymal disease, availability of complete laboratory data including AST levels and platelet counts required to calculate the APRI score.

Exclusion Criteria: Pregnant and lactating women, patients with prior liver transplantation, patients with febrile illness affecting platelet levels at the time of evaluation and incomplete or missing data necessary for calculating the APRI score or correlating ultrasonographic findings.

Sample Size: Consecutive sampling was employed. Sample size was calculated based on previously published data from Jain et al. (2015) which reported sensitivity of 91.1% and specificity of 93.1% for APRI in diagnosing liver cirrhosis [7]. Using a prevalence of 18.3%, precision of 10%, and confidence level of 95%, the calculated minimum sample size was 175 patients. A total of 200 patients fulfilling the eligibility criteria were enrolled in the final study, exceeding the minimum requirement.

Data Collection: Patient data were retrieved from the hospital's electronic medical records (EMR) and laboratory information system. Demographic details, laboratory parameters (serum AST (U/L), platelet count (x109/L), total bilirubin (mg/dL), serum albumin (g/dL), ultrasonographic findings liver echotexture, liver size, presence of fatty infiltration, splenomegaly, ascites, USG category were recorded for each patient using a structured data collection proforma.

APRI Score Calculation: The APRI score was calculated using the standard formula:

$$\text{APRI} = \left[\frac{\text{AST/ULN of AST}}{\text{Platelet count } (10^9/\text{L})}\right] \times 100$$

where ULN (Upper Limit of Normal) for AST was taken as 40 U/L as per the institutional laboratory reference range. The APRI score was calculated for each patient from the available AST and platelet count values.

FIB-4 Score Calculation: The FIB-4 index was calculated using the formula: FIB-4 = [Age (years) × AST (U/L)] ÷ [Platelet count (10^9/L) × √ALT (U/L)]. This was used for comparative ROC analysis alongside APRI.

AAR Calculation: The AST/ALT ratio (AAR) was calculated as the simple ratio of serum AST to serum ALT. This was included as the third comparator index in the diagnostic performance analysis.

Ultrasonographic Categorisation: All patients had documented abdominal ultrasonography. Based on USG findings, patients were classified into three categories representing a spectrum of increasing liver parenchymal involvement:

• Fatty Liver — diffuse increased echogenicity of the liver parenchyma consistent with hepatic steatosis, without features of significant architectural distortion

• Liver Parenchymal Disease (LPD) — coarse or heterogeneous echotexture, altered liver size, irregular or nodular surface, suggestive of significant parenchymal disease beyond steatosis

• LPD with Ultrasonographic Features Suggestive of Portal Hypertension — parenchymal disease as above, with additional features including splenomegaly, ascites, or portal vein dilatation

STATISTICAL ANALYSIS

Microsoft Excel 2010 was used to compile the data, and SPSS v23.0 (IBM Corp., Armonk, NY, USA) was used for analysis. Whereas continuous data were displayed as mean ± SD, categorical variables were expressed as frequency and percentage. One-way ANOVA with Bonferroni post-hoc testing was used to compare APRI scores among the three USG groups. Pearson's r was used to evaluate correlations between the APRI score and biochemical indicators (AST, ALT, platelet count, serum bilirubin, and serum albumin). The diagnostic performance of APRI in identifying substantial liver parenchymal disease (LPD and LPD portal hypertension) in comparison to fatty liver was assessed using ROC curve analysis. The Youden index was used to identify the ideal cutoff for reporting AUC, sensitivity, specificity, PPV, and NPV. For the APRI, FIB-4, and AAR scores, a comparative ROC analysis was performed. The threshold for statistical significance was fixed at $p < 0.05$.

RESULTS

A total of 200 patients with documented ultrasonographic evidence of liver parenchymal disease were included in the present retrospective study. All patients had complete laboratory data required for APRI score calculation. The demographic, biochemical, and diagnostic findings are presented below.

