

ORIGINAL ARTICLE**Prediction of Recurrent Variceal Bleeding in Cirrhotic Patients after Endoscopic Variceal Ligation**Nabila Hassan Ahmed¹, Mohammed Emam¹, Mohamed Abdelrahman Mohamed², Ahmed Lofty Sharaf^{1*}¹Hepatology & Gastroenterology and Infectious Diseases Department, Faculty of Medicine, Zagazig University, Zagazig, Egypt.²Hepatology and Gastroenterology Department, Zagazig Fever Hospital, Zagazig, Egypt.***Corresponding Author:**

Ahmed Lofty Sharaf

Email:

drahmedsharaf77@gmail.com**Submit Date:** 21-09-2025**Revise Date:** 09-10-2025**Accept Date:** 22-10-2025**ABSTRACT****Background**

Variceal rebleeding is a serious complication associated with increased hospital stay and mortality. Prediction of patients with high risk of recurrent variceal bleeding is important and challenging. This study aimed to assess relation between Albumin-Bilirubin (ALBI) grade and Platelet-Albumin-Bilirubin (PALBI) score and recurrence of variceal bleeding after endoscopic variceal ligation (EVL).

Methods

Cirrhotic patients (n = 240) with acute variceal bleeding were included. Child-Turcotte Pugh (CTP) score, Model for end stage liver disease (MELD) score, ALBI grade and PALBI score were calculated for all patients. Upper GI endoscopy and EVL were done for all patients. Every patient was followed up for 6 months then classified into rebleeding and non-rebleeding groups.

Results

The validity of ALBI score at cutoff point -1.94 (grade 3) and PALBI score at cut-off value 3 in prediction of variceal rebleeding were the highest specific (82.14%, 89.29%) in comparison to MELD and CTP score (68%, 60.71%), and comparable sensitivity of ALBI grade to MELD and CTP score (71.88%, 75.86%, 84.38%) respectively, while PALBI score shows the least sensitivity 50%. Moreover, patients who died had a higher MELD, CTP scores, ALBI grade > 3 and a higher PALBI when compared to patients who survived. After applying logistic regression analysis, MELD score, CTP score, ALBI grade and PALBI score can be used as independent factors for predicting rebleeding post EVL.

Conclusion

ALBI grade and PALBI score have considerable sensitivity and specificity and can be used for predicting recurrent bleeding after EVL in cirrhotic patients.

Key words: Variceal rebleeding, Albumin Bilirubin grade, Cirrhosis, Esophageal varices

INTRODUCTION

The annual incidence of variceal bleeding ranges from 5% to 15% in cirrhotic patients. Upper GI bleeding due to esophageal or gastric varices is a common complication of cirrhosis with high mortality

rate about 17% to 57% per year [1]. The Baveno VII guidelines recommended upper GI endoscopy screening for esophageal varices (EV) according to Fibroscan and platelets count in patients with cirrhosis. Furthermore, the emergency endoscopic

variceal ligation (EVL) is often supposed to be ideal treatment method to control bleeding [2].

The mortality rate following variceal bleeding is high, approximately 10% to 20% and mainly occurs due to early rebleeding post EVL [3-5]. Prognostic indicators for recurrent bleeding following EVL include prior variceal bleeding, coagulation status, peptic esophagitis, and the high-risk varices. There are no consensus or guidelines on the risk factors and preventive or predictive methods for variceal rebleeding post EVL [6].

Therefore, adequate assessment of patients presenting with acute variceal bleeding is needed to identify those at elevated risk of recurrent bleeding and unresponsive to conventional management, who constitute approximately 20 - 30% of patients [7]. These patients require more aggressive treatment measures to control bleeding and prevent death. Identification of these patients is important and challenging, due to coagulation status and degree of severity of the underlying liver cirrhosis.

Child-Turcotte Pugh (CTP) and Model for end stage liver disease (MELD) are the most conventional scores used for evaluation of liver function in cirrhotic patients. However, they have several drawbacks. New scores have been developed, including Albumin-bilirubin (ALBI) grade, and Platelet-Albumin-bilirubin score (PALBI). These scores were previously studied in cirrhotic patients with hepatocellular carcinoma (HCC) [8,9]. Additionally, these scores previously studied for prognosis of cirrhotic patients, predicting presence of high-risk EV or variceal bleeding. These methods are objective and broadly applicable [10-12].

In developing countries, the issue of management of a cirrhotic patient with variceal bleeding is complicated by interaction between medical, financial, social, cultural factors and poor adherence to

treatment [13]. The ideal method to predict EV and variceal rebleeding should be non-invasive, accessible and with high sensitivity and specificity [14]. The present study aimed to evaluate relation between ALBI grade, PALBI score and recurrence of variceal bleeding after EVL in cirrhotic patients with acute variceal bleeding.

METHODS

Study design and patient recruitment

This prospective cohort study was carried out in Hepatology & Gastroenterology and Infectious Diseases Department, Zagazig University Hospitals and in Hepatology & Gastroenterology Department, Zagazig Fever Hospital, during the period from May 2024 to May 2025. We included 240 patients with liver cirrhosis presented with proven acute variceal bleeding (haematemesis and/ or Melena). Patients presented with upper GI bleeding due to other causes (ulcers, erosions or fundal varix) were excluded. Additionally, patients with other causes of portal hypertension and variceal bleeding than cirrhosis were excluded.

Patient assessment

All patients were subjected to complete history taking and physical examination. Laboratory tests including complete blood count (CBC), liver profile, kidney profile, coagulation profile and viral markers were done. Patients classified according to CTP score. It includes serum bilirubin, serum albumin, international normalized ratio (INR), degree of ascites, and grade of encephalopathy. Patients classified to Child class A (5-6 points), Child class B (7-9 points) and Child class C (10-15 points) [15]. MELD score calculated for included patients (range from 6 to 40 points). The formulas used for the calculations were $3.78 \times \ln(\text{serum bilirubin [mg/dL]}) + 11.2 \times \ln(\text{INR}) + 9.57 \times \ln(\text{serum creatinine [mg/dL]}) + 6.43$ [16].

ALBI score and grade were calculated as follow: $(\log_{10} \text{bilirubin } [\mu\text{mol/L}] \times 0.66) + (\text{albumin } [\text{g/L}] \times -0.0852)$. Patients classified into 3 grades: grade 1 ≤ -2.6 , grade 2 $> -2.6, \leq -1.39$, and grade 3 > -1.39 [8]. PALBI score was calculated by adding ALBI grade to the point of platelet count (ranged from 2 to 5). One point if the platelets count $> 150,000/\text{mm}^3$, and two points if platelets count $< 150,000/\text{mm}^3$ [9]. Upper GI endoscopy was done for all patients and EV were classified to grade I, grade II, grade III and grade IV according to size, extent, and presence of risky signs as cherry red spots [17].

Follow up and patient classification

EVL was done for all included patients, then proton pump inhibitors (PPIs) were taken. Every patient was followed after 4week and then according to size and severity of EV up to 6 months for the recurrence of variceal bleeding post EVL. The patients were classified according to post endoscopic recurrence of bleeding into two groups: group I, recurrent variceal bleeding post EVL; group II, non-recurrent variceal bleeding post EVL. Recurrent bleeding defined as any upper GI bleeding occurred after EVL or subsequently in-between band ligation sessions [3].

Ethical approval

The study was approved by Institutional Review Board (ZU-IRB #340/12-May-2024). Written informed consent was obtained from all participants.

Statistical analysis

Data collected were statistically analyzed using SPSS 23.0 for windows (SPSS Inc., Chicago, IL, USA). Chi-square test, Fisher's exact test, independent samples Student's t-test and Mann-Whitney U test were used to analyse data. Pearson's correlation used for correlation between two quantitative variables. Receiver operating characteristic (ROC) curve was utilized to calculate ALBI grade and PALBI scores optimal cut-off

value with maximum sensitivity and specificity for predication of recurrent bleeding post EVL. Logistic regression analysis was utilized for detecting independent factors associated with recurrent bleeding post EVL. P-value < 0.05 considered statistically significant.

RESULTS

The present study included 240 patients presented with the first attack of acute variceal bleeding. Their ages ranged between 17 to 75 years, and 164 patients (68.3%) were males. Chronic HCV infection (85%), followed by chronic HBV infection (4.6%) then unknown cause (8.3%) and auto-immune hepatitis (2.1%) were the causes of cirrhosis in our study.

Regarding MELD, CTP scores, ALBI grade and PALBI score among studied patient, our results shows that MELD score ranged from 9 to 27. The CTP score ranged from 5 to 11, 45% of patients were Child class C, then Child class A (35%), and Child class B (20%). The ALBI score ranged from -2.88 to -0.36 with a mean $\pm$ SD of -1.71 ± 0.65 . 61.7% of patients were ALBI grade 2, then ALBI grade 3 (26.7%) and ALBI grade 1 (11.7%). PALBI score ranged from 2 to 5 points with a mean $\pm$ SD 3.51 ± 1.85 and 40% of patients were score 3.

EVL was done for all patients. 83.75% of the patients don't rebleed after EVL, while 16.25% had rebleeding episode. Most of rebleeding occurred between 3- and 6-months post EVL (40%). 12 patients died during the post-EVL follow-up period (**Table 1**).

Patients in rebleeding group post EVL had a higher MELD and CTP scores when compared to non-bleeding patients ($P < 0.001$). Additionally, 64.1% of cases with rebleeding were Child C in comparison to 41.3% in non-bleeding group ($P = 0.001$). ALBI score and PALBI score were higher in rebleeding patients post ELV when compared to non-bleeding patients ($P <$

0.001). Additionally, 46.2% of the patients with rebleeding were ALBI grade 3 in comparison to 22.9% of the patients without rebleeding ($P = 0.005$) (**Table 2**).

Patients with rebleeding post EVL had a longer duration of hospital stay, compared to patients' do not bleed ($P < 0.001$). Additionally, 15.4% of the patients with rebleeding died in comparison to 2.9% of non-bleeding the patients ($P = 0.006$).

MELD, CTP scores, ALBI grade and PALBI score was high in died patients when compared with patients who survived ($P < 0.001$). Additionally, 83.3% of the patients who died were ALBI grade 3 in comparison to 23.7% of the patients who survived ($P < 0.001$) (**Table 3**). There is a significant positive correlation between hospital stay and MELD score ($r = 0.342$, $P = 0.02$), CTP score ($r = 0.292$, $P = 0.03$), ALBI score ($r = 0.342$, $P = 0.01$) and PALBI score ($r = 0.261$, $P = 0.04$) (**Figure 1**).

