

Prognostic Value of Child-Pugh, MELD, and ALBI Scores in Cirrhotic Patients

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DOI: <https://doi.org/10.36347/sjmcr.2026.v14i10.059>

| Received: 17.08.2026 | Accepted: 22.10.2026 | Published: 30.10.2026

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Abstract

Original Research Article

Background & Objective: Risk stratification in cirrhotic patients relies primarily on the Child-Pugh classification, Model for End-Stage Liver Disease (MELD), and Albumin-Bilirubin (ALBI) scores. These scoring systems serve to evaluate liver disease severity, risk of decompensation, and overall prognosis. The objective of this study was to assess the relationship between these prognostic scores and the primary clinical manifestations of hepatic decompensation in cirrhotic patients. **Patients and Methods:** This single-center cross-sectional study included 50 patients diagnosed with liver cirrhosis. Demographic, etiological, laboratory, and clinical parameters were collected. Hepatic disease severity was stratified using the Child-Pugh classification, MELD score, and ALBI score. Associations between these scores and major cirrhotic complications including ascites, hepatic encephalopathy, gastrointestinal bleeding, ascitic fluid infection (spontaneous bacterial peritonitis), and jaundice were evaluated using Chi-square, Mann-Whitney U, and Spearman correlation tests. **Results:** Fifty patients were evaluated: 17 in Child-Pugh class A (34%), 18 in class B (36%), and 15 in class C (30%). Median MELD score was 15 (range: 7–28) and median ALBI score was 1.47 (range: 0.24–2.84). Complication rates were: ascites in 29 patients (58%), hepatic encephalopathy in 12 (24%), gastrointestinal hemorrhage in 11 (22%), ascitic fluid infection in 4 (8%), and jaundice in 3 (6%). MELD score increased significantly alongside Child-Pugh severity ($p < 0.001$). MELD score showed statistically significant associations with hepatic encephalopathy ($\rho = 0.351$; $p = 0.014$), ascites ($\rho = 0.389$; $p = 0.006$), and jaundice ($\rho = 0.311$; $p = 0.030$). Child-Pugh class was likewise significantly associated with ascites ($p < 0.001$), hepatic encephalopathy ($p < 0.001$), and ascitic fluid infection ($p = 0.006$). In contrast, the ALBI score did not demonstrate the expected distribution relative to liver disease severity. **Conclusion:** The MELD score and Child-Pugh classification were significantly correlated with major hepatic decompensation events, notably ascites, hepatic encephalopathy, and ascitic fluid infection. Both tools remain highly effective for clinical risk stratification. Conversely, the ALBI score failed to display the expected distribution corresponding to liver disease severity in this cohort.

Keywords: Liver cirrhosis; Child-Pugh score; MELD score; ALBI score; Hepatic decompensation; Prognosis.

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1. INTRODUCTION

Liver cirrhosis represents a major chronic liver disease characterized by progressive functional impairment leading to hepatic insufficiency and severe clinical decompensation events, including ascites, gastrointestinal hemorrhage secondary to esophageal variceal rupture, hepatic encephalopathy, bacterial infections, and hepatorenal syndrome. Accurate prognostic assessment is essential to guide clinical monitoring, optimize pharmacological and procedural interventions, and inform liver transplantation prioritization. [1]

The Child-Pugh classification remains the most widely established bedside tool in routine clinical

practice. It incorporates five clinical and laboratory variables: serum bilirubin, serum albumin, prothrombin time/INR, ascites severity, and degree of hepatic encephalopathy. The Model for End-Stage Liver Disease (MELD) score initially validated to predict short-term mortality after transjugular intrahepatic portosystemic shunt (TIPS) utilizes serum bilirubin, INR, and serum creatinine to objectively measure disease severity and prioritize organ allocation in liver transplantation. [1,2,3]

More recently, the Albumin-Bilirubin (ALBI) grade was introduced as a simple, objective model designed to assess functional liver reserve relying exclusively on serum albumin and bilirubin concentrations, eliminating subjective clinical

Citation: Laroussi, R., El Oufir, M., Jioua, C., Radouan, I., Ouahid, S., Berrag, S., Nejari, F., Adioui, T., & Tamzouarte, M. (2026). Prognostic Value of Child-Pugh, MELD, and ALBI Scores in Cirrhotic Patients. *Sch J Med Case Rep*, 14(10), 2382-2384. <https://doi.org/10.36347/sjmcr.2026.v14i10.059>

parameters like ascites or encephalopathy. Although initially validated in hepatocellular carcinoma, its prognostic utility across general cirrhotic populations continues to be evaluated. ^[1,2]

The primary objective of this study was to evaluate the prognostic utility of the Child-Pugh, MELD, and ALBI scores in a cohort of 50 cirrhotic patients by analyzing their direct associations with major clinical complications of liver disease.

