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Original Article

Correlation of Albi and Palbi Grades with Child–Pugh and Meld Scores in Decompensated Chronic Liver Disease: A Cross-Sectional Study

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ABSTRACT

Background: Decompensated chronic liver disease (DCLD) is associated with significant morbidity and mortality due to complications such as ascites, hepatic encephalopathy, and variceal bleeding. Conventional scoring systems like Child–Turcotte-Pugh (CTP) and Model for End-Stage Liver Disease (MELD) are widely used but have limitations due to subjectivity and laboratory variability. Objective scores such as Albumin–Bilirubin (ALBI) and Platelet–Albumin–Bilirubin (PALBI) have emerged as potential alternatives. **Materials and Methods**: This cross-sectional observational study included 100 patients with DCLD attending a tertiary care center in lower Assam. ALBI and PALBI scores were calculated and categorized into grades. Their correlation with CTP and MELD scores was assessed using Pearson correlation. Associations with complications such as ascites, hepatic encephalopathy, variceal bleeding, and spontaneous bacterial peritonitis were evaluated. **Results**: The mean age was 52 ± 12 years, with 81% males and 19% females. Alcohol was the most common etiology (57%). Most patients were Child–Pugh Class B (46%) or C (44%). PALBI showed strong positive correlation with Child–Pugh ($r = 0.83$, $p < 0.001$) and MELD ($r = 0.77$, $p < 0.001$), whereas ALBI showed weak, non-significant correlations ($r \approx 0.04$, $p > 0.05$). Higher PALBI grades were associated with increased frequency of complications, while ALBI showed weaker associations. **Conclusion**: PALBI is a superior, simple, and cost-effective tool compared to ALBI for assessing disease severity in DCLD, particularly in resource-limited settings.

Keywords: *Decompensated chronic liver disease, ALBI score, PALBI score, Child–Pugh score, MELD score, Portal hypertension.*

INTRODUCTION

Decompensated chronic liver disease (DCLD) represents an advanced stage of chronic liver disease characterized by the development of complications such as ascites, hepatic encephalopathy, variceal bleeding, and spontaneous bacterial peritonitis. These complications are associated with significant morbidity and mortality, making accurate assessment of disease severity essential for prognostication and clinical decision-making.

Traditionally, the severity of liver disease has been assessed using scoring systems such as the Child-Turcotte-Pugh (CTP) score and the Model for End-Stage Liver Disease (MELD) score. While widely used, these scoring systems have certain limitations. Pugh et al. (1973) described the Child–Pugh score, which includes subjective clinical parameters such as ascites and hepatic encephalopathy, leading to interobserver variability. The MELD score, proposed by Kamath et al. (2001) and later refined by Wiesner et al. (2003) is more objective but relies on the international normalized ratio (INR), which can be influenced by external factors such as anticoagulant use and laboratory variability.

In recent years, newer objective scoring systems such as the Albumin–Bilirubin (ALBI) and Platelet–Albumin–Bilirubin (PALBI) scores have been developed to overcome these limitations. Johnson et al. (2015) introduced the ALBI score based solely on serum albumin and bilirubin levels. Subsequently, Roayaie et al. (2017) developed the PALBI score, which incorporates platelet count, thereby reflecting both hepatic synthetic function and portal hypertension.
Several studies have demonstrated the utility of ALBI and PALBI scores in assessing liver function and predicting outcomes in patients with hepatocellular carcinoma and chronic liver disease. Hiraoka et al. (2019), Deng et al. (2020), and Mahmud et al. (2021) reported that these scores correlate well with disease severity and clinical outcomes. Furthermore, Oikonomou et al. (2019) highlighted their prognostic significance in patients with decompensated cirrhosis.

However, there is limited data evaluating their role specifically in patients with decompensated chronic liver disease, particularly in the Indian population and in resource-limited settings. Studies by Kumar et al. (2020), Rathod et al. (2021), and Naik et al. (2022) have emphasized their applicability in such settings.

Given the need for simple, objective, and reproducible tools to assess disease severity in DCLD, this study was undertaken to evaluate the correlation of ALBI and PALBI scores with conventional severity scoring systems and their association with clinical complications.