ROC analysis showed that ALBI score had the highest sensitivity (71.88%) and specificity (82.14%) at -1.94 with an area under the curve (AUC) of (0.813), otherwise PALBI score had the highest sensitivity (50%) and specificity (89.29%) at 3 with AUC (0.681). Additionally, the analysis showed that MELD score had the highest sensitivity (75.86%) and specificity (68%) at 15 with AUC (0.770). Also, CTP score had the highest sensitivity (84.38%) and specificity (60.71%) at 8 with AUC (0.754) (**Table 4**) (**Figure 2**).

After applying logistic regression analysis for predictors of rebleeding post EVL; albumin level, total and direct bilirubin levels, INR level, haemoglobin level, haematocrit value, CTP score, MELD score, ALBI score and PALBI score can be used as independent factors for predicting rebleeding after EVL (**Table 5**).

Table 1: Endoscopic findings, bleeding recurrence, and outcome of the studied patients.

Variables		All patients (n=240)
EV grade (n. %)	Grade I- II	72 (30%)
	Grade III	72 (30%)
	Grade IV	96 (40%)
Endoscopic management	Band ligation	240 (100%)
Recurrent bleeding (n. %)	No	201 (83.75%)
	Yes	39 (16.25%)
Time of recurrent bleeding	1 week	4 (10.3%)
	1 week – 1month	7 (17.9%)
	1 month – 3 months	11 (28.2%)
	3 months – 6 months	17 (43.6%)
Mortality (n. %)	Survived	228 (95%)
	Died	12 (5%)

EV, Esophageal Varices.

Table 2: Comparison between recurrent bleeding and non-recurrent bleeding group after EVL as regards MELD, CTP scores, ALBI grade, PALBI score.

Variables		Recurrent bleeding (n=39)	Non-recurrent bleeding (n=201)	P Value
MELD score	Mean $\pm$ SD	17.48 $\pm$ 4.96	12.85 $\pm$ 4.19	<0.001*
	Range	(9 – 27)	(9 – 22)	
CTP score	Mean $\pm$ SD	8.81 $\pm$ 1.57	7.25 $\pm$ 1.67	<0.001*
	Range	(5 – 11)	(5 – 11)	
CTP class (n. %)	Class A	5 (12.8%)	79 (39.3%)	0.005 [†]
	Class B	9 (23.1%)	39 (19.4%)	
	Class C	25 (64.1%)	83 (41.3%)	
ALBI score	Mean $\pm$ SD	-1.54 $\pm$ 0.68	-2.03 $\pm$ 0.53	<0.001*
	Range	(-2.88 – -0.36)	(-2.68 – -0.36)	
ALBI grade (n. %)	Grade 1	1 (2.6%)	27 (13.4%)	0.005 [†]
	Grade 2	20 (51.3%)	128 (63.7%)	
	Grade 3	18 (46.2%)	46 (22.9%)	
PALBI score	Mean $\pm$ SD	3.03 $\pm$ 0.53	1.64 $\pm$ 0.68	<0.001*
	Range	(4 – 5)	(2 – 3)	

Independent sample t-test*, Fisher exact test[†], Non-significant: P >0.05, Significant: P $\leq$ 0.05.

MELD, Model for end stage liver disease; CTP, Child-Turcott Pugh; ALBI, Albumin-bilirubin; PALBI, Platelet-Albumin-bilirubin.

Table 3: Relation between MELD, CTP, ALBI, PALBI scores and mortality among the studied patients in both groups.

Variables		Survived (n=228)	Died (n=12)	P Value
MELD score	Mean $\pm$ SD	14.42 $\pm$ 4.65	22.67 $\pm$ 2.42	<0.001*
	Range	(9 – 25)	(20 – 27)	
CTP score	Mean $\pm$ SD	7.87 $\pm$ 1.73	10 $\pm$ 1.1	<0.001*
	Range	(5 – 11)	(8 – 11)	
CTP class (n. %)	Class A	84 (36.8%)	0 (0%)	0.03 [†]
	Class B	45 (19.7%)	3 (25%)	
	Class C	99 (43.4%)	9 (75%)	
ALBI score	Mean $\pm$ SD	-1.95 $\pm$ 0.58	-1.12 $\pm$ 0.61	<0.001*
	Range	(-2.88 – -0.36)	(-1.91 – -0.36)	
ALBI grade (n. %)	Grade 1	28 (12.3%)	0 (0%)	<0.001 [†]
	Grade 2	146 (64%)	2 (16.7%)	
	Grade 3	54 (23.7%)	10 (83.3%)	
PALBI score	Mean $\pm$ SD	1.1 $\pm$ 0.57	2.9 $\pm$ 0.63	<0.001*
	Range	(2 – 3)	(4 – 5)	

Independent sample t-test*, Fisher exact test[†], Non-significant: P >0.05, Significant: P $\leq$ 0.05.

MELD, Model for end stage liver disease; CTP, Child-Turcott Pugh; ALBI, Albumin-bilirubin; PALBI, Platelet-Albumin-bilirubin.