Sex Distribution of Study Population:

Table 1. Sex Distribution of Study Population

Sex	Frequency	Percentage (%)
Male	143	71.5
Female	57	28.5
Total	200	100.0

Figure 1: Sex Distribution of Study Population

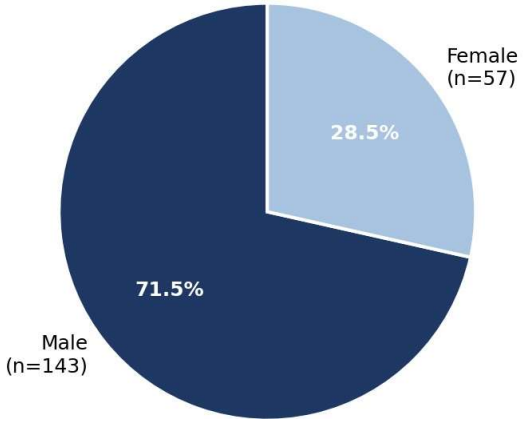

Figure 1: Sex Distribution of Study Population

Out of the total 200 study participants, 143 (71.5%) were males and 57 (28.5%) were females. The study population showed a distinct male predominance with a male-to-female ratio of approximately 2.5:1. (Table 1, Figure 1)

Age Distribution of Study Population:

Table 2. Mean Age of Study Population

Variable	Mean	SD	N
Age (years)	49.57	12.08	200

Table 3. Age Group Distribution

Age Group (years)	Frequency	Percentage (%)
< 40	45	22.5
40 – 49	58	29.0
50 – 59	50	25.0
>= 60	47	23.5
Total	200	100.0

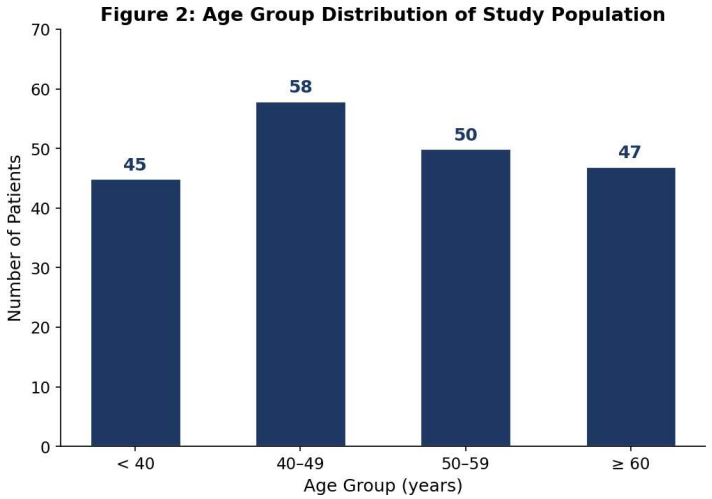

Figure 2: Age Group Distribution of Study Population

The mean age of the study population was 49.57 ± 12.08 years. The majority of participants belonged to the 40–49 year age group (29.0%), indicating that liver parenchymal disease was most prevalent among middle-aged individuals in the present study. The age range spanned from 20 to 81 years. (Table 2-3, Figure 2)

Distribution of Study Population by USG Category

Table 4. Distribution According to USG Category

USG Category	Frequency	Percentage (%)
Fatty Liver	108	54.0
Liver Parenchymal Disease (LPD)	64	32.0
LPD with Portal Hypertension Features	28	14.0
Total	200	100.0

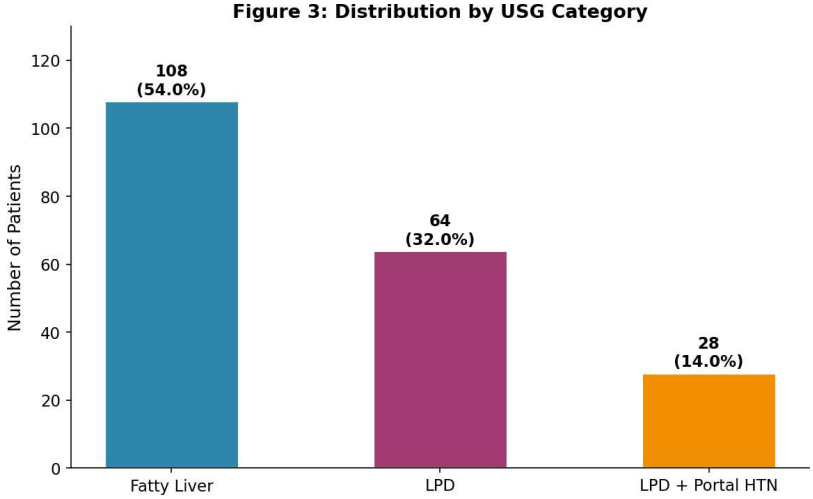

Figure 3: Distribution by USG Category

The largest group comprised patients with fatty liver (n=108, 54.0%), followed by liver parenchymal disease (n=64, 32.0%), and LPD with ultrasonographic features suggestive of portal hypertension (n=28, 14.0%). These three categories represent a spectrum of increasing severity of liver parenchymal involvement, from early fatty change to established portal hypertension. (Table 4, Figure 3)

Biochemical Profile of the Study Population

Table 5. Overall Biochemical and Score Parameters (Mean ± SD)

Parameter	Mean	SD	N
AST (U/L)	61.59	26.82	200
ALT (U/L)	64.89	21.44	200
Platelet Count (x10⁹/L)	191.62	52.16	200
Total Bilirubin (mg/dL)	1.65	0.85	200
Serum Albumin (g/dL)	3.90	0.49	200
APRI Score	0.98	0.85	200
FIB-4 Score	2.44	2.11	200
AAR Score	1.04	0.61	200

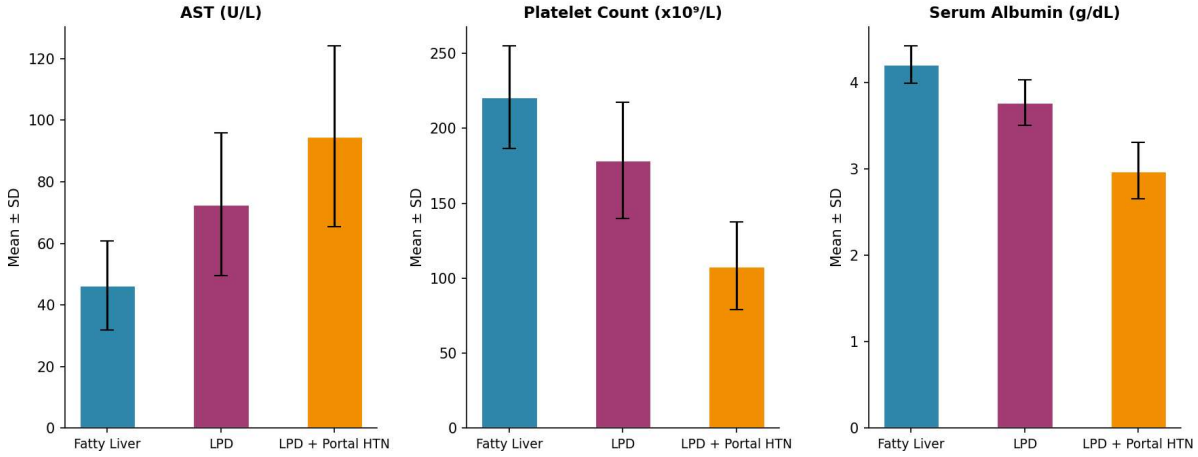

Figure 4: Key Biochemical Parameters across USG Categories (Mean ± SD)

The mean AST was 61.59 ± 26.82 U/L and mean ALT was 64.89 ± 21.44 U/L. The mean platelet count was 191.62 ± 52.16 × 10⁹/L. Mean total bilirubin was 1.65 ± 0.85 mg/dL and mean serum albumin was 3.90 ± 0.49 g/dL. The mean APRI score was 0.98 ± 0.85, with a mean FIB-4 of 2.44± 2.11 and mean AAR of 1.04 ± 0.61. Figure 4 demonstrates a consistent pattern of rising AST, falling platelet count, and declining albumin across the three USG categories, reflecting progressive hepatic dysfunction (Table 5, figure 4).

