Original Research Article

A comparative study of albumin bilirubin score, with meld for predicting the in-hospital mortality in cirrhotic patients complicated with upper gastrointestinal bleeding in a tertiary care hospital

Parmendra Kumar Prajapati*, Basudev Prasad Priyadarshi, Ashaq Hussain Dar

Department of Medicine, GSVM Medical College, Kanpur Uttar Pradesh, India

*Correspondence:
Dr. Parmendra Kumar Prajapati,
E-mail: parmendra101@gmail.com

ABSTRACT

Background: Chronic liver disease (CLD) encompasses a spectrum of injury from simple steatosis to frank cirrhosis which is evaluated by many scoring systems. Aim of the study was to evaluate the discriminative abilities of model for end-stage liver disease (MELD) score and albumin-bilirubin (ALBI) score in predicting the in-hospital mortality in cirrhotic patients complicated with upper gastrointestinal bleeding.
Methods: Data of patients with liver cirrhosis secondary to ethanol, hepatitis B and hepatitis C and cryptogenic liver cirrhosis, with upper gastrointestinal bleed was prospectively reviewed from admission to date of discharge. MELD and ALBI score, calculated for the patient from ROC curves were analysed.
Results: Our study was conducted on 149 patients. Age distribution was between 18-80 years with mean age of patients being 44.7±12.37 years, male to female sex ratio 127:22, with mortality calculated at 23.5%. The MELD score demonstrated a high predictive accuracy with an area under ROC curve of 0.953, with a 95% confidence interval ranging from 0.903 to 1.000. In contrast, ALBI score showed a lower predictive accuracy with an area under the ROC curve (AUROC) of 0.672 and 95% confidence interval ranging from 0.577 to 0.766.
Conclusions: The prognostic performance of two scores was comparable but MELD score was found to have a better prognostic significance than ALBI score.

Keywords: Albumin bilirubin score, Acute upper gastrointestinal bleed, Model for end stage liver disease chronic liver disease, Receiver operating characteristic curve

INTRODUCTION

Chronic liver disease constitutes a range of liver conditions marked by a decline in liver function, lasting for longer than six months, as well as presence of ongoing process of inflammation, destruction and regeneration of the liver parenchyma, which ultimately results in cirrhosis and fibrosis. Accurate prognostic indicators are crucial for managing cirrhosis. The child turcotte pugh (CTP) score has been in use for more than four decades. It was initially proposed to evaluate cirrhotic patients' outcomes after surgery for portal hypertension and has since acquired widespread recognition.[1-3] MELD score model was initially used for patients receiving trans-jugular intrahepatic portosystemic shunts4, but has since been used to evaluate candidates for liver transplantation5. MELD-Na, a modified MELD score that includes serum sodium, has been used to predict survival in cirrhosis patients, taking into account the role of hyponatremia in early mortality.[6-8] Recently, a very basic score called the albumin-bilirubin (ALBI) score was proposed. It assesses just two objective indicators, which are easily accessible for all patients with cirrhosis. The ALBI Score is a novel mathematical model used to assess liver function. The

formula for calculating it is -0.085×(albumin g/l) +0.66×log (bilirubin µmol/l). A number of liver diseases linked to the hepatitis B virus have been reported to be treated with the ALBI score, including cirrhosis patients experiencing upper gastrointestinal bleeding, patients with primary biliary cholangitis and patients with hepatocellular carcinoma.[9-12] Yet, not enough research has been done to determine how helpful it is in evaluating a patient cohort with cirrhosis.

Upper gastrointestinal bleeding in patients of liver cirrhosis leads to high mortality rates. Model for End-Stage Liver Disease (MELD) score and the Albumin-Bilirubin (ALBI) score are two of the most well-known scoring systems that have been created to predict mortality and unfavorable outcomes in these individuals.

This study emphasizes the importance of early diagnosis and treatment for upper gastrointestinal (GI) bleeding due to its high mortality rates. Accurate outcome prediction is crucial for clinical decision-making and resource allocation. It compares the Model for End-Stage Liver Disease (MELD) score and the Albumin-Bilirubin (ALBI) score. The study also reviews the Child-Pugh (CP) score and its modifications, highlighting the ALBI score's recent development and simplicity. The aim is to determine which scoring system is most reliable and useful for clinicians in predicting mortality, intervention needs, hospitalization duration and overall survival in upper GI bleeding patients.

For cirrhosis patients who have upper gastrointestinal bleeding, the albumin-bilirubin (ALBI) Score and MELD Score should be computed. To assess the predictive power of albumin-bilirubin (ALBI) scores and Model for end-stage liver disease (MELD) and these measures in predicting the in-hospital mortality of cirrhotic patients experiencing acute upper gastrointestinal bleeding.

METHODS

Study place

This study was conducted at K.P.S. Post Graduate Institute of Medicine, GSVM Medical College Kanpur, India.