Objective
To evaluate the correlation of ALBI and PALBI scores with conventional severity scores and their association with clinical complications in patients with decompensated chronic liver disease.

METHODOLOGY

Study Design and Setting
This was a cross-sectional observational study conducted in the Department of General Medicine, Barpeta Medical College and Hospital (BMCH), Barpeta, Assam.

Study Duration
The study was conducted over a period of 6 months, from April 2025 to September 2025.

Study Population
Patients with decompensated chronic liver disease (DCLD) admitted to the medicine ward of Barpeta Medical College and Hospital were included in the study.

Inclusion Criteria
Patients aged 18 years and above with a diagnosis of DCLD were included in the study. Decompensation was defined by the presence of at least one of the following complications- ascites, hepatic encephalopathy, variceal bleeding or spontaneous bacterial peritonitis. All participants provided informed consent.

Exclusion Criteria
Patients with acute liver failure or acute-on-chronic liver failure, hepatocellular carcinoma, active alcohol consumption within the last 3 months, severe comorbid conditions not attributable to liver disease, active infections unrelated to liver disease, a history of liver transplantation, or those who were pregnant or lactating were excluded from the study.

Data Collection
Detailed clinical history was obtained from all patients. A thorough physical examination was performed with particular emphasis on signs of chronic liver disease and decompensation. All patients underwent blood investigations that included CBC (complete blood count including platelet count), LFT (liver function tests including serum albumin), RFT (renal function tests including electrolytes), coagulation profile (prothrombin time, INR); ultrasonography of the abdomen and upper gastrointestinal endoscopy.

Chronic liver disease was defined by (Garcia-Tsao et al., 1985) the presence of clinical signs of hepatocellular failure (such as jaundice, hepatic encephalopathy, spider angioma, palmar erythema, testicular atrophy and gynaecomastia in males, breast atrophy in females) along with signs of portal hypertension (ascites, splenomegaly, varices) and ultrasonographic features suggestive of chronic liver disease (including coarse echotexture, nodular surface, decreased caudate to right lobe (C/RL) ratio and features of portal hypertension).

The etiology of chronic liver disease (CLD) was determined using clinical history, physical findings and targeted laboratory investigations. Viral causes included Hepatitis B, identified by the presence of HBsAg, and Hepatitis C, confirmed by anti-HCV antibodies. Alcohol-related liver disease was diagnosed based on a history of significant alcohol consumption (≥ 40–80 g/day in men and ≥ 20–40 g/day in women for 10–12 years). Non-alcoholic steatohepatitis (NASH) was considered in the absence of significant alcohol intake (< 20-40 g/day) and after exclusion of other causes. Autoimmune hepatitis (AIH) was diagnosed by excluding viral, metabolic, and drug-induced causes, supported by laboratory parameters such as AST/ALP > 3 and established scoring systems (Revised Original Scoring System for diagnosis of AIH). Wilson's disease was suggested by low serum ceruloplasmin (<14 mg/dL) and elevated 24-hour urinary copper excretion (>40 µg/day), with or without Kayser–Fleischer rings. Cases in which no etiology could be established after comprehensive evaluation were classified as cryptogenic cirrhosis. (Feldman et al., 2021).

The following complications were assessed:

- Ascites (graded clinically/USG guided)
- Hepatic encephalopathy (West Haven criteria)
- Variceal bleeding (based on history and/or endoscopy)
- Spontaneous bacterial peritonitis

Assessment of Severity Scores

1. ALBI Score- The ALBI score was calculated using the formula:
   ALBI = ($\log_{10}$ bilirubin × 0.66) + (albumin × –0.085).

