RETROSPECTIVE STUDY

ALBI and Child-Pugh Score in Predicting Mortality in Chronic Liver Disease Patients Secondary to Alcohol: A Retrospective Comparative Study

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ABSTRACT

Background/Aims: The severity of liver dysfunction in chronic liver disease (CLD) is often estimated with Child-Pugh (CTP) classification or model for end-stage liver disease (MELD) score. The albumin-to-bilirubin (ALBI) score is a new model for assessing the severity of liver dysfunction, which is simple and more objective. In the present study, we aimed to retrospectively compare the performance of ALBI score with Child-Pugh score for predicting the mortality in patients with CLD. **Material and methods:** Data of patients with CLD, irrespective of etiology, were retrospectively reviewed. Child-Pugh score and ALBI score were calculated for the patients and results from receiver operating characteristic (ROC) curves were analyzed. **Results:** The study was conducted on 299 patients of CLD; age distribution was between 20 and 85 years with mean age of patients being 45.7 ± 10.94 years, sex ratio male: female 265:34 with mortality rate of 19.73%. The area under the curve (AUC) of ROC of ALBI and Child-Pugh were 0.586 and 0.549, respectively. **Conclusion:** Ability of ALBI score for predicting mortality was comparable with that of Child-Pugh score but Child-Pugh score of >10 had better performance of predicting mortality as compared to ALBI score.

Keywords: Chronic liver disease, liver cirrhosis, alcoholic liver disease, Child-Pugh score, MELD score, ALBI score

The World Health Organization (WHO) estimates 2 billion people as consuming alcohol and 76.3 million as having alcohol use disorders. Thirty percent of Indian adults use alcohol, among which 4-13% are daily consumers. The alcohol consumption rose by 30% in 2015. An estimate of 14 million has been made as heavy consumers. Looking at this data, the burden of alcoholic liver disease on the community is obvious. Alcohol abuse leads to a spectrum of liver diseases, ranging from fatty liver, alcoholic hepatitis to cirrhosis and hepatocellular carcinoma. Liver cirrhosis is a common cause of death worldwide[1,2]. The accurate prognostification of liver cirrhosis is important in our daily practice. The most commonly used tool to predict the prognosis of liver cirrhosis is Child-Pugh score[3]. However, it has been established for a long time, and its components are selected primarily based on the surgeons' experiences. Model for end-stage liver disease (MELD) score is another tool for prognostic assessment of liver cirrhosis[4,5]. Until now, there is a lot of controversy regarding the comparison of Child-Pugh versus MELD scores[6-8]. Of late, albumin-to-bilirubin (ALBI) score has been proposed as a novel, simple and readily available model calculated using mathematical formula $-0.085 \times (\text{alb g/L}) + 0.66 \times \log (\text{bil } \mu\text{mol/L})$.

The ALBI score, by combining serum albumin and bilirubin, is a new model for assessing the severity of liver dysfunction. Johnson and colleagues reported that the ALBI score more accurately predicts patients' mortality without requiring subjective determinants of liver failure, including ascites and encephalopathy, in patients with hepatocellular carcinoma[9].

A retrospective study also investigated the prognostic significance of the ALBI score among patients with primary biliary cirrhosis[10]. It was found that the ALBI score seems to outperform other scores (such as Child-Pugh and MELD score) for predicting the occurrence of hepatic events in such patients. Furthermore, Chen et al[11] demonstrated that ALBI score had a significantly better performance for long-term survival prediction in patients with hepatitis B virus (HBV)-related cirrhosis than the Child-Pugh or MELD

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scores. Herein, we attempted to study the ALBI score for in-hospital death in alcoholic cirrhosis patients.

AIMS AND OBJECTIVES

- To calculate ALBI and Child-Pugh score in chronic liver disease (CLD) patients secondary to alcohol.
- To assess the utility of ALBI in predicting the mortality in CLD patients secondary to alcohol.
- To evaluate the discriminative abilities of ALBI and Child-Pugh score in predicting the in-hospital mortality in CLD patients secondary to alcohol.

MATERIAL AND METHODS

Study Design

The study was conducted at Bowring and Lady Curzon Hospital (Attached to Bangalore Medical College and Research Institute). Cirrhotic patients secondary to alcohol admitted in the hospital between January 2017 and December 2017 were retrospectively reviewed and the data of the patients were collected. Approval was obtained from the Institutional Ethical Committee.

Inclusion Criteria

- Age >18 years.
- Liver cirrhosis patients secondary to alcohol.

Exclusion Criteria

- CLD due to HBV, hepatitis C virus (HCV), malignancy, metabolic causes and autoimmune hepatitis.

Method of Collection of Data

Detailed history and clinical examination was done for all patients. Routine investigations like complete hemogram, renal function test, liver function test, serum electrolytes, human immunodeficiency virus (HIV), hepatitis B surface antigen (HBsAg), HCV, prothrombin time/International Normalized Ratio (PT/INR), activated partial thromboplastin time (APTT), ultrasonography (USG) abdomen and other relevant investigations were noted. Diagnosis of liver cirrhosis was established by USG abdomen with shrunken liver with altered echo texture.

ALBI score and Child-Pugh score (Table 1) were calculated and compared.

ALBI score = (–0.085 × [alb g/L] + 0.66 × log [bil μmol/L])

Table 1. Calculation and Comparison of ALBI and Child-Pugh Score

Parameter	Numerical score		
	1	2	3
Ascites	None	Slight	Moderate-to-severe
Encephalopathy	None	Slight-to-moderate	Moderate-to-severe
Bilirubin (mg/dL)	<2.0	2-3	>3.0
Albumin (g/dL)	>3.5	2.8-3.5	<2.8
Prothrombin time (Prolonged in seconds)	1-3 s	4-6 s	>6.0

Child-Pugh Class A = 5-6 points; Child-Pugh Class B = 7-9 points; Child-Pugh Class C = 10-15 points.

Method of Statistical Analysis

All statistical analyses were performed using Medcalc software. Continuous data were expressed as the mean ± SD (standard deviation) and median with minimum and maximum. Categorical data were expressed as the frequency. The receiver operating characteristic (ROC) curve were performed to identify the discriminative ability of ALBI and Child-Pugh score in predicting in-hospital mortality. The area under the curve (AUC) were calculated and compared. The best cut-off value was selected as the sum of sensitivity and specificity was maximal. The sensitivity, specificity, positive likelihood ratio (PLR), negative likelihood ratio (NLR) were reported.

RESULTS AND ANALYSIS

The sample size in our study was 299 patients. The age distribution was between 20 and 85 years with mean age of patients being 45.7 ± 10.94 years. Two hundred sixty-five were males and 34 were females. Among 299 patients, 59 patients had in-hospital mortality and 240 were discharged with mortality percentage of 19.73%.

Comparison of In-Hospital Mortality with ALBI and Child-Pugh Scores

The in-hospital morality was 19.73%. The AUC of the ALBI score for predicting the in-hospital mortality was 0.586 (confidence interval [CI]: 95%; 0.528-0.642). The best cut-off value was –1.01, with sensitivity of 94.92%, a specificity of 32.5%, PLR of 1.406 and NLR 0.156 (Fig. 1).

The AUC of the Child-Pugh score for predicting the in-hospital mortality was 0.549 (CI 95%; 0.490-0.606). The best cut-off value of the Child-Pugh score was 10, with a sensitivity of 76.27%, a specificity of 34.58%, PLR of 1.165 and NLR of 0.686 (Fig. 2).

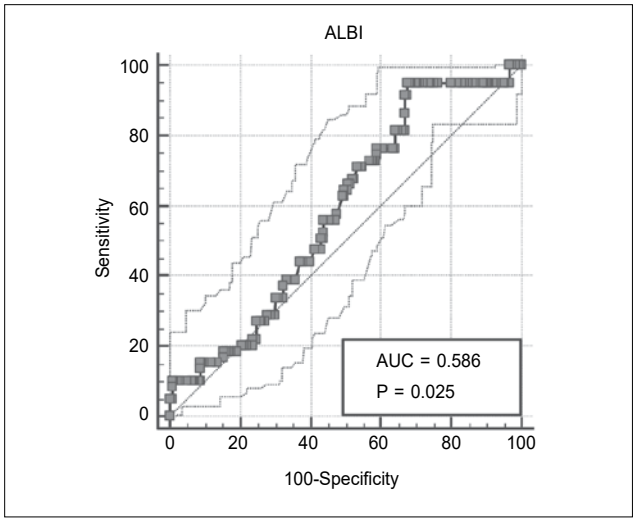


Figure 1. ROC curve of ALBI score for predicting in-hospital mortality.