Study duration

The study period was from April 2023 to June 2024. All patients in OPD and IPD were evaluated for this study.

The study included individuals older than eighteen years of age (of either sex), suffering from chronic liver disease (liver conditions marked by a decline in liver function, lasting longer than six months, along with ongoing process of inflammation, destruction and regeneration of the liver parenchyma, which ultimately results in cirrhosis and fibrosis), who voluntarily agreed to participate in the study. These patients with cirrhosis had upper gastrointestinal bleeding.

The study did not include patients of chronic liver disease with non-variceal bleeding or patients with systemic diseases and those on intravenous antibiotics. Pregnant females were also excluded from this study.

Investigations like s. bilirubin (total/direct/indirect), s. Albumin, s. creatinine and PT/INR were sent and based on the outcome, ALBI and MELD score were calculated and compared.

Statistical analysis

Statistical analysis was done using an MS Excel spreadsheet was used to enter, clean and code the data. SPSS Version 20.0 was used for data analysis. For normally distributed continuous variables, the expressions were means and standard deviation, for nonnormally distributed continuous variables, the expressions were median and interquartile range.

RESULTS

The sample size in our study was 149 patients. The age distribution was between 18-80 years, with mean age of patients being 44.47±12.32 years (Table 1).
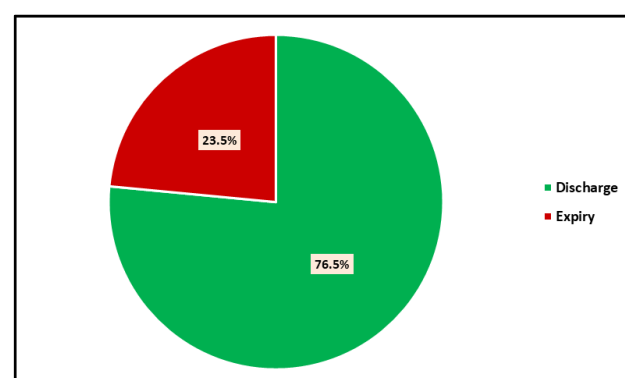

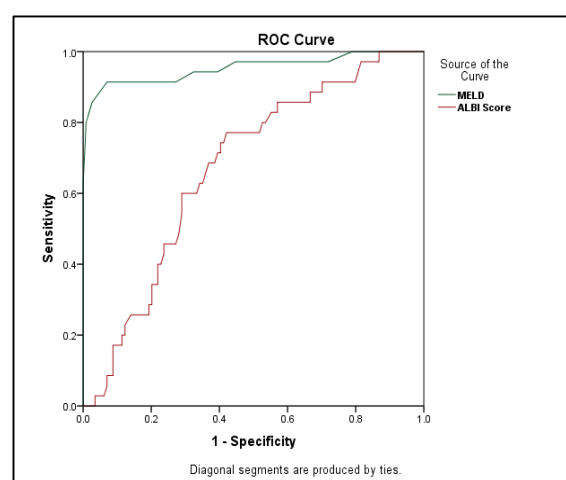**Figure 1: Distribution of patients by outcome.**

Figure 2: ROC analysis of comparison of MELD and ALBI.

One hundred and twenty-seven (127) patients were males and twenty-two (22) were females (Table 2). The outcome for cirrhotic patients with upper gastrointestinal bleeding reveals that 76.5% of the patients, totaling 114 individuals, were discharged, while 23.5%, equating to 35 individuals, unfortunately expired (Figure 1).

The ROC (Receiver Operating Characteristic) analysis was conducted to compare the predictive accuracy of the MELD (Model for End-Stage Liver Disease) score and the ALBI (Albumin-Bilirubin) score for mortality in patients with cirrhosis and upper gastrointestinal bleeding.

The MELD score demonstrated a high predictive accuracy with an Area Under the ROC Curve (AUROC) of 0.953, with a 95% Confidence Interval (CI) ranging from 0.903 to 1.000. The optimal cut-off value for MELD was identified as greater than 23.5. At this threshold, the sensitivity was 91.40% (95% CI: 86.90% to 95.90%), indicating a high capability of the MELD score to correctly identify patients who would not survive. The specificity was 93.00% (95% CI: 88.90% to 97.10%), demonstrating a high ability to correctly identify patients who would survive.

In contrast, the ALBI score showed a lower predictive accuracy with an AUROC of 0.672 and a 95% CI ranging from 0.577 to 0.766. The optimal cut-off value for ALBI was determined to be greater than -1.50. At this cut-off, the sensitivity was 77.10% (95% CI: 70.35% to 83.85%),

indicating a moderate ability of the ALBI score to correctly identify patients who would not survive. The specificity was 57.90% (95% CI: 49.97% to 65.83%), reflecting a moderate ability to correctly identify patients who would survive. In summary, the MELD score, with its higher AUROC, sensitivity and specificity, outperformed the ALBI score in predicting mortality in patients with cirrhosis and upper gastrointestinal bleeding. The MELD score's superior predictive power suggests it is a more reliable marker for assessing mortality risk in these patients compared to the ALBI score.

