



A comparative study of albumin-bilirubin score, MELD and Child Pugh scores for predicting the in-hospital mortality in cirrhotic patients complicated with Upper GI bleeding in a Tertiary care hospital

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ABSTRACT

Background: Alcoholic liver Disease (ALD) encompasses a spectrum of Injury, ranging from simple steatosis to frank cirrhosis which is evaluated by many scoring systems. **Aims and Objective:** Our study aims at evaluating the discriminative abilities of Child-Pugh, model for end-stage liver disease (MELD), and albumin-bilirubin (ALBI) scores in predicting the in-hospital mortality in cirrhotic patients complicated with acute upper gastrointestinal bleeding. **Materials and Methods:** Data of Patients with Liver cirrhosis secondary to ethanol presented with Upper GI bleed were retrospectively reviewed. Child Pugh, MELD and ALBI scores were calculated for the patients and results from ROC curves were analysed. **Results:** In our study conducted on 112 patients, the age distribution was between 18-74 yrs with mean age of patients being 46.47 +/-10.9 years, sex ratio Male: Female: 105:7 with mortality rate of 33.4%.the Area under curves of ROC of ALBI, Child Pugh and MELD are 0.743, 0.864 and 0.763. **Conclusion:** The prognostic performance of all 3 scores was comparable but Child Pugh score was found to have better prognostic significance than ALBI and MELD score.

Key words: Albumin Bilirubin score; Acute Upper Gastrointestinal bleed; Model for end stage liver disease

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INTRODUCTION

Alcoholic liver Disease (ALD) encompasses a spectrum of Injury, ranging from simple steatosis to frank cirrhosis.¹ Alcohol related liver disease is the commonest cause of death, accounting for 2.5 million/yr.² Upper Gastro Intestinal Bleeding related to portal hypertension is a lethal complication in patients with liver cirrhosis. Child Pugh and Meld scores are two of the most important models for predicting the survival of acute upper Gastro intestinal Bleeding in cirrhotic patients.^{3,4} Recently the Albumin Bilirubin score (ALBI) has been established as a convenient and evidenced based model to access the severity of liver dysfunction in patients with hepatocellular carcinoma(HCC).⁵

ALBI Score (Albumin-Bilirubin Score) is a new mathematical model for evaluation of liver function. It is calculated by using the formula $-0.085 \times (\text{albumin g/l}) + 0.66 \times \log (\text{bilirubin } \mu\text{mol/l})$. It is a mathematical formula using only two parameters, based on routine blood tests, avoids subjective assessment of ascites and encephalopathy and without arbitrary cut-offs as compared to child Pugh score.⁶

However, the role of the ALBI score for the assessment of prognosis of AUGIB in liver cirrhosis remains unclear. Herein we conducted a retrospective study in cirrhotic patients with Upper GI Bleed to compare the prognostic performance of the ALBI score with CHILD PUGH and MELD scores.

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Aims and objectives

1. To calculate Albumin Bilirubin score, Child Pugh score and MELD scores for cirrhotic patients complicated with upper Gastro intestinal bleeding.
2. To evaluate the discriminative abilities of Child-Pugh, model for end-stage liver disease (MELD), and albumin-bilirubin (ALBI) scores in predicting the in-hospital mortality in cirrhotic patients with acute upper gastrointestinal bleeding.

MATERIALS 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 ethanol complicated with acute upper GI bleed admitted in the Hospital between 2016 January and 2016 December were retrospectively reviewed and the data of the patients were collected.

Inclusion criteria

- 1) Patient aged > 18 years.
- 2) Cirrhotic patients with Upper gastro intestinal Bleeding.

Exclusion criteria

- 1) Chronic liver disease due to hepatitis B, C, malignancy, metabolic causes, autoimmune hepatitis, Non variceal bleed patients.

Method of collection of data

Detailed history and clinical Examination done for all the patients were noted from the case sheets. Routine investigations like CBP, RFT, LFT, serum electrolytes, HIV, HBsAg, HCV, VDRL serology, prothrombin time, APTT, Ultrasound of abdomen, upper GI endoscopy and other relevant investigations were noted. Diagnosis of liver cirrhosis was established by USG abdomen with shrunken liver with altered echo texture.

Complications like anemia, hepatic encephalopathy, renal dysfunction and mortality secondary to upper GI bleed were noted.

ALBI ($-0.085 \times (\text{albumin g/l}) + 0.66 \times \log (\text{bilirubin } \mu\text{mol/l})$), Child-Pugh and MELD ($10 * ((0.957 * \ln (\text{Creatinine})) + (0.378 * \ln(\text{Bilirubin})) + (1.12 * \ln(\text{INR}))) + 6.43$ scores were calculated and compared.

Method of statistical analysis

All statistical analysis were performed using the Medcalc software. Continuous Data were expressed

as the mean+/- standard deviation(SD) and median with minimum and maximum. Categorical data were expressed as the frequency. Receiving-operative characteristics curve analysis was performed to identify the discriminative ability of the ALBI, Child Pugh and MELD scores in predicting in-hospital mortality. Areas under the ROC curves were calculated and compared. The best cut off value was selected as the sum of sensitivity and specificity was maximal. Then sensitivity, specificity, positive likelihood ratio, negative likelihood ratio were reported.