Patients were classified as:

- Grade 1: ≤ –2.60
- Grade 2: > –2.60 to ≤ –1.39
- Grade 3: > –1.39

2. PALBI Score- The PALBI score was calculated using the formula:
PALBI = 2.02 × $\log_{10}$ bilirubin – 0.37 × ($\log_{10}$ bilirubin)² – 0.04 × albumin – 3.48 × $\log_{10}$ platelets + 1.01 × ($\log_{10}$ platelets)²
Patients were classified as:

- Grade 1: ≤ –2.53
- Grade 2: > –2.53 to ≤ –2.09
- Grade 3: > –2.09

3. Child–Pugh Score: The Child–Pugh score was calculated using serum bilirubin, serum albumin, INR (International Normalized Ratio), ascites, hepatic encephalopathy.
Patients were classified into:

- Class A: 5-6: well compensated
- Class B: 7-9: significant functional compromise
- Class C: 10-15: decompensated disease

4. MELD Score
The MELD score was calculated using serum bilirubin, serum creatinine, and INR according to the standard formula.
MELD = 3.78 x In(bilirubin) + 11.2 x In(INR) + 9.57 x In(creatinine) + 6.43

Statistical Analysis

Data was analyzed using Statistical Package for the Social Sciences (SPSS) version 25.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean ± standard deviation (SD), and categorical variables were expressed as frequencies and percentages. Correlation between variables was assessed using the Pearson correlation coefficient (r). A value of r > 0.7 was considered a strong correlation, 0.3–0.7 as moderate, and < 0.3 as weak. A p-value < 0.05 was considered statistically significant.

RESULTS

Baseline Characteristics of the Study Population

A total of 100 patients with decompensated chronic liver disease (DCLD) were included in the study. The mean age of the study population was 52 ± 12 years. There was a marked male predominance, with 81 males (81%) and 19 females (19%). (Table 1 and 2)

Alcohol-related liver disease was the most common etiology, accounting for approximately 57% cases, followed by non-alcoholic steatohepatitis (NASH) in 31%, while other causes constituted the remaining 12%. (Table 3)

The majority of patients presented with advanced disease. According to the Child–Pugh classification, Class A was observed in 10% of patients, Class B in 46%, and Class C in 44%. (Table 4, Figure 1)

Distribution of ALBI and PALBI Grades

ALBI and PALBI scores were calculated for each patient and categorized into standard grades. For ALBI, Grade 3 was observed in 60% of patients, Grade 2 in 35%, and Grade 1 in 5%. For PALBI, Grade 3 was observed in 72% of patients, Grade 2 in 24%, and Grade 1 in 4%. (Table 5, Figure 2)

Correlation of ALBI and PALBI with Severity Scores
Pearson correlation analysis demonstrated that PALBI showed a strong positive correlation with established severity scores. PALBI correlated significantly with the Child–Pugh score ($r = 0.83$, $p < 0.001$) and the MELD score ($r = 0.77$, $p < 0.001$). In contrast, ALBI showed weak and non-significant correlations with both Child–Pugh and MELD scores ($r \approx 0.04$, $p > 0.05$). These findings indicate that PALBI correlates significantly with established severity scores, whereas ALBI does not demonstrate a meaningful association. These findings are summarized in Table 6 and illustrated in Figure 3 and 4.

Correlation of ALBI and PALBI scores with complications of chronic liver disease
Clinical complications were common in the study population. Ascites (78%) was the most common complication, followed by variceal bleeding (38%), hepatic encephalopathy (18%), and spontaneous bacterial peritonitis (7%).
ALBI score showed very weak correlations with all complications ($r \approx 0.03–0.08$) and no statistical significance ($p > .05$). PALBI score showed strong positive correlations with all complications ($r \approx 0.61$ -- 0.75), all of which were statistically significant ($p < 0.001$). The strongest association was observed between PALBI and variceal bleeding ($r = 0.75$), followed by ascites ($r = 0.72$).

PALBI score correlates much better with complications of chronic liver disease than ALBI score. These findings are summarized in Table 7 and illustrated in Figure 5.

TABLES

Table 1: Age distribution of the study population

Age Group (years)	Frequency (n)	Percentage (%)
20–30	6	6
31–40	18	18
41–50	28	28
51–60	26	26
61–70	16	16
>70	6	6
Total	*100*	*100*

Table 2: Gender distribution

Gender	Frequency (n)	Percentage (%)
Male	81	81
Female	19	19
Total	*100*	*100*

Table 3: Etiology of Cirrhosis

Etiology	Frequency (n)	Percentage (%)
Alcohol	57	57
NASH/MAFLD	31	31
Hepatitis B	3	3
Hepatitis C	1	1
Alcohol + Hepatitis B	1	1
Alcohol + Hepatitis C	1	1