Table 4: Diagnostic performance of different scores in predicting recurrent bleeding after EVL.

Variables	Cut point	Sensitivity	Specificity	PPV	NPP	AUC
ALBI score	-1.94	71.88%	82.14%	82.14%	71.88%	0.813
PALBI score	3	50%	89.29%	84.21%	60.98%	0.681
MELD score	15	75.86%	68%	73.33%	70.83%	0.770
CTP score	8	84.38%	60.71%	71.05%	77.27%	0.754

EVL, Endoscopic Variceal Ligation; NPV, negative predictive value; PPV, positive predictive value; AUC, area under the curve; ALBI, Albumin-bilirubin; PALBI, Platelet-Albumin-bilirubin; MELD, Model for end stage liver disease; CTP, Child-Turcotte Pugh.

Table 5: Logistic regression analysis for predictors of recurrent bleeding after EVL.

Variables	Univariate analysis		Multivariate analysis	
	P value	Odds (CI 95%)	P value	Odds (CI 95%)
Age	0.41	1.02 (0.97 – 1.07)	-	-
Sex	0.63	0.76 (0.26 – 2.29)	-	-
PV diameter	0.25	1.08 (0.95 – 1.22)	-	-
Albumin	0.03	0.33 (0.13 – 0.89)	0.09	0.36 (0.11 – 1.21)
Total bilirubin	0.04	1.59 (1.02 – 2.49)	0.91	1.03 (0.59 – 1.79)
Direct bilirubin	0.008	2.66 (1.28 – 5.51)	0.06	2.35 (0.99 – 5.35)
AST	0.11	0.99 (0.99 – 1.00)	-	-
ALT	0.23	0.99 (0.99 – 1.00)	-	-
INR	0.004	3.46 (1.13 – 3.83)	0.11	2.02 (0.64 – 2.26)
Creatinine	0.67	0.78 (0.25 – 2.47)	0.65	1.03 (0.91 – 1.17)
Hemoglobin	0.01	0.61 (0.41 – 0.89)	0.31	0.75 (0.44 – 1.3)
Hematocrit	0.01	0.83 (0.72 – 0.96)	0.25	0.89 (0.74 – 1.08)
Platelets count	0.61	1.01 (0.99 – 1.01)	-	-
WBC count	0.59	1.04 (0.89 – 1.22)	-	-
MELD score	0.002	1.23 (1.08 – 1.41)	0.009	1.19 (1.05 – 1.37)
CTP score	0.002	1.77 (1.24 – 2.52)	0.04	1.49 (1.02 – 2.17)
ALBI score	<0.001	1.72 (1.46 – 8.55)	0.003	1.73 (1.32 – 4.56)
PALBI score	0.004	1.68 (1.37 – 6.46)	0.007	1.23 (1.22- 2.74)
Hospital stay	0.02	1.33 (1.04 – 1.69)	0.11	1.25 (0.95 – 1.64)

Non-significant: $P > 0.05$, Significant: $P \leq 0.05$.

CI, Confidence Interval; PV, Portal Vein; AST, Aspartate Aminotransferase; ALT Alanine Transaminase; INR, International Normalized Ratio; WBC, White Blood Cell; MELD, Model for end stage liver disease; CTP, Child-Turcotte Pugh; ALBI, Albumin-bilirubin; PALBI, Platelet-Albumin-bilirubin.

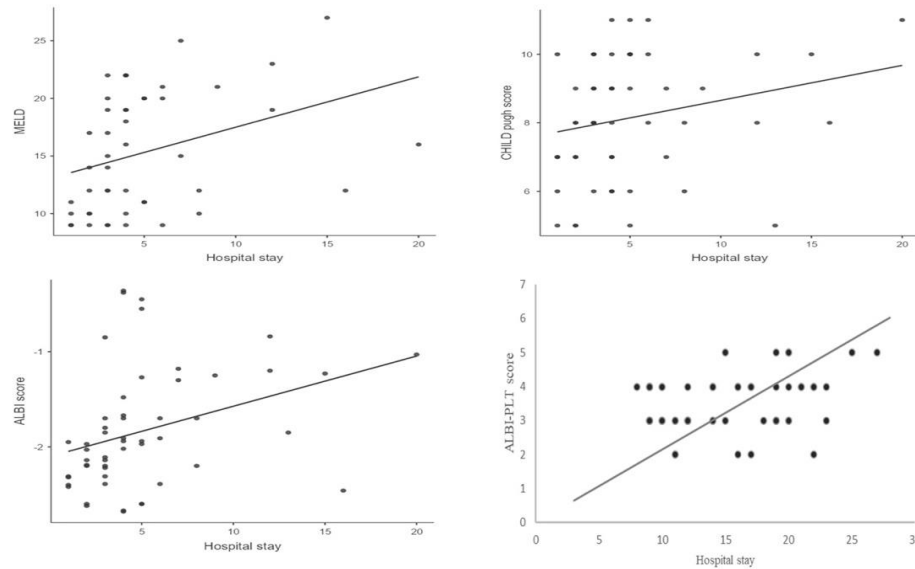


Figure 1: Scatter plots showing the correlation between hospital stay and different scores among the studied patients.

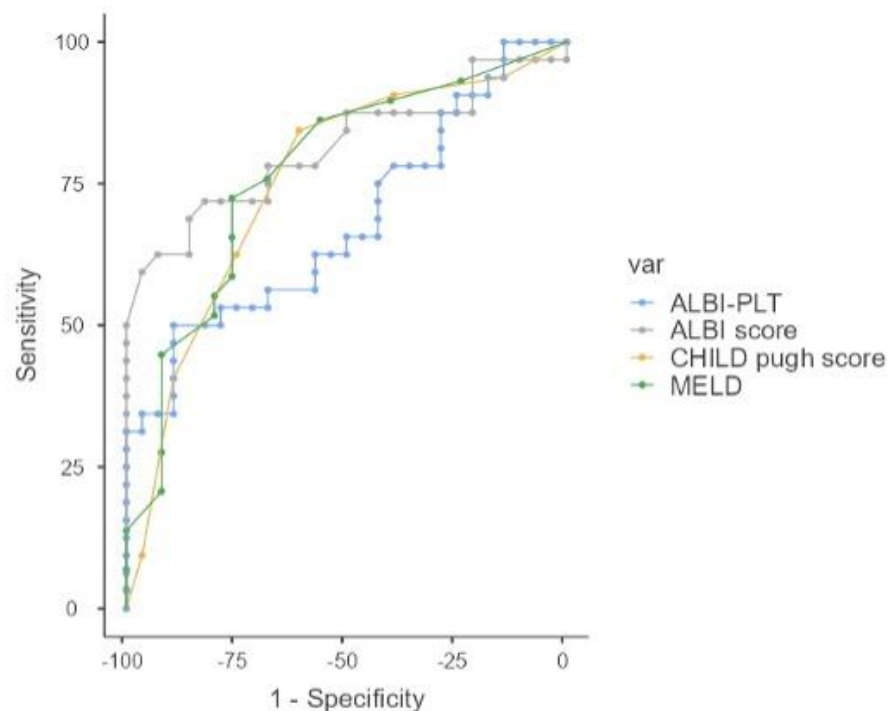


Figure 2: ROC curve analysis of different scores in predicting post-intervention bleeding.

DISCUSSION

Recurrent EV bleeding is indeed a serious complication associated with increased hospital stay and mortality in cirrhotic patients [18]. Bleeding from EV necessitates hospitalization for management. Recurrent bleeding episodes

can prolong the duration of hospital stays and increase healthcare costs.

Various factors and scores were used for prediction of high-risk EV and recurrent variceal bleeding, including CTP and MELD scores in cirrhotic patients [19]. Upper GIT endoscopy is most reliable

diagnostic technique for detection of EV and cause of rebleeding, but it is invasive method, relatively high cost and with poor patient adherence. Therefore, non-invasive tools required as prognostic markers, helping in predicating cases with risk of recurrent variceal bleeding and need early intervention [20]. The present study aimed to assess the relation between ALBI grade and PALBI score and recurrence of variceal bleeding after EVL in cirrhotic patients.

In the present study, there are a significant percentage of patients experience rebleeding post EVL (about 16.25%), with varying time frames for recurrence. Consistently, Bambha et al. showed that recurrent variceal bleeding was diagnosed in 15% of patients in first 5 days post EVL [21]. In comparison, the recurrence rate of variceal bleeding post EVL is approximately 40% – 60% at 1 year in multiple previous studies [22,23]. Similarly, Lopes et al. found that 38% of patients post EVL experienced variceal rebleeding over 1.5 year of follow-up [24]. In contrast, Branch-Elliman et al. reported low prevalence of recurrent variceal bleeding about 4.6% in a period of 2 year follow up [25]. This difference between studies may be due to number of patients, duration of follow up or may be due to excluding patients with hemodynamic instability. low percentage of rebleeding in our study may attributed to short duration of study and small number of patients. Additionally, we noticed early rebleeding [within the first week (10.3%) and within 1st month (17.9%)] is less frequent than later rebleeding. These findings indicate that mostly rebleeding occurred in our study related to advanced cirrhosis, high portal hypertension and size of EV itself and not related to post banding complication.

In our study, we found that patients with recurrent bleeding post EVL had higher MELD and CTP scores when compared to non-bleeding group ($P < 0.001$). Additionally, 64.1% of rebleeding patients were Child C in comparison to 41.3% in non-bleeding group ($P = 0.001$). Consistently, a study done by Liang et al., 2016 gave similar results and considered that MELD and CTP scores were predictors of recurrent variceal bleeding independently in cirrhotic patients, but their study was on chronic kidney diseases [26]. In contrast, Aluizio et al, showed that CTP and MELD scores can predict risk of 6-week mortality but not variceal rebleeding [27]. This difference may be due most of patients in this study were Child B (Child C in our study) and they include patients with bleeding due to gastric varices (about 12% of patients) not only band EV as in our study.