RESULTS

The sample size in our study was 112 patients. The age distribution was between 18-74 yrs, with mean age of patients being 46.47+/-10.9 years (Table 1). One hundred and five (105) were males and Seven (7) were females (Table 2).

Table 1: Age distribution of patients studied

| Age in years | No. of patients | % |
|--------------|-----------------|-------|
| 20-30 | 9 | 8.0 |
| 31-40 | 26 | 23.2 |
| 41-50 | 47 | 42.0 |
| 51-60 | 21 | 18.8 |
| 61-70 | 8 | 7.1 |
| >70 | 1 | 0.9 |
| Total | 112 | 100.0 |

Mean \pm SD: 46.47 \pm 10.90

Table 2: Gender distribution of patients studied

| Gender | No. of patients | % |
|--------|-----------------|-------|
| Female | 7 | 6.3 |
| Male | 105 | 93.8 |
| Total | 112 | 100.0 |

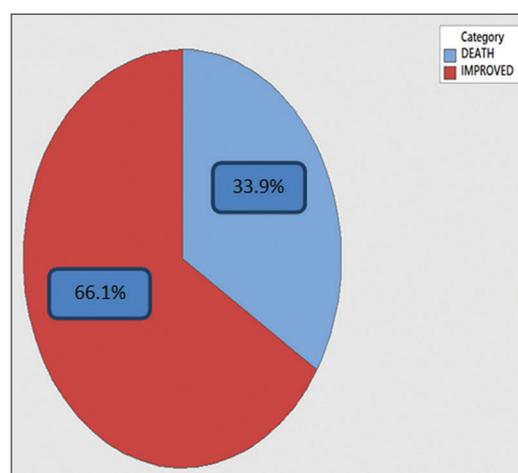


Figure 1: Pie chart: Death: 38 Improved: 74

Among 112 patients reviewed, 38 were deaths and 74 were patients who showed improvement, with mortality percentage of 33.4 % (Figure 1).

Comparison of in-hospital mortality with ALBI, Child PUGH and MELD scores

The in Hospital mortality was 33.9%. The Area under curve (AUC) of the ALBI score for predicting the in-hospital mortality was 0.743 (confidence interval: 95%: 0.652 -0.821).The best cut-off value of -0.743,with sensitivity of 89%, a specificity of 52.7%, positive likelihood ratio(PLR) of 1.255 and negative likelihood ratio (NLR) 0.23.

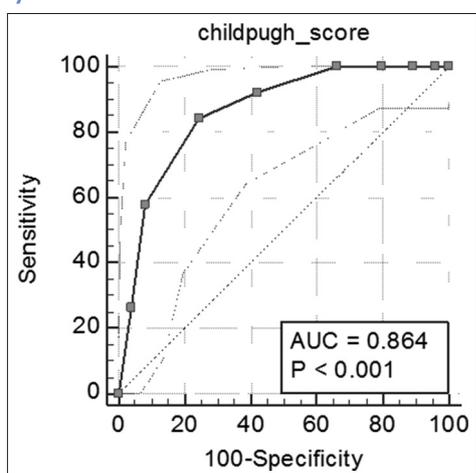
The AUC of the Child Pugh score for predicting the in-hospital mortality was 0.864(confidence interval 95%: 0.786-0.921). The Best cut-off value of the Child-Pugh score was 12, with a sensitivity of 84.2%, a specificity of 75.6%, PLR of 3.62 and NLR of 0.2.

The AUC of the MELD score for predicting the in-hospital mortality was 0.762 (confidence interval 95% 0.672 -0.837). The Best cut-off of the MELD score was 25.5, with a sensitivity of 73.7%, a specificity of 69.9%, PLR of 3.49 and NLR of 0.381.

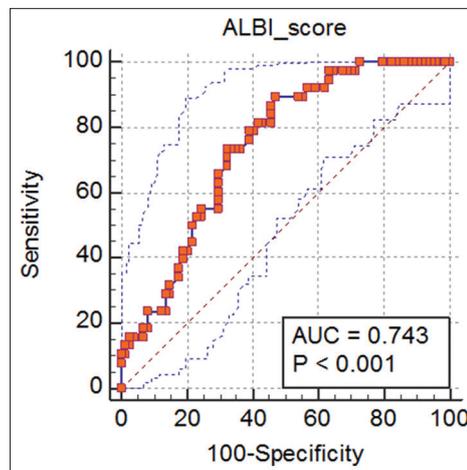
The AUC for predicting the in-hospital mortality was significantly different between the Child Pugh versus ALBI and MELD scores.(Child Pugh and ALBI: P= 0.0193; ChildPugh and MELD: P= 0.0397)