Table 1: Age distribution of cirrhotic patients with upper gastro intestinal bleeding.

Age (in years)	No. of patients	%
18-30	21	14.1
31-40	40	26.8
41-50	47	31.5
51-60	26	17.4
61-70	11	7.4
71-80	4	2.7
Mean±SD	44.47±12.32 years	

Table 2: Sex distribution of patients.

Sex	No. of patients	%
Male	127	85.2
Female	22	14.8

Table 3: Comparison of in hospital mortality of meld-score with ALBI score.

Parameter	MELD			ALBI score		
	Value	95% CI lower	95% CI upper	value	95% CI lower	95% CI upper
AUROC	0.953	0.903	1.000	0.672	0.577	0.766
optimum cut off	MELD>23.5			ALBI>-1.50		
Sensitivity	91.40	86.90	95.90	77.10	70.35	83.85
Specificity	93.00	88.90	97.10	57.90	49.97	65.83

DISCUSSION

The study on cirrhotic patients with upper gastrointestinal (GI) bleeding found that the majority were in their 40s, with a mean age of 44.47 years, suggesting middle-aged individuals are primarily affected. Males predominated (85.2%), likely due to higher alcohol consumption and hepatitis infections.

However, in a study By Sarangapani et al., the median age was 45 (range 18–74).[13] In our study the MELD score demonstrated a high predictive accuracy with an Area Under the ROC Curve (AUROC) of 0.953, with a 95% Confidence Interval (CI) ranging from 0.903 to 1.000. The optimal cut-off value for MELD was identified as greater than 23.5. At this threshold, the sensitivity was 91.40%

(95% CI: 86.90% to 95.90%), indicating a high capability of the MELD score to correctly identify patients who would not survive. The specificity was 93.00% (95% CI: 88.90% to 97.10%), demonstrating a high ability to correctly identify patients who would survive. In contrast, the ALBI score showed a lower predictive accuracy with an AUROC of 0.672 and a 95% CI ranging from 0.577 to 0.766. The optimal cut-off value for ALBI was determined to be greater than -1.50.

At this cut-off, the sensitivity was 77.10% (95% CI: 70.35% to 83.85%), indicating a moderate ability of the ALBI score to correctly identify patients who would not survive. The specificity was 57.90% (95% CI: 49.97% to 65.83%), reflecting a moderate ability to correctly identify patients who would survive. In a study done by Lichun Sao et al, department of gastro enterology 1067 cirrhotic

patients were retrospectively enrolled and receiver operating characteristic curve analyses was done. Area under curves of the study was in following order: child pugh>MELD>ALBI. Later concluded that ALBI score might be an alternative index for assessing the in-hospital mortality in patients with liver cirrhosis.[14]

In a similar study conducted by Deli Zou et al, department of gastroenterology in 2016 on 631 patients, ALBI score had the largest AUC, followed by MELD score and Child Pugh scores in ROC curves, so they concluded that ALBI score has moderate to high prognostic performance.[15] A retrospective study done by Xavier SA et al, on 111 patients between Jan 2011 and Nov 2015, came out with conclusion that ALBI score is particularly useful in the assessment of short come outcomes, with a better performance than the most commonly used scores. Area under curves (of ROC) were ALBI- 0.75, child Pugh- 0.64 and MELD -0.7216.

Common complications in liver cirrhosis patients included ascites (79.9%) and hepatic encephalopathy (HE), with HE significantly impacting mortality. Alcohol-related cirrhosis was the most common aetiology (79.9%). Most patients had high-grade varices (Grade III: 53.0%) and experienced oesophageal variceal (EV) bleeding (97.3%).

Critical prognostic indicators included serum creatinine, bilirubin, prothrombin time, INR and MELD score (with a score above 23.5 predicting higher mortality). The study emphasized early identification, aggressive management, routine variceal surveillance, HE management, utilization of the MELD score, addressing alcohol use and a multidisciplinary approach for optimal patient outcomes. As long-term follow-up was not available, the study was unable to assess the efficacy of ALBI in predicting long-term prognosis. As the mean MELD score of the patients who were presenting was 23.5, mortality was extremely high. Since, ALBI scores are not dynamically calculated, it is unclear if they are elevated step-by-step in response to a steady decline in liver function.

CONCLUSION

MELD has a larger AUC as compare to ALBI score that indicated a better prognostic significance when compared with ALBI score. This study provides valuable insights into the demographics, clinical characteristics and outcome of cirrhotic patients with upper GI bleeding. The findings underscore the need for targeted interventions to manage complications such as hepatic encephalopathy and variceal bleeding and they highlight the prognostic utility of MELD score. Improving the management of these patients could significantly reduce mortality and improve their quality of life.

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