In the present study, the validity of ALBI score at cutoff point -1.94 (grade 3) and PALBI score at cutoff value 3 in prediction of recurrent variceal bleeding were the highest specific (82.14%, 89.29%) in comparison by others common non-invasive valid scores as MELD and CTP score (68%, 60.71%), and comparable sensitivity of ALBI grade to MELD and CTP scores (71.88%, 75.86%, 84.38%) respectively, while PALBI score shows the least sensitivity 50%. These findings agreed with prior studies by Ambulge et al., 2018, Ying et al 2012, and Chen., et al 2018 [28-30]. Similarly, Gomaa et Al., 2018 showed that ALBI score can predict presence of EV at a cut-off value > -2.2 [31]. This difference may be due to the smaller number of patients in their study (80 patients). In contrast, Salama SA et al, reported that ALBI, PALBI and the MELD scores in patients with first attack of bleeding and recurrent bleeding did not differ significantly [32],

but this study was on small number of patients which may explain this differences.

The present study showed a significant positive correlation between hospital stay and CTP score, MELD score, ALBI grade and PALBI score ($r=0.342, 0.292, 0.342, 0.261$), respectively. Moreover, died patients (12 patients) had a higher CTP score, MELD, ALBI grade 3 and a higher PALBI when compared to patients who survived ($P < 0.001$). These results agreed with multiple studies, as reported by Marqus et al., 2008 and Teng et al., 2014 who found that, MELD, CTP, ALBI grade and PALBI scores can predict mortality among cirrhotic patients with risky gastric varices [33,34]. Similarly, a study by Zou et al., 2016 showed that, predicting hospital mortality due to variceal bleeding in cirrhotic patients with AUC of the ALBI score was higher value 0.808 with significance ($p < 0.001$) [11]. Additionally, Xu and Jiang, 2021 perform a study on 221 patients and concluded that PALBI score have better benefit in predicting mortality within 30 days among variceal bleeding patients [35].

In the present study, predictors of recurrent bleeding post EVL were Albumin level, total and direct bilirubin levels, INR level, haemoglobin level, haematocrit value, CTP score, MELD score, ALBI grade and PALBI score. All of these can be used as independent factors for predicting recurrent bleeding post EVL, which are in adherence with those of Chandrasekhara et al., 2007 and Giri et al., 2022 whose results reported several factors that can increase the risk of recurrent bleeding. These factors included advanced liver cirrhosis (indicated by MELD score and CTP class), presence of gastric varices, grade of EVs, and presence of peptic esophagitis [36,37]. Previous studies proposed possible factors that can

predict recurrent bleeding after EVL included prior variceal bleeding, low platelet count, elevated INR, and the presence of ascites. In addition, factors related to the EVL procedure itself, such as the number of bands used and whether the patient is compliant with post-procedure care, can influence the risk of rebleeding [38-41]. These studies concern mainly clinical evaluation and the complications of the procedure of ligation. Our study showed a strong correlation between ALBI grade / PALBI score with prevalence and grade of EV. Patients with ALBI grade 3 and PALBI score 3 have a much higher probability of recurrent esophageal variceal bleeding post EVL (Table 2,4,5). The present study compared ALBI grade/PALBI score to other non-invasive markers as CTP score and MELD score, and showed that both gives comparable or even superior result in predicting the presence and recurrence of esophageal bleeding post EVL in patients with cirrhosis, the explanation of this superiority over other non-invasive tests is the fact that ALBI grade/PALBI score depended on measurable items (albumin, bilirubin and platelets count) and don't include other suspicious not measurable items (as ascites or encephalopathy grade). Our explanation for answering question why ALBI grade/PALBI score can predict variceal bleeding is the fact that EV develops as a direct consequence of portal hypertension in patients with cirrhosis. ALBI score is a measure of functional liver reserve indirectly reflecting the severity of liver disease that cause portal hypertension. Hypoalbuminemia is hallmark of poor synthetic liver function and elevated bilirubin indicate impaired liver excretory functions. Low platelets count is an indicator of high portal hypertension and splenomegaly in cirrhotic patients. All of these can explain

relation between high ALBI score (grade 2 and 3)/high PALBI score (> 3) and increased risk for recurrent variceal bleeding in our studied group of patients. The primary limitation of this study that it's a single center design which may limit the generalization of our finding to all cirrhotic patients of different etiology. Additionally, some patients in our study with high ALBI score (grade 2 and 3)/PALBI score don't develop recurrent esophageal bleeding and this cannot exactly be explained and make some limitation for generalized use of these scores alone as a good predictor item and make endoscopy to still as the good standard for evaluation of recurrence of esophageal bleeding according to variceal size and risky signs. Further multicenter studies with larger sample size were recommended. The future research should investigate the long term follow up over 3-5 year of ALBI grade/PALBI score as a non-invasive predictor for recurrent variceal bleeding.

CONCLUSION

ALBI grade and PALBI score have considerable sensitivity and specificity comparable to MELD and CTP score and markedly improve the prediction of recurrent variceal bleeding in cirrhotic patients with avoidance of invasive endoscopic examination.

Data availability

The data that support findings of this study are available from the corresponding author.

Author contribution

Emam M, Ahmed NH and Sharaf AL involved in conception and design of the work. Mohamed MA involved in data collection. All authors contributed to acquisition, analysis, and interpretation of data. Sharaf AL and Ahmed NH involved in manuscript drafting and approval. All

authors gave final approval of the manuscript.

Conflict of interest

None.

Funding

None.