Order of sequence in respect to AUC: CHILD-PUGH > MELD > ALBI

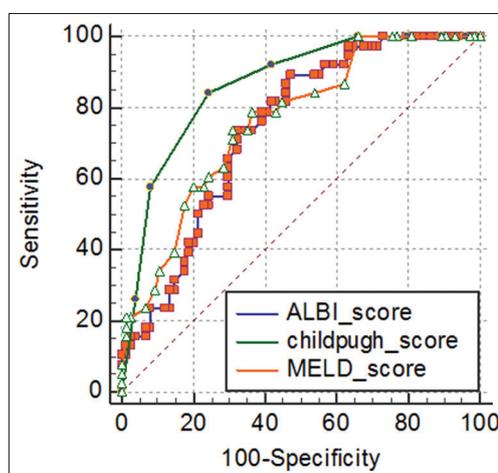
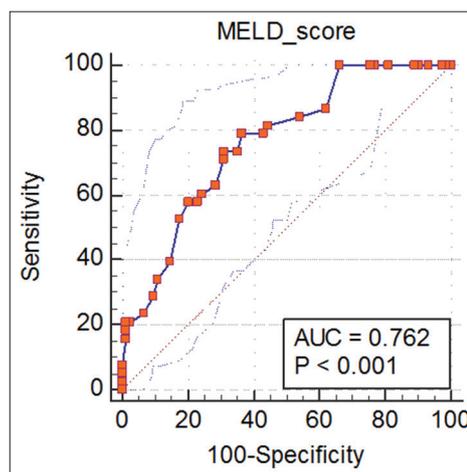
ROC curve of child pugh score for predicting in hospital mortality



ROC curve of ALBI score for predicting In Hospital Mortality



ROC curve of MELD score for predicting in hospital mortality



Comparison of all 3 scores

| Variable | AUC | SE ^a | 95% CI ^b |
|-----------------|-------|-----------------|---------------------|
| ALBI_score | 0.743 | 0.0461 | 0.652 to 0.821 |
| childpugh_score | 0.864 | 0.0340 | 0.786 to 0.921 |
| MELD_score | 0.762 | 0.0457 | 0.672 to 0.837 |

DISCUSSION

The First appearance and subsequent growth of gastro-oesophageal varices following diagnosis of varices is approximately 7% per year.^{7,8} Degree of the liver dysfunction is the best predictor of variceal bleeding.⁹ It is well known that there are several scoring systems available to evaluate the severity of liver dysfunction and predict the prognosis of patients with liver Disease, such as the MELD and Child- Pugh score scores.

The Child- Pugh Score contains Five Parameters, including the Total Bilirubin, Serum Albumin, Prothrombin time, ascites and Hepatic Encephalopathy. However the Highly Subjective evaluation of Ascites and encephalopathy might reduce the accuracy of assessment.⁸

The MELD score incorporates 3 laboratory variables, Total Bilirubin, INR and creatinine, and it eliminates the subjective factors.⁸ The MELD score was widely used as a scoring system for organ allocation in liver Transplantation and is the current standard prognostic tool for assessing the 3 to 6 month survival in patients with Failure.¹¹

The ALBI score involves only 2 common laboratory parameters, albumin and total bilirubin and it is being used in patients with Hepatocellular carcinoma for accessing the severity of Liver dysfunction.¹²

In our study, we tried to explore the prognostic performance of the ALBI score for the assessment of the in-hospital mortality of AUGIB in liver cirrhosis. We found that the prognostic performance of the ALBI score was comparable to that of Child Pugh and MELD scores.

In overall analysis, Child Pugh score had the largest AUC, followed by MELD and ALBI scores. So according to our study, Child Pugh score has better prognostic performance compared to ALBI and MELD score.

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.¹³

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.¹⁴

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 -0.72.¹⁵

A study conducted by Peng et al showed there was no significant difference in predicting in-hospital mortality in cirrhotic patients. Area under curves (of ROC) was ALBI- 0.57, child Pugh- 0.59, and MELD -0.57.¹⁶

A study conducted by Flores-Rendon AR et al in 2008, on 212 cirrhotic patients with variceal bleeding concluded that MELD score was significantly better than Child-Pugh score for predicting in hospital mortality related to variceal bleeding.(AUC were MELD: 0.905 and child-Pugh 0.794).¹⁷

CONCLUSION

Child Pugh score has the Largest AUC, followed by MELD and ALBI scores indicating that CHILD-PUGH score has better Prognostic significance when compared to ALBI and MELD score. So, Child Pugh score being calculated easily (compared to other scores) and accounting for more parameters has the better prognostic performance compared to ALBI and MELD score, Hence can be continued to be used in peripheral centres to assess the prognosis of chronic liver disease patients presenting with complications like Upper GI Bleed.

Limitations of the study

- 1) Long term follow up was unavailable, so this study couldn't evaluate the role of ALBI for predicting LONG term Prognosis.
- 2) Mortality was very high, because the mean Child Pugh score of presenting patients was 12.
- 3) ALBI scores are not dynamically measured, therefore whether the albi score is step wise elevation based on the progressