Original Article

Platelet-Albumin-Bilirubin (PALBI) Score to Predict Outcomes of Acute Variceal Bleed in Patients with Cirrhosis

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ABSTRACT

Objective: The objective of this study was to determine whether the Platelet-Albumin-Bilirubin (PALBI) score outperformed the traditional Child-Pugh classification in predicting outcomes, such as deaths in hospitals and subsequent bleeding, in cirrhotic patients presenting with an acute variceal bleed.

Study Design: A cross-sectional study

Place and Duration of Study: This study was conducted at the Gastroenterology Department, Holy Family Hospital, Rawalpindi from 1 July to 31 December 2021.

Methods: 68 cirrhosis patients who were admitted due to acute variceal bleeding were among them. Serum albumin, bilirubin, and platelet count were used to compute the PALBI score, and the Child-Pugh classification was also evaluated. The two main outcomes were re bleeding within four weeks and in-hospital death. Each scoring system's predictive accuracy was calculated using the Area Under the Receiver Operating Characteristic Curve (AUC).

Results: A total of 68 patients were enrolled in the study, with mean age 54.32 years. 63.2% (43) were male and 36.8% (25) were female. According to Child–Pugh classification, 5.9% were Class A, 27.9% Class B, and 66.2% Class C. while 14.7% were Grade 1, 38.2% Grade 2, and 47.1% Grade 3 PALBI score. Overall, in-hospital mortality was 16.17%, occurring only in Child–Pugh Classes B (5.26%) and C (22.22%), and in PALBI Grades 2 (7.69%) and 3 (28.13%). No deaths were observed in Child–Pugh A or PALBI Grade 1. Rebleeding occurred in 5.26% of Class B and 57.78% of Class C patients, and in 15.38% of PALBI Grade 2 and 71.88% of Grade 3 patients; no rebleeding occurred in Class A or PALBI Grade 1. PALBI grade showed a strong association with both mortality and rebleeding ($p < 0.001$). For predicting rebleeding, PALBI demonstrated high sensitivity (85.19%) and specificity (100%), with an excellent AUC of 0.926. Although not statistically superior to Child–Pugh (AUC difference 0.0944; $p = 0.0722$), PALBI showed better overall performance.

Conclusion: When predicting rebleeding and early mortality in individuals with acute variceal hemorrhage, the PALBI score is a trustworthy method.

Key Words: PALBI score, CTP, Variceal bleed, Mortality

Citation of article: Mumtaz M, Hussain T, Ahmed S, Noureen M, Abbas A, Umar M. Platelet-Albumin-Bilirubin (PALBI) Score to Predict Outcomes of Acute Variceal Bleed in Patients with Cirrhosis. Med Forum 2025;36(12):50-54. doi:10.60110/medforum.361210.

INTRODUCTION

Liver cirrhosis is a chronic, progressive disease characterized by extensive hepatic fibrosis and disruption of normal liver architecture, leading in the creation of regenerating nodules.

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Received: June, 2025
Reviewed: July-August, 2025
Accepted: September, 2025

The liver gradually loses its vital processes, such as protein synthesis, bile generation, and detoxification, as the illness progresses[1]. One of the most dangerous cirrhosis consequences is portal hypertension, which is characterized by increased resistance to blood flow via the fibrotic liver[2]. Elevated portal pressure can trigger the formation of varices, especially in the esophagus, which may rupture and produce acute variceal hemorrhage[3].

Acute variceal bleeding is a severe complication in cirrhotic individuals, representing a major source of morbidity and mortality in those with decompensated liver disease[4,5].

Cirrhotic patients presenting with variceal bleeding face not only the risk of an initial life-threatening bleed but also a significant risk of early rebleeding[6]. Rebleeding is a well-recognized and dangerous event that markedly increases mortality in this population[7]. Effective management of acute variceal bleeding therefore depends on early identification of patients at highest

risk for poor outcomes such as mortality and rebleeding.

Prognostic scoring systems have become essential tools in clinical practice, helping clinicians assess disease severity and predict patient outcomes[8]. These tools facilitate more personalized care and more efficient use of healthcare resources, especially in critical care settings[9].

The most extensively used scoring system for measuring liver function and prognosis in cirrhotic patients is the Child-Turcotte-Pugh (CTP) score[10]. Clinical factors like ascites and hepatic encephalopathy are combined with laboratory measurements including blood bilirubin, albumin levels, and prothrombin time in this approach[11]. Although the CTP score has shown promise in the treatment of cirrhosis, it has significant drawbacks. Ascites and encephalopathy are subjectively graded, and several crucial physiological indicators, including platelet count, are excluded[12].

The Model for End-Stage Liver Disease (MELD) score, which is based on laboratory data and has been demonstrated to predict survival in recipients of liver transplants, is another popular tool[13]. Nevertheless, MELD does not adequately represent the complexity of cirrhosis and its sequelae, much as the CTP score[14].

METHODS

This study included 68 patients with confirmed liver cirrhosis who presented with acute variceal bleeding—defined by the presence of hematemesis (vomiting of blood) or melena (black, tarry stools)—within 24 hours of hospital admission. Inclusion criteria required that patients have documented cirrhosis and evidence of variceal hemorrhage. Patients with non-variceal sources of gastrointestinal bleeding were excluded from the study. All participants provided informed consent. Data collection involved detailed assessment of demographic characteristics, medical history, and laboratory results. Key variables recorded included age, gender, platelet count, serum albumin, bilirubin levels, prothrombin time, and Child-Turcotte-Pugh (CTP) score. Both PALBI and CTP scores were calculated for each patient.

RESULTS

Demographics Analysis

This research study analyzed 68 patients of an acute variceal bleed, which presented valuable data as illustrated below. Table 1 shows the descriptive statistics that provide a detailed glimpse of the study sample characteristics.

Descriptive Analysis: Hematological parameters observed during the post rebleeding event depict significant findings concerning the recovery of the patients after acute variceal bleeding. The average hemoglobin (Hb) level on rebleeding was 6.27 g/dL (+/- 1.37) that is considerably lower than the normal hemoglobin range (12-16 g/dL in women and 13-17 g/dL in men).

Table No. 1: Summary of Demographics

Characteristics	N	Mean	Std. Deviatio	Minimum	Maximum
Age	68	54.32	10.34	26.00	78.00
Albumin(g/L)	68	29.37	4.25	18.00	36.00
APTT	68	37.38	3.04	27.66	48.00
Bilirubin(micromole/L)	68	26.25	17.79	5.47	90.97
Creatinine	68	1.69	0.72	0.50	4.10
Hb(g/dL)	68	7.22	1.95	3.30	13.80
HCT	68	22.45	5.94	10.70	43.20
INR	68	1.52	0.49	0.81	2.50
K	68	4.07	0.57	3.00	7.10
Na	68	134.84	5.55	122.00	145.00
CTP Score	68	9.10	1.54	6.00	12.00
PALBI Score	68	-2.06	0.42	-2.96	-1.09
Urea	68	40.75	23.87	11.00	144.00
WBC	68	6.19	2.00	2.60	14.60
PLT	68	113.74	32.13	42.00	193.00
Duration of admission	68	3.04	0.21	3.00	4.00

Table No. 2: Descriptive Statistics

Hematological Parameters	N	Mean	Std. Deviation	Maximum	Minimum
Hb (g/dL) after rebleed	39	6.27	1.37	9.2	3.3
HCT (%) level after rebleed	39	19.44	3.93	30.2	11.7

This is an indication that a lot of patients were still suffering from anemia as a result of losing blood during the variceal bleeding. The noted hemoglobin level range of 3.3 to 9.2 g/dL is quite variable and there were patients with severe anemia and those with moderately low levels. This observation is in line with the clinical expectations, because patients presenting with variceal bleeding can lose significant amount of blood, which results in reduction of hemoglobin levels. The standard deviation value of 1.37 indicates a moderate level of variation or difference in the severity of anemia amongst the patients.

Analysis of Mortality and Rebleeding Incidents According to Child- Pugh Classes: There is evident connection between the classifications of Child-Pugh and mortality and rebleeding outcomes of the patients with cirrhosis of liver who have presented with an acute bleeding of variceal disease. Child-Pugh scoring system groups patients with an elevated degree of liver disease in three classes (A, B and C), in the order of severity. No cases of either in-hospital mortality or rebleeding were observed in a Class A (n=4), which indicates an excellent prognosis in patients with the mildest form of liver dysfunction. The risks were moderate in Class B (n=19) patients, with the rate of mortality and rebleeding equal to 5.26%. This implies a relatively high risk that is nevertheless quite noticeable in comparison with the extreme category. The prognosis of patients with Class C (n=45) was much worse: 22.22% of the patients passed away in the hospital, and 57.78% had rebleeding. These findings are found in close correlation of the worst clinical outcomes with the highest Child-Pugh class.