Comparison of APRI Score across USG Categories

Table 6. APRI Score across USG Categories (One-Way ANOVA)

USG Category	N	Mean APRI	SD	p-value
Fatty Liver	108	0.541	0.203	
LPD	64	1.072	0.454	
LPD with Portal HTN	28	2.436	1.278	
One-Way ANOVA: F = 129.348, p < 0.001				

All three USG categories showed a steady and statistically significant rise in the mean APRI score. The average APRI score was 1.072 ± 0.454 for the LPD group, 2.436 ± 1.278 for the LPD with portal hypertension group, and 0.541 ± 0.203 for the fatty liver group. A highly significant difference between the groups was shown by a one-way ANOVA (F = 129.348, p < 0.001). This progressive growth is visually confirmed by the box plot (Figure 5), which shows distinct distributions for each of the three groups. APRI consistently monitors the degree of liver parenchymal disease as determined by ultrasonography, according to post-hoc pairwise analysis, which verified statistically significant differences between all three pairings (p < 0.001 for each) (Table 6).

Correlation of APRI Score with Biochemical Parameters

Table 7. Pearson Correlation of APRI Score with Biochemical Parameters

Parameter	Pearson r	p-value
AST (U/L)	0.829	< 0.001
ALT (U/L)	0.333	< 0.001
Platelet Count (x10⁹/L)	-0.755	< 0.001
Total Bilirubin (mg/dL)	0.633	< 0.001
Serum Albumin (g/dL)	-0.635	< 0.001

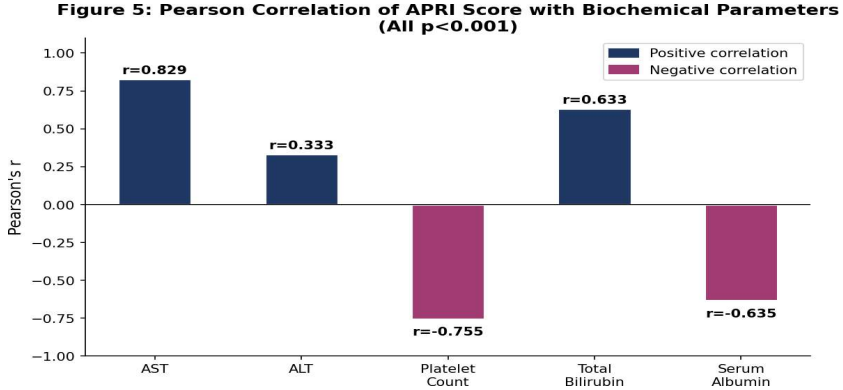

Figure 5: Pearson Correlation Coefficients — APRI vs Biochemical Parameters

The APRI score had a substantial negative connection with platelet count (r = -0.755, p < 0.001) and a high positive correlation with AST (r = 0.829, p < 0.001). There was a moderately negative connection with serum albumin (r = -0.635, p < 0.001) and a moderately positive correlation with total bilirubin (r = 0.633, p < 0.001) and ALT (r = 0.333, p < 0.001). At p < 0.001, every correlation was statistically significant. The direction and strength of each association are depicted in the correlation chart (Figure 6), with platelet count and AST exhibiting the most statistically and clinically significant associations with APRI (Table 7, Figure 5).

Diagnostic Performance of APRI Score — ROC Analysis

Table 8. Diagnostic Performance of APRI Score at Optimal Cutoff

Index	Value		
AUC	0.910	-	-
Optimal Cutoff (Youden Index)	0.730	-	-
Sensitivity	83.7%	TP = 77	FN = 15
Specificity	87.0%	TN = 94	FP = 14
PPV	84.6%	-	-
NPV	86.2%	-	-

Table 9. Comparative AUC — APRI vs FIB-4 vs AAR

Score	AUC	Interpretation	Rank
APRI	0.910	Excellent	1st
FIB-4	0.852	Good	2nd
AAR	0.674	Fair	3rd

Figure 6: ROC Curves — APRI, FIB-4, and AAR

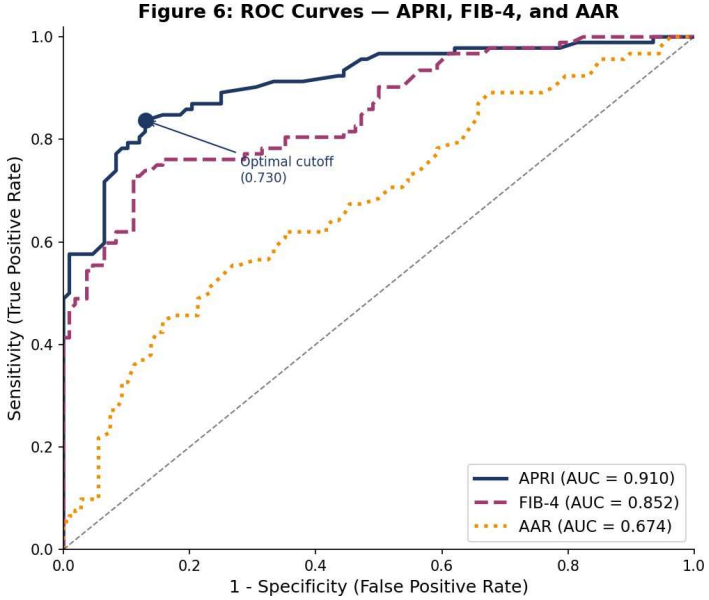

Figure 6: ROC Curves — APRI, FIB-4, and AAR

ROC curve analysis was performed to evaluate the diagnostic performance of APRI score in distinguishing liver parenchymal disease (LPD and LPD with portal hypertension) from fatty liver. The APRI score demonstrated excellent discriminatory ability with an AUC of 0.910. Using the Youden index, the optimal cutoff was identified as 0.730, yielding a sensitivity of 83.7%, specificity of 87.0%, PPV of 84.6%, and NPV of 86.2%.

On comparative analysis, APRI (AUC = 0.910) outperformed both FIB-4 (AUC = 0.852) and AAR (AUC = 0.674) in detecting liver parenchymal disease in this cohort. The ROC curve (Figure 7) demonstrates the superior and consistent discriminatory performance of APRI over the other two indices across all threshold values, establishing it as the most reliable non-invasive marker among the three evaluated in this study (Table 8-9, figure 6).

DISCUSSION

The present retrospective study was undertaken to evaluate the utility of the APRI score as a non-invasive and inexpensive tool for assessing liver parenchymal disease, using ultrasonography as the reference standard. A total of 200 patients with documented ultrasonographic evidence of liver involvement were included, and the APRI score was assessed for its diagnostic performance, correlation with biochemical parameters, and ability to track the severity of parenchymal disease across three ultrasonographic categories.

The study population had a mean age of 49.57 ± 12.08 years, with the 40–49 year age group being the most commonly affected, accounting for 29.0% of patients. This distribution is consistent with the known epidemiology of liver parenchymal disease in India, where middle-aged adults bear the highest burden due to the cumulative effect of metabolic, toxic, and nutritional insults over time. A marked male predominance was noted, with males constituting 71.5% of the study population. This is in keeping with existing literature, where male sex has consistently been

identified as a risk factor for progressive liver disease, attributable in large part to higher rates of alcohol consumption, greater visceral adiposity, and potentially sex-based differences in hepatic fibrogenesis.

The most common ultrasonographic result among the 200 patients examined was fatty liver, which accounted for 54.0% of the cohort. This was followed by liver parenchymal disease (32.0%) and LPD with characteristics suggestive of portal hypertension (14.0%). This distribution illustrates how the epidemiology of liver disease is changing in India, where a significant percentage of chronic liver pathology that presents to tertiary care facilities is now caused by alcohol-related liver disease and non-alcoholic fatty liver disease. A helpful comparator group for assessing APRI performance throughout a range of disease severity, from early parenchymal involvement to established portal hypertension, was also made possible by the cohort's comparatively high percentage of fatty liver.