Autoimmune	2	2
Wilson's disease	1	1
Cryptogenic	3	3
Total	*100*	*100*

Table 4: Child–Pugh Classification

Class	Frequency (n)	Percentage (%)
A	10	10
B	46	46
C	44	44
Total	*100*	*100*

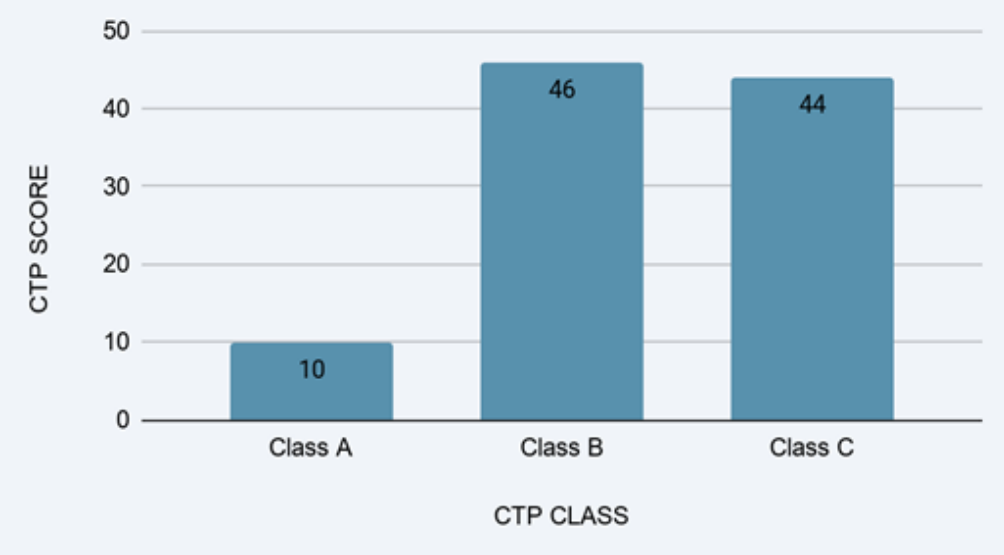

Figure 1: Bar diagram showing Child-Pugh classification of the study population

Table 5: Distribution of ALBI and PALBI Grades

Grade	ALBI (n)	ALBI (%)	PALBI (n)	PALBI (%)
Grade 1	5	5	4	4
Grade 2	35	35	24	24
Grade 3	60	60	72	72
Total	*100*	*100*	*100*	*100*

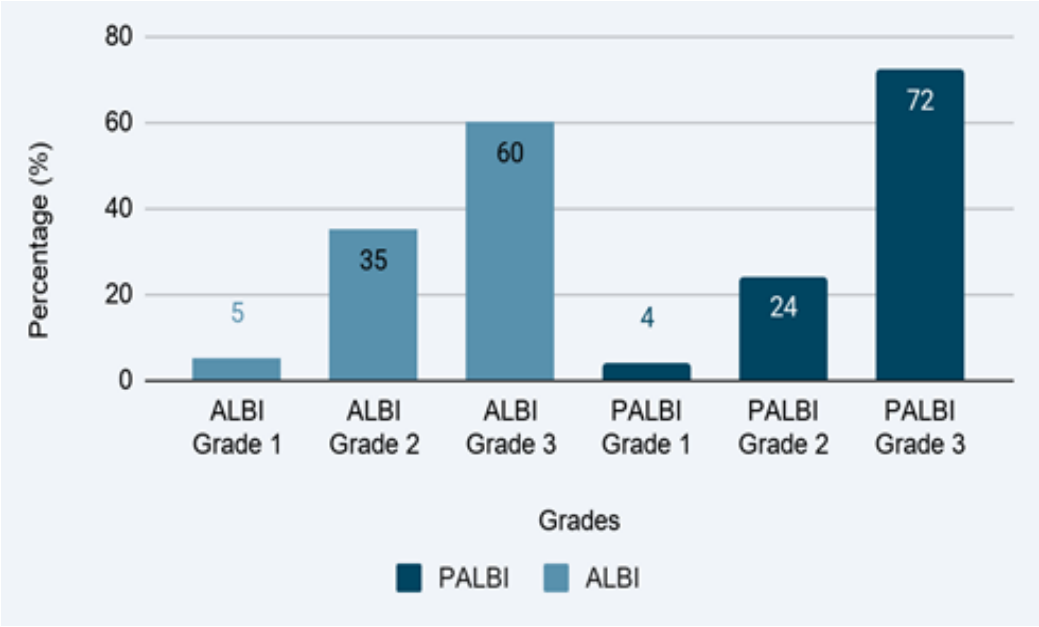

Figure 2: Bar diagram showing distribution of ALBI and PALBI grades (%)

Table 6: Correlation of ALBI and PALBI with Severity Scores

Parameter	Child–Pugh (r)	MELD (r)	p-value
ALBI	0.04	0.04	0.68, NS
PALBI	0.83	0.77	< 0.001, S

S-Significant, NS- Not significant

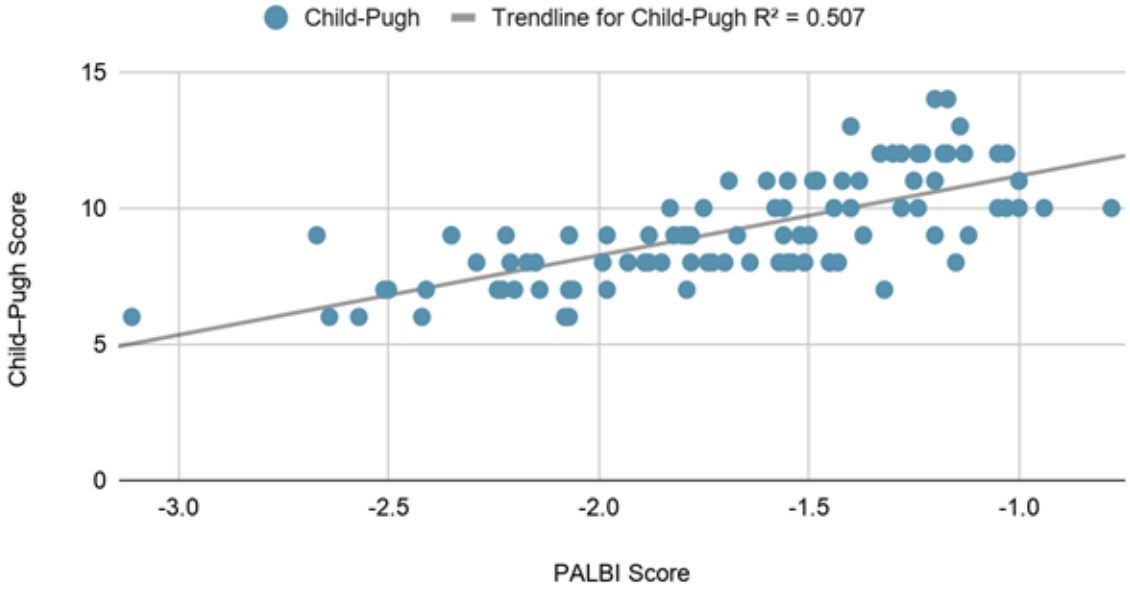

Figure 3: Scatter plot showing strong positive correlation between PALBI score and Child-Pugh score (r = 0.83, p < 0.001)