Table No. 3: Analysis of Mortality and Rebleeding Incidents According to Child- Pugh Classes

Child Class		In hospital mortality				Rebleed			
		Yes		No		Yes		No	
	Total N	N	N %	N	N %	N	N %	N	N %
A	4	0	0.00%	4	100%	0	0.00%	4	100%
B	19	1	5.26%	18	94.74%	1	5.26%	17	89.47%
C	45	10	22.22%	35	77.78%	26	57.78%	9	20.00%
Chi square	Constant					0.00			

Table No.4: Patient Outcomes by PALBI Grade Regarding In-Hospital Mortality and Rebleeding Incidents

PALBI Grade		In hospital mortality				Rebleed			
		Yes		No		Yes		No	
	Total N	N	N %	N	N %	N	N %	N	N %
"Grade 1"	10	0	0.00%	10	100%	0	0.00%	10	100%
Grade 2	26	2	7.69%	24	92.31%	4	15.38%	20	76.92%
Grade 3	32	9	28.12%	23	71.88%	23	71.88%	0	0.00%
Chi square	Constant					0.00			

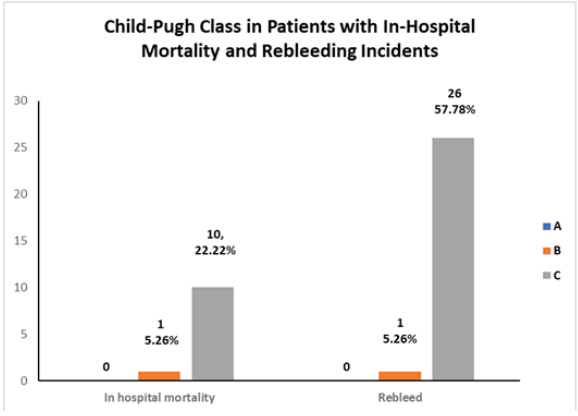

Figure No.1: Child-Pugh Class in patients with in-hospital mortality and rebleeding incidents

The chi-square testing of the statistical analysis proved this distribution to be very important (p = 0.000) and this strengthens that the severity of a child is directly correlated to the likelihood of development of complications. This confirms the fact that the Child-Pugh classification can be used as a prognostic tool when patients bleed varices. Finally, Table No. 3 has stressed on the value of risk stratification early during Child-Pugh classes. The good results of Class A patients, moderate risks of Class B and high risks of mortality and rebleeding of Class C patients all remain the same as before. These outcomes have demonstrated the importance of increasing the monitoring and, perhaps, aggressive treatment plans among the patients of Class C.

Patient Outcomes by PALBI Grade Regarding In-Hospital Mortality and Rebleeding Incidents: The statistics support the obvious relation between PALBI grade and the patient outcomes pertaining to in-hospital mortality and the rebleeding cases. Both the mortality and rebleeding rates were 0 percent in PALBI Grade 1. On the other hand; PALBI Grade 2 patients experienced 7.69 percent mortality rate with 15.38 percent experiencing rebleeding due to considerably lower values of 28.12 percent and 71.88 percent experiencing

mortality and rebleeding respectively in PALBI Grade 3 patients. The result of a statistical test reveals that there is a great degree of significance between adverse outcomes and PALBI grade as indicated by the Chi-square outcome. Although in the analysis the result of the Chi-square is recorded as Constant 0.00, it is most likely that it is a wrong coding of the output and the accurate outcome is lower than 0.001. What makes the point is that this low p-value gives credence to the fact that the differences in mortality and rebleeding as seen in the PALBI grades are not likely to arise out of chance. So, the connection between higher PALBI grades and poor clinical outcomes is strongly evident and in that regard, the prognostic value of PALBI grading supports its application in clinical practice

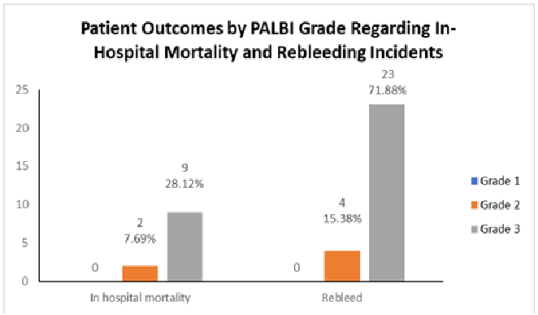

Figure No.2: Patient outcomes by ALBI grade regarding in-hospital mortality and rebleeding incidents.