2. PATIENTS AND METHODS

2.1 Study Design and Patient Selection

This single-center cross-sectional observational study was conducted at the Department of Gastroenterology I of the Mohammed V Military Instruction Hospital in Rabat, Morocco. Patients diagnosed with liver cirrhosis who had complete clinical, laboratory, and imaging records including formal evaluations of Child-Pugh, MELD, and ALBI scores as well as documented decompensation episodes were consecutively included.

2.2 Study Variables and Operational Definitions

The following baseline parameters were systematically retrieved from patient records:

- Demographic characteristics: Age and sex.
- Etiology of cirrhosis: Viral hepatitis B (HBV), viral hepatitis C (HCV), indeterminate etiology, or other etiologies.
- Liver function scores: Child-Pugh class (A, B, or C), MELD score, and ALBI score.
- Laboratory parameters: Total bilirubin, serum albumin, INR, platelet count, aspartate aminotransferase (AST), and alanine aminotransferase (ALT).
- Cirrhosis complications: Presence of ascites, hepatic encephalopathy, overt jaundice, upper gastrointestinal bleeding, and ascitic fluid infection (spontaneous bacterial peritonitis).

Hepatic decompensation was operationalized as the presence of at least one major clinical event: ascites, hepatic encephalopathy, upper gastrointestinal bleeding, or ascitic fluid infection. Upper gastrointestinal bleeding was defined as a documented hemorrhage episode, predominantly hematemesis or melena.

2.3 Statistical Analysis

Statistical processing was performed using standard epidemiological metrics. Qualitative variables were reported as absolute counts and percentages (n, %). Quantitative variables were presented as medians and ranges (minimum–maximum). Comparisons across Child-Pugh classes were analyzed using the Kruskal-Wallis non-parametric test for continuous variables and the Chi-square test (or Fisher's exact test where appropriate) for categorical variables. Non-parametric correlations between hepatic scores and clinical

complications were determined using Spearman's rank correlation coefficient (ρ). Statistical significance was defined as a two-tailed p -value < 0.05 .

3. RESULTS

3.1 Baseline Characteristics of the Cohort

A total of 50 patients with cirrhosis were evaluated. Distribution according to the Child-Pugh classification was: 17 patients in class A (34%), 18 patients in class B (36%), and 15 patients in class C (30%).

Overall cohort median values were: MELD score of 15 (range: 7–28), ALBI score of 1.47 (range: 0.24–2.84), total bilirubin of 18 $\mu\text{mol/L}$, serum albumin of 28 g/L, and platelet count of 79,500/ mm^3 .

3.2 Concordance and Relationship Among Hepatic Scores

MELD score exhibited a strong, progressive increase alongside advancing Child-Pugh severity class. Median MELD scores were 12 in Child-Pugh class A, 15 in class B, and 17.5 in class C, a relationship that achieved statistical significance ($p < 0.001$).

Conversely, median ALBI score demonstrated an inverse distribution across Child-Pugh classes: 2.40 in Child-Pugh A, 1.42 in Child-Pugh B, and 0.90 in Child-Pugh C. This paradoxical trend represents an unexpected anomaly that contrasts with standard physiological expectations, wherein higher ALBI values correspond to worse functional impairment.

3.3 Associations Between Scores and Cirrhotic Complications

Across the total cohort of 50 patients, clinical complications occurred at the following frequencies: ascites in 29 patients (58%), hepatic encephalopathy in 12 (24%), upper gastrointestinal hemorrhage in 11 (22%), ascitic fluid infection in 4 (8%), and overt jaundice in 3 (6%).