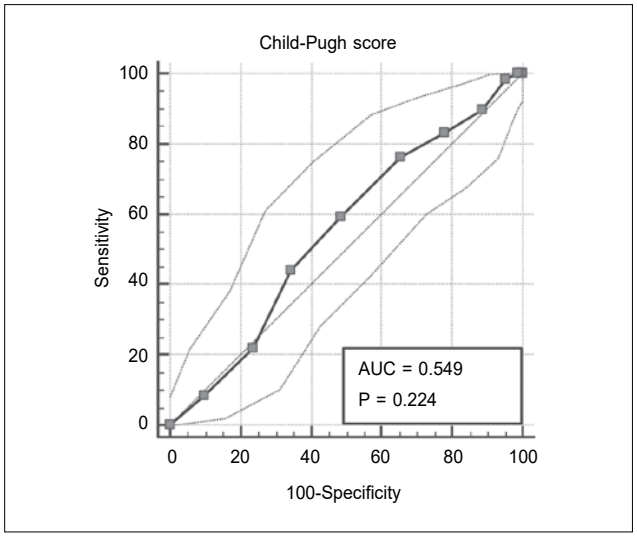


Figure 2. ROC curve of Child-Pugh score for predicting in-hospital mortality.

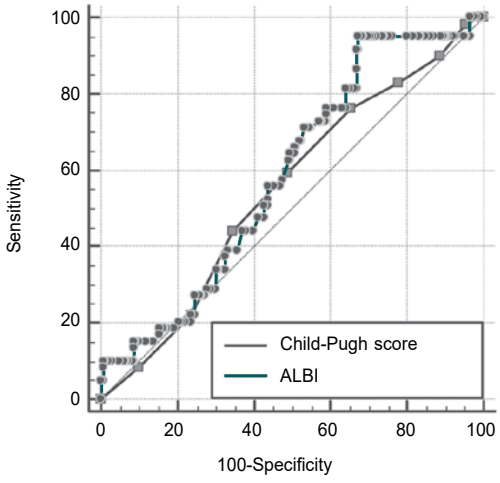
The AUC for predicting the in-hospital mortality was not significantly different between the Child-Pugh and ALBI scores. (Child-Pugh and ALBI: p = 0.4461) (Fig. 3).

The performance of Child-Pugh score is higher than ALBI score.

DISCUSSION

Child-Pugh score and MELD score have been studied extensively for their prognostic abilities and have shown good performance in predicting the mortality of cirrhotic patients. But, the cumbersome calculation of scores and the variables included in them have subjective variability that has led to the development of ALBI score.

Variable	AUC	SE	95% CI
Child-Pugh score	0.549	0.0401	0.490-0.606
ALBI	0.586	0.0382	0.528-0.642



Child-Pugh score ~ ALBI	
Difference between areas	0.0370
SE	0.0486
95% CI	–0.0582 to 0.132
Z statistic	0.762
Significance level	P = 0.4461

Figure 3. Comparison of ROC curves.

ALBI score involves only two variables and has already been studied in various liver disorders such as HBV, hepatocellular carcinoma, primary biliary cirrhosis and has shown to perform well and is comparable with the Child-Pugh and MELD scores. In our study, an attempt has been made to compare the discriminative ability of ALBI score with that of the Child-Pugh score in predicting the in-hospital mortality in alcoholic cirrhosis patients. ALBI score showed better performance compared to Child-Pugh score in predicting mortality, but there was no statistical difference between them.

In a study by Shao et al, ALBI score demonstrated similar ability as that of Child-Pugh and MELD score in predicting in-hospital mortality in cirrhosis. It also suggested that ALBI score can be readily used as prognostic model[3].

Another study by Chen et al showed that the ALBI score determined on admission indicates the likelihood of survival of acute-on-chronic liver failure patients[12].

In a study conducted by Zou et al, in patients with alcohol-related liver cirrhosis, ALBI score had the largest AUC, followed by the Child-Pugh and MELD scores, so they concluded that ALBI score has moderate-to-high prognostic performance[13].

A study conducted by Peng et al showed that there was no significant difference among the three scores in predicting in-hospital mortality in cirrhotic patients[14].

A retrospective study done by Xavier et al on 111 patients between January 2011 and November 2015, came out with the conclusion that ALBI score is particularly useful in the evaluation of short-term outcomes, with a better performance than the most commonly used scores[15].

The limitations of our study were that it was a retrospective study, the late mortality was not considered and follow-up was not done.

CONCLUSION

AUC of the ALBI score and the Child-Pugh score were comparable and there was no statistical difference between them. ALBI can be used in place of Child-Pugh score in peripheral centers to assess the prognosis of CLD patients secondary to alcohol in view of simple calculation, only two variables and no subjective variation of the score.

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