The consistent and statistically significant rise in mean APRI scores across the three ultrasonographic categories was one of the study's main conclusions. In the fatty liver group, the mean APRI was 0.541 ± 0.203; in the LPD group, it increased to 1.072 ± 0.454; in patients with LPD and portal hypertension symptoms, it peaked at 2.436 ± 1.278. A highly significant difference across groups was confirmed by one-way ANOVA ($F = 129.348$, $p < 0.001$), and post-hoc pairwise comparisons showed that each group differed considerably from the others ($p < 0.001$ for all pairs).

This gradient in APRI scores mirrors the pathophysiological progression of liver disease. As hepatic fibrosis advances, AST levels rise due to ongoing hepatocellular injury while platelet counts fall secondary to hypersplenism and reduced thrombopoietin synthesis by the diseased liver. The APRI formula, which incorporates both these parameters, therefore naturally captures this progression. The finding that patients with portal hypertension features had an APRI more than four times that of the fatty liver group underscores the discriminatory power of this simple score across the disease spectrum.

Reddy S et al. (2024), in a study from India evaluating APRI as a noninvasive indicator for liver cirrhosis, similarly found statistically significant variation in APRI scores across patient groups with different degrees of liver involvement [8]. Their study reported an optimal APRI cutoff of 3.99 for cirrhosis with an AUC of 0.693, noting moderate discriminatory ability in an advanced cirrhotic cohort. The higher cutoff and lower AUC in their study compared to our findings likely reflects the more homogeneous and advanced disease state of their population, in contrast to our cohort which spanned the full spectrum from fatty liver to established portal hypertension. Jain et al. (2015) evaluated APRI as a noninvasive marker for liver cirrhosis and concluded that it could identify cirrhosis with a high degree of accuracy, reporting sensitivity and specificity values that informed the sample size calculation of the present study [7].

APRI score demonstrated a strong positive correlation with AST ($r = 0.829$, $p < 0.001$), which is mathematically anticipated given that AST constitutes the numerator of the APRI formula. However, the strength of this correlation also validates the internal consistency of data entry and score calculation. A strong negative correlation was observed with platelet count ($r = -0.755$, $p < 0.001$), reflecting the progressive thrombocytopenia that accompanies worsening portal hypertension and splenic sequestration. Moderate positive correlations with total bilirubin ($r = 0.633$, $p < 0.001$) and ALT ($r = 0.333$, $p < 0.001$), and a moderate negative correlation with serum albumin ($r = -0.635$, $p < 0.001$), were also noted.

The negative correlation with albumin is particularly clinically meaningful. Serum albumin reflects hepatic synthetic function, and its progressive decline with rising APRI scores indicates that the score is tracking not merely enzymatic activity but the functional deterioration of the liver parenchyma. The modest correlation with ALT compared to AST is also noteworthy. In chronic liver disease, particularly alcoholic liver disease, the AST:ALT ratio typically exceeds 2:1 due to mitochondrial damage and relative ALT depletion, which explains why APRI — using AST rather than ALT — correlates more strongly with the degree of parenchymal disease. This observation is consistent with the findings of Rodrigues et al. (2012) from Portugal, who demonstrated significant correlations between APRI, liver stiffness, and histological staging of fibrosis, concluding that the biochemical underpinning of APRI makes it a reliable surrogate for structural liver change [10].

APRI had an AUC of 0.910 in differentiating between liver parenchymal disease and fatty liver, demonstrating high discriminatory performance. Sensitivity was 83.7%, specificity was 87.0%, PPV was 84.6%, and NPV was 86.2% at the ideal Youden index threshold of 0.730. These numbers are in good agreement with the body of research on APRI performance.

Snyder et al. (2006) reported AUC values in the range of 0.80–0.88 across several fibrosis stages, validating APRI as a simple and accurate predictor of hepatic fibrosis chronic hepatitis C [11]. Using liver biopsy as the reference standard, Lin et al. (2011) found that an APRI score more than 1.0 produced a sensitivity of 76% and specificity of 72% for cirrhosis prediction in an updated meta-analysis of 40 studies encompassing 8,739 patients with chronic hepatitis C (12).