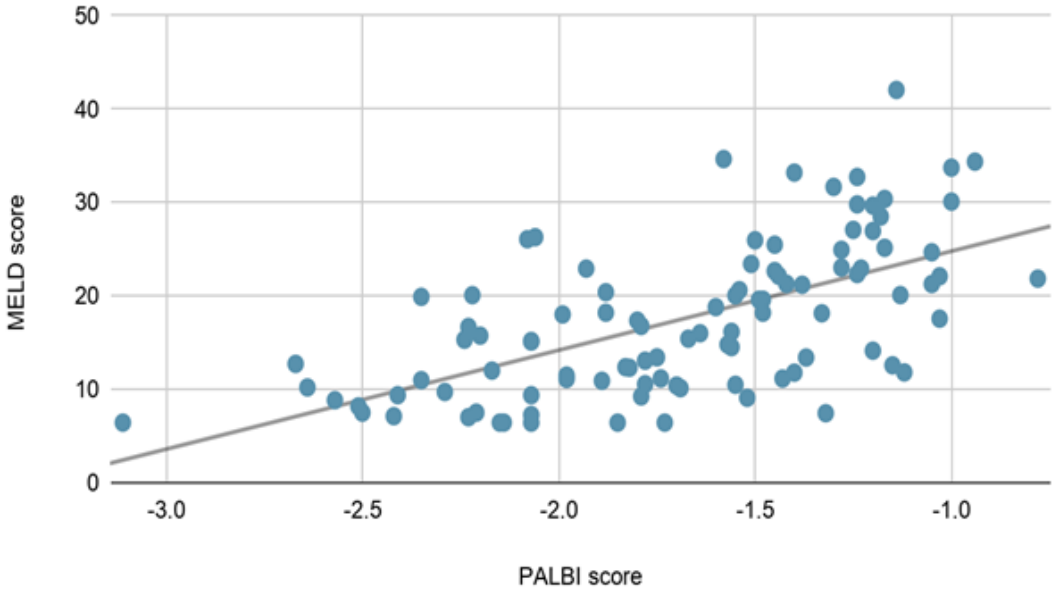

Figure 4: Scatter plot showing strong positive correlation between PALBI score and MELD score (r = 0.77, p < 0.001)

Table 7: Correlation of ALBI and PALBI scores with complications of chronic liver disease

Complication	Frequency (n=100)	Percentage (%)	ALBI (r)	p-value	PALBI (r)	p-value
Ascites	78	78%	0.08	0.42, NS	0.72	< 0.001, S
Hepatic encephalopathy	18	18%	0.05	0.61, NS	0.68	< 0.001, S
Variceal bleeding	38	38%	0.07	0.48, NS	0.75	< 0.001, S
Spontaneous bacterial peritonitis	7	7%	0.03	0.74, NS	0.61	< 0.001, S

S-Significant, NS- Not significant

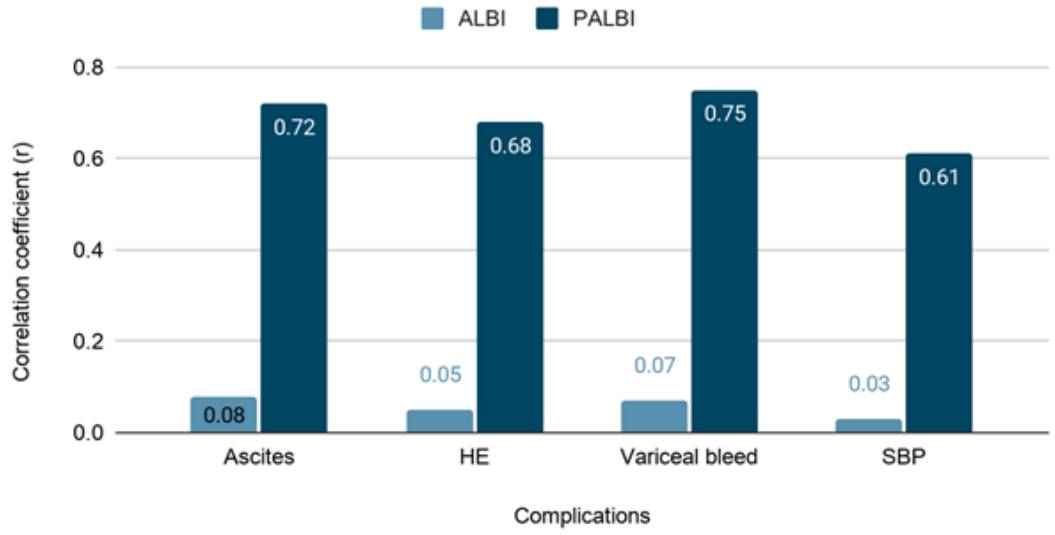

Figure 5: Bar diagram showing correlations of ALBI and PALBI scores with complications of chronic liver disease

DISCUSSION

Decompensated chronic liver disease represents a critical stage of liver disease associated with significant morbidity and mortality. Accurate assessment of disease severity is essential for prognostication and management. Conventional scoring systems such as Child–Pugh and MELD have been widely used; however, they are limited by subjectivity and variability

in laboratory parameters. The Child–Pugh score described by Pugh et al. (1973) and the MELD score developed by Kamath et al. (2001) and Wiesner et al. (2003) remain widely used but have inherent limitations.