REFERENCES

- 1- D'Amico G, De Franchis R, Cooperative Study Group. Upper digestive bleeding in cirrhosis. Post-therapeutic outcome and prognostic indicators. *Hepatology*. 2003;38(3):599-612.
- 2- De Franchis R, Bosch J, Garcia-Tsao G, Reiberger T, Ripoll C, Abraldes JG, et al. Baveno VII—renewing consensus in portal hypertension. *J Hepatol*. 2022;76(4):959-74.
- 3- De Franchis R, Faculty BV. Expanding consensus in portal hypertension: Report of the Baveno VI Consensus Workshop: Stratifying risk and individualizing care for portal hypertension. *J Hepatol*. 2015;63(3):743-52.
- 4- Tripathi D, Stanley AJ, Hayes PC, Patch D, Millson C, Mehrzad H, et al. UK guidelines on the management of variceal haemorrhage in cirrhotic patients. *Gut*. 2015;64(11):1680-704.
- 5- Reiberger T, Püspök A, Schoder M, Baumann-Dürschschein F, Bucsics T, Datz C, et al. Austrian consensus guidelines on the management and treatment of portal hypertension (Billroth III). *Wien Klin Wochenschr*. 2017;129(Suppl 3):135-58.
- 6- Reji R, Buckley N, Chin J, Hazeldine S. Identification of high-risk individuals for bleeding from post-endoscopic variceal band ligation ulceration. *In JOURNAL OF GASTROENTEROLOGY AND HEPATOLOGY* 2020 Nov 1 (Vol. 35, pp. 207-208).
- 7- Sharara AI, Rockey DC. Gastroesophageal variceal hemorrhage. *N Engl J Med*. 2001;345(9):669-81.
- 8- Johnson PJ, Berhane S, Kagebayashi C, Satomura S, Teng M, Reeves HL, et al. Assessment of liver function in patients with hepatocellular carcinoma: a new evidence-based approach - the ALBI grade. *J. Clin. Oncol*. 2015 20;33(6):550-8.
- 9- Roayaie S, Jibara G, Berhane S, Tabrizian P, Park JW, Yang J, et al. PALBI-an objective score based on platelets, albumin & bilirubin stratifies HCC patients undergoing resection & ablation better than Child's classification. *In Hepatology* 2015 Oct 1 (Vol. 62, pp. 631A-2A).
- 10- Elshaarawy O, Allam N, Abdelsameea E, Gomaa A, Waked I. Platelet-albumin-bilirubin score-a predictor of outcome of acute variceal bleeding in patients with cirrhosis. *World J Hepatol*. 2020;12(3):99.
- 11- Zou D, Qi X, Zhu C, Ning Z, Hou F, Zhao J, et al. Albumin-bilirubin score for predicting the in-hospital