Ultrasonography offers an objective macroscopic assessment of parenchymal change, thus providing a more consistent comparator for APRI validation in ordinary clinical practice, in contrast to biopsy-based studies where sampling error and interobserver variability might alter histological staging. Ayed et al. (2017) evaluated APRI as a predictor of significant liver fibrosis in chronic hepatitis B and found it to be well-performing, concluding that the score is of particular importance in developing countries where non-invasive assessment tools are needed most [13]. Findings of the present study echo this conclusion in a broader liver parenchymal disease context, demonstrating that APRI performs with high accuracy even when the reference standard is imaging rather than histology.

The optimal cutoff of 0.730 identified in the present study is lower than the conventionally cited threshold of 1.0 for significant fibrosis and 2.0 for cirrhosis. This is clinically logical — our cohort included patients across the full spectrum of parenchymal involvement including early fatty change, and identifying any significant parenchymal disease rather than advanced cirrhosis specifically requires a more sensitive threshold. This finding suggests that in a real-world Indian outpatient setting, a cutoff of 0.730 may be more operationally appropriate for triaging patients who require further evaluation, compared to the standard thresholds derived from biopsy-based hepatitis studies in Western populations.

On comparative ROC analysis, APRI (AUC = 0.910) outperformed both FIB-4 (AUC = 0.852) and AAR (AUC = 0.674). The superior performance of APRI over FIB-4 in this cohort is noteworthy, as several published studies have reported comparable or marginally superior performance for FIB-4 in hepatitis C-related fibrosis. Lee et al. (2020) in a systematic review of NAFLD-related outcomes found FIB-4, APRI, and NFS to have comparable performance in risk stratification, while Catanzaro et al. (2021) confirmed that both FIB-4 and APRI adequately predicted severe fibrosis and cirrhosis in chronic hepatitis C [6]. The advantage of APRI over FIB-4 in our population may relate to the fact that FIB-4 incorporates age as a variable, which can introduce noise in middle-aged cohorts where physiological age-related changes in biochemistry overlap with early disease. APRI, relying solely on AST and platelet count, may therefore offer a cleaner signal in this age group.

The markedly lower AUC of AAR (0.674) confirms its limited utility as a standalone diagnostic tool in this setting, consistent with its established role as a supplementary rather than primary marker of hepatic fibrosis. An APRI score, calculable from two routinely available parameters — AST and platelet count — at

minimal cost, could serve as a practical first-line screening tool to identify patients with significant liver parenchymal disease who require further evaluation or referral. With a sensitivity of 83.7% and specificity of 87.0% at a cutoff of 0.730, the score demonstrates sufficient diagnostic accuracy to be clinically meaningful.

Furthermore, the strong correlation of APRI with the severity of ultrasonographic disease — from fatty liver through LPD to portal hypertension — suggests that the score may also have utility in longitudinal monitoring of disease progression, though prospective studies are needed to validate this application. The WHO has already endorsed APRI as a tool for assessing liver fibrosis in hepatitis C, and the present study provides evidence supporting its broader application in general liver parenchymal disease assessment.

CONCLUSION

This retrospective analytical study establishes the APRI (Aspartate Aminotransferase to Platelet Ratio Index) score as a simple, low-cost, biologically sound, and diagnostically accurate non-invasive tool for assessing liver parenchymal disease in South Indian tertiary care populations, with ultrasonography serving as the reference. At the locally determined ideal cut-off of 0.730, which is lower than traditionally stated thresholds and represents the wider illness spectrum in this cohort, APRI showed outstanding discriminatory performance (AUC = 0.910) with clinically relevant sensitivity, specificity, PPV, and NPV. Its pathophysiological validity is supported by strong correlations with platelet count and AST as well as noteworthy relationships with albumin, bilirubin, and ALT. Comparative ROC analysis demonstrated APRI's robustness and decreased vulnerability to age-related variability, confirming its advantages over FIB-4 and AAR. In countries with limited resources and uneven access to advanced imaging, APRI has significant clinical and public health utility as a first-line screening and triage tool due to its dependence on standard laboratory markers. This work provides a population-specific cut-off and confirms that APRI is a useful, precise, and scalable method for assessing liver disease in practical settings.

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