In recent years, ALBI and PALBI scores have emerged as objective alternatives. The ALBI score introduced by Johnson et al. (2015) and the PALBI score developed by Roayaie et al. (2017) provide an evidence-based approach using readily available laboratory parameters.

In the present study, PALBI demonstrated a strong positive correlation with both Child–Pugh and MELD scores, whereas ALBI showed weak and non-significant correlations. These findings suggest that PALBI is a more reliable indicator of disease severity in patients with decompensated chronic liver disease.

The superior performance of PALBI can be attributed to the inclusion of platelet count, which serves as an indirect marker of portal hypertension. Portal hypertension plays a central role in the pathogenesis of complications such as ascites and variceal bleeding. Therefore, PALBI provides a more comprehensive assessment of disease severity compared to ALBI.

Our findings are consistent with previous studies. Oikonomou et al. (2019) demonstrated that PALBI has significant prognostic value in patients with decompensated cirrhosis. Similarly, Deng et al. (2020) and Mahmud et al. (2021) reported that ALBI and PALBI scores correlate with disease severity and clinical outcomes in chronic liver disease. Studies from India by Kumar et al. (2020), Rathod et al. (2021), and Naik et al. (2022) have also highlighted the utility of these scores in resource-limited settings.

In the present study, higher PALBI grades were associated with an increased frequency of complications such as ascites, hepatic encephalopathy, and variceal bleeding. This further supports the role of PALBI as a marker of both hepatic dysfunction and portal hypertension.

Correlation analysis further demonstrated that PALBI showed a strong and statistically significant association with major complications of chronic liver disease, including ascites, hepatic encephalopathy, variceal bleeding, and spontaneous bacterial peritonitis. In contrast, ALBI showed weak and statistically non-significant correlations with these complications. These findings emphasize the importance of platelet count as a surrogate marker of portal hypertension, thereby enhancing the predictive ability of PALBI compared to ALBI.
In contrast, ALBI showed weaker associations with severity scores and clinical complications. While ALBI remains useful as an objective measure of hepatic function, its inability to account for portal hypertension limits its utility in advanced disease.

The findings of this study have important clinical implications. PALBI is simple to calculate, does not rely on subjective variables, and utilizes readily available laboratory parameters. This makes it particularly useful in resource-limited settings, where access to advanced investigations may be limited.

CONCLUSION

Decompensated chronic liver disease requires accurate and reliable assessment of disease severity for optimal management. In the present study, PALBI demonstrated a strong correlation with conventional severity scores and showed better association with clinical complications compared to ALBI. By incorporating platelet count, PALBI reflects both hepatic function and portal hypertension, making it a superior, simple, and cost-effective tool for risk stratification in patients with DCLD, particularly in resource-limited settings.

Limitations

This study has certain limitations. Being a cross-sectional study, it does not allow assessment of temporal relationships or long-term outcomes such as mortality. Additionally, it was conducted at a single center with a relatively small sample size, which may limit the generalizability of the findings.

Financial support and sponsorship
Nil.

Conflicts of Interest
There are no conflicts of interest.

LIST OF ABBREVIATIONS

ALBI – Albumin–Bilirubin Score
Anti-HCV – Antibody to Hepatitis C Virus
CLD – Chronic Liver Disease
CTP – Child–Pugh Score
DCLD – Decompensated Chronic Liver Disease
HBsAg – Hepatitis B Surface Antigen
HE – Hepatic Encephalopathy

INR – International Normalized Ratio
MELD – Model for End-Stage Liver Disease
NASH – Non-Alcoholic Steatohepatitis
PALBI – Platelet–Albumin–Bilirubin Score
SBP – Spontaneous Bacterial Peritonitis
SPSS – Statistical Package for the Social Science

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