DISCUSSION

The Platelet-Albumin-Bilirubin (PALBI) score is an objective laboratory-based measure for assessing liver function and portal hypertension severity in cirrhosis patients. Unlike older scoring systems like the Child-Pugh classification, the PALBI score is based purely on routine, quantifiable parameters platelet count, serum albumin, and bilirubin levels which eliminates subjective clinical characteristics. By using platelet count as a proxy marker of portal hypertension, the PALBI score provides a more nuanced and reliable assessment of liver failure, making it a viable risk-stratifying tool in patients with cirrhosis and acute variceal bleeding.

The purpose of the research was to compare the efficacy using the widely utilized Child-Pugh classification as a PALBI score to anticipate clinical consequences, which includes deaths in the hospital and bleed again, with cirrhosis and acute variceal bleeding. Our results show that the severity of liver dysfunction, as evaluated by both the Child-Pugh and PALBI scores, is highly related with the probability of unfavorable outcomes in patients experiencing re bleeding[15].

The Child-Pugh score has long been considered a cornerstone for assessing prognosis in cirrhotic patients and continues to hold clinical value[16]. In our study, patients classified as Child-Pugh Class C showed markedly higher in-hospital mortality (22.22%) and rebleeding rates (57.78%)[17]. In contrast, there were no mortality or rebleeding events among Class A patients, with intermediate outcomes observed in Class B[18]. These results are consistent with existing literature showing that patients with decompensated cirrhosis (Class C) are at significantly increased risk of complications such as bleeding and death[19]. The findings reaffirm the role of the Child-Pugh classification as a validated risk stratification tool in cirrhosis, particularly in the context of variceal hemorrhage.

An advantage of the PALBI score lies in its simplicity and objectivity, combining platelet count, serum albumin, and bilirubin levels. In our study, the PALBI score demonstrated superior predictive accuracy compared to the Child-Pugh score, with an AUC of 0.926 versus 0.831. This suggests the PALBI score may be more effective in predicting mortality and rebleeding, given its reliance on objective and easily obtainable laboratory parameters[20]. These results align with previous studies highlighting the PALBI score's utility in predicting survival and complications among patients with cirrhosis and hepatocellular carcinoma.

It is noteworthy, therefore, that the difference in prediction performance between the two scores was not statistically significant ($p = 0.0722$). This implies that even though the PALBI score had a greater AUC, the study did not conclusively show the difference[20,21]. One possible explanation for this finding is the small sample size, which may have hampered the capacity to detect a statistically significant difference. To ascertain whether the PALBI score actually performs better than the Child-Pugh classification in predicting mortality and rebleeding among cirrhotic patients, larger, prospective trials are necessary[22]. The PALBI score offers an objective, reproducible, and practical approach for assessing liver function in cirrhotic patients with acute variceal bleeding. Unlike the Child-Pugh score, which includes subjective clinical variables such as ascites and encephalopathy, PALBI relies solely on routine laboratory tests, making it more standardized and consistent. Moreover, by incorporating platelet count, the score better captures aspects of portal hypertension, offering a more nuanced evaluation of liver dysfunction than either the Child-Pugh or MELD scores. Its simplicity, low cost, and clinical relevance position it as a promising tool for risk stratification in this patient population. Nonetheless, robust validation through larger, multicenter, prospective studies is essential to confirm its clinical utility and to explore potential integration with other biomarkers or imaging modalities for even better prognostic accuracy.

CONCLUSION

PALBI score offers superior predictive ability compared to the traditional Child-Pugh classification and provides a more objective, reproducible measure of liver function. Its dependence on routine, easily obtainable laboratory parameters and its high predictive accuracy make it a practical option for clinical use, potentially supporting improved risk stratification and more personalized treatment strategies.

Suggestions: Nevertheless, while the PALBI score shows considerable promise, our results also highlight the need for further validation through larger,

multicenter, prospective studies. Such research would help confirm its comparative advantage over existing prognostic models, evaluate its integration with other diagnostic tools, and establish its role in routine clinical practice. Ultimately, the PALBI score may become an important component of cirrhosis management, helping clinicians identify high-risk patients who would benefit from timely and intensive interventions, thereby improving outcomes and cost-effectiveness in the treatment of acute variceal bleeding.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Muhammad Mumtaz, Tanveer Hussain, Sadia Ahmed
Drafting or Revising Critically:	Misbah Noureen, Anum Abbas, Muhammad Umar
Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

Conflict of Interest: The study has no conflict of interest to declare by any author.

Source of Funding: None

Ethical Approval: No.M-25/5297/RMU Dated 24.09.2021

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