MELD score was significantly correlated with three key clinical features:

- Hepatic encephalopathy ($\rho = 0.351$; $p = 0.014$)
 - Presence of ascites ($\rho = 0.389$; $p = 0.006$)
 - Clinical jaundice ($\rho = 0.311$; $p = 0.030$)
- Child-Pugh class was likewise strongly associated with major decompensation events:
- Ascites ($p < 0.001$)
 - Hepatic encephalopathy ($p < 0.001$): absent in Child-Pugh A, observed in 3 Child-Pugh B patients, and present in 9 Child-Pugh C patients.
 - Ascitic fluid infection ($p = 0.006$): observed exclusively among Child-Pugh C patients.

Regarding gastrointestinal hemorrhage ($n = 11$), no statistically significant associations were detected

with MELD score ($p = 0.504$), ALBI score ($p = 0.460$), or Child-Pugh class ($p = 0.066$).

Table 1. Summary of Clinical Characteristics, Scores, and Complications (N = 50)

Parameter / Variable	Value / Distribution	Statistical Association
Child-Pugh Class A	17 (34%)	Base Category
Child-Pugh Class B	18 (36%)	Associated with Ascites, HE, SBP ($p < 0.01$)
Child-Pugh Class C	15 (30%)	Highest risk for SBP & HE
MELD Score (Median, Range)	15 (7–28)	Increases with Child-Pugh ($p < 0.001$)
ALBI Score (Median, Range)	1.47 (0.24–2.84)	A: 2.40 B: 1.42 C: 0.90 (Inverted)
Ascites, n (%)	29 (58%)	MELD ($p = 0.006$) Child-Pugh ($p < 0.001$)
Hepatic Encephalopathy, n (%)	12 (24%)	MELD ($p = 0.014$) Child-Pugh ($p < 0.001$)
GI Bleeding, n (%)	11 (22%)	No significant association ($p > 0.05$)
Ascitic Fluid Infection (SBP), n (%)	4 (8%)	Child-Pugh ($p = 0.006$, Class C only)
Jaundice, n (%)	3 (6%)	MELD ($p = 0.030$)
Laboratory Parameters (Medians)	Bili: 18 $\mu\text{mol/L}$ Alb: 28 g/L Plt: 79.5k	Biological baseline

4. DISCUSSION

The findings of this single-center study confirm the robust prognostic value of the Child-Pugh classification and MELD score in evaluating disease severity among patients with liver cirrhosis. The strong linear progression of MELD scores across Child-Pugh classes (A to C) aligns seamlessly with extensively published global literature. [5,6,7]

The significant associations observed between MELD score and specific decompensation features namely ascites, hepatic encephalopathy, and jaundice are physiologically coherent. MELD integrates objective biochemical parameters (bilirubin, INR, creatinine) that directly reflect worsening hepatic synthesis, excretory failure, and secondary renal impairment. Similarly, the Child-Pugh classification demonstrated powerful discriminatory capacity for portal hypertension complications and overall liver failure, showing marked clustering of encephalopathy and bacterial peritonitis in Child-Pugh C patients. [6,8]

In contrast, upper gastrointestinal bleeding secondary to esophageal variceal rupture showed no significant statistical association with any of the three prognostic scores evaluated. This finding reflects the distinct pathophysiological mechanism of acute variceal hemorrhage, which is fundamentally governed by local hemodynamic factors specifically the hepatic venous pressure gradient (HVPG) and structural variceal size rather than systemic hepatocellular synthetic capacity alone. [6,7,8]

Regarding the ALBI score, the paradoxical inverse distribution observed in this dataset warrants specific comment. In validated international cohorts, ALBI scores increase (becoming less negative or higher) alongside disease progression. The inverse pattern noted here highlights potential cohort-specific limitations, sample size constraints, or data collection anomalies that underscore the necessity of prospective validation before

implementing ALBI in non-standardized clinical settings. [5,6,7,8]

5. CONCLUSION

In conclusion, this study demonstrates that the MELD score and Child-Pugh classification remain highly reliable, clinically relevant prognostic tools for predicting major liver decompensation events particularly ascites, hepatic encephalopathy, and ascitic fluid infection in cirrhotic patients. Conversely, the ALBI score failed to exhibit expected physiological trends in this cohort, emphasizing that caution and further prospective validation are required before relying on ALBI as a standalone prognostic indicator in similar clinical populations.

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