- mortality of acute upper gastrointestinal bleeding in liver cirrhosis: A retrospective study. *Turk J Gastroenterol.* 2016;27(2):180-6.
- 12- Abd Elbaser ES, Sharaf AL, Farag AA. Prediction of high-risk esophageal varices in patients with compensated cirrhosis using albumin-bilirubin-platelet score. *Eur J Gastroenterol Hepatol.* 2022; 34:332–7.
 - 13- El Makarem MA, Shatat ME, Shaker Y, Aleem AA, El Sherif AM, Moaty MA, et al. Platelet count/bipolar spleen diameter ratio for the prediction of esophageal varices: the special Egyptian situation: noninvasive prediction of esophageal varices. *Hepat Mon.* 2011;11(4):278.
 - 14- Berzigotti A, Seijo S, Arena U, Abraldes JG, Vizzutti F, García-Pagán JC, et al. Elastography, spleen size, and platelet count identify portal hypertension in patients with compensated cirrhosis. *Gastroenterology.* 2013;144(1):102-11.
 - 15- Pugh RN, Murray-Lyon IM, Dawson JL, Pietroni MC, Williams R. Transection of the esophagus for bleeding esophageal varices. *Br J Surg* 1973; 60:646–9.
 - 16- Kamath PS, Kim WR. The model for end-stage liver disease (MELD). *Hepatology.* 2007;45(3):797-805.
 - 17- Abby Philips C, Sahney A. Oesophageal and gastric varices: historical aspects, classification and grading: everything in one place. *Gastroenterol Rep (Oxf).* 2016;4(3):186-95.
 - 18- Meseha M, Attia M. Esophageal varices. [Updated 2023 Aug 7]. *StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing.* 2025.
 - 19- Thabut D, Moreau R, Lebrech D. Non-invasive assessment of portal hypertension in patients with cirrhosis. *Hepatology.* 2011;53(2):683-94.
 - 20- Kim MY, Jeong WK, Baik SK. Invasive and non-invasive diagnosis of cirrhosis and portal hypertension. *World J Gastroenterol.* 2014; 20(15):4300.
 - 21- Bambha K, Kim WR, Pedersen R, Bida JP, Kremers WK, Kamath PS. Predictors of early re-bleeding and mortality after acute variceal haemorrhage in patients with cirrhosis. *Gut.* 2008 Jun 1;57(6):814-20.
 - 22- Bosch J, Garcia-Pagan JC. Prevention of variceal rebleeding. *Lancet* 2003; 361(9361): 952–4.
 - 23- de Franchis R. Updating consensus in portal hypertension: report of the Baveno III Consensus Workshop on definitions, methodology and therapeutic strategies in portal hypertension. *J Hepatol* 2000; 33: 846–52.
 - 24- Lopes CV, Pereira-Lima JC, Pereira-Lima LF, Hornos AP, Marques DL, Cassal AP et al. The efficacy of endoscopic ligation for the prevention of variceal rebleeding in cirrhotic patients according to the hepatocellular function. *Hepato-gastroenterology* 2004; 51(55): 195–200.
 - 25- Branch-Elliman W, Perumalswami P, Factor SH, Sled SM, Flamm SL. Rates of recurrent variceal bleeding are low with modern esophageal banding strategies: a retrospective cohort study. *Scand J Gastroenterol* 2015; 50: 1059–67.
 - 26- Liang CC, Chou CY, Chang CT, Wang IK, Huang CC. Upper gastrointestinal bleeding as a risk factor for dialysis and all-cause mortality: a cohort study of chronic kidney disease patients in Taiwan. *BMJ open.* 2016; 6(5): e010439.
 - 27- Aluizio CL, Montes CG, Reis GF, Nagasako CK. Risk stratification in acute variceal bleeding: Far from an ideal score. *Clinics.* 2021 Jun 28;76: e2921.
 - 28- Ambulge S, Putta S, Mathur NP, Babu S. 36. Platelet count to splenic diameter ratio (PSR) and liver stiffness by MR elastography in prediction of oesophageal varices in patients with chronic liver disease. *J Clin Exp Hepatol.* 2018; 8: S68-9.
 - 29- Ying L, Lin X, Xie ZL, Hu YP, Shi KQ. Performance of platelet count/spleen diameter ratio for diagnosis of esophageal varices in cirrhosis: a meta-analysis. *Dig Dis Sci.* 2012 Jun;57(6):1672-81.
 - 30- Chen PH, Hsieh WY, Su CW, Hou MC, Wang YP, Hsin IF, et al. Combination of albumin-bilirubin grade and platelets to predict a compensated patient with hepatocellular carcinoma who does not require endoscopic screening for oesophageal varices. *Gastrointestinal endoscopy.* 2018;88(2):230-9.
 - 31- Gomaa AA, Mohammed SF, Mousa WM, Hasan NF, Mhdy MA. Evaluation of ALBI, MELD and Child-Pugh scores as non-invasive predictors of oesophageal varices. *The Egyptian Journal of Hospital Medicine.* 2018;73(8):7358-64.
 - 32- Salama Sieddek A, Sayed W, Nafady S. Platelet-albumin-bilirubin score for prediction of complications in cirrhotic patients with acute variceal bleeding. *Egyptian Journal of Medical Research.* 2025 Jan 1;6(1).
 - 33- Marques P, Maluf-Filho F, Kumar A, Matuguma SE, Sakai P, Ishioka S. Long-term outcomes of acute gastric variceal bleeding in 48 patients following treatment with cyanoacrylate. *Dig Dis Sci.* 2008; 53(2):544-50.
 - 34- Teng W, Chen WT, Ho YP, Jeng WJ, Huang CH, Chen YC, et al. Predictors of mortality within 6 weeks after treatment of gastric variceal bleeding in cirrhotic patients. *Medicine.* 2014; 93(29): e321.
 - 35- Xu C, Jiang M. Value of platelet-albumin-bilirubin score in predicting the short-term prognosis of patients with liver cirrhosis and acute upper gastrointestinal bleeding.
 - 36- Chandrasekhara V, Yepuri J, Sreenarasimhaiah J. Clinical predictors for recurrence of esophageal varices after obliteration by Endoscopic Band ligation. *Gastrointestinal Endoscopy.* 2007; 65(5): AB148.

- 37- Giri S, Sundaram S, Jearth V, Bhrugumalla S. Predictors of early bleeding after endoscopic variceal ligation for esophageal varices: a systematic review and meta-analysis. Clin Exp Hepatol. 2022 Dec 28;8(4):267-77.
- 38- Vanbiervliet G, Giudicelli-Bornard S, Piche T, Berthier F, Gelsi E, Filippi J, et al. Predictive factors of bleeding related to post-banding ulcer following endoscopic variceal ligation in cirrhotic patients: a case-control study. Aliment Pharmacol Ther. 2010;32(2):225-32.
- 39- Xu L, Ji F, Xu QW, Zhang MQ. Risk factors for predicting early variceal rebleeding after endoscopic variceal ligation. World J Gastroenterol. 2011;17(28):3347.
- 40- Cho E, Jun CH, Cho SB, Park CH, Kim HS, Choi SK, et al. Endoscopic variceal ligation-induced ulcer bleeding: What are the risk factors and treatment strategies? Medicine. 2017;96(24): e7157.
- 41- Sun R, Qi X, Zou D, Shao X, Li H, Guo X. Risk factors for 5-day bleeding after endoscopic treatments for gastroesophageal varices in liver cirrhosis. AME Medical Journal. 2017;2(3).

Citation

Ahmed, N., Emam, M., Mohamed, M., Sharaf, A. Prediction of Recurrent Variceal Bleeding in Cirrhotic Patients after Endoscopic Variceal Ligation.. *Zagazig University Medical Journal*, 2025; (5488-5499): -. doi: 10.21608/zumj.2025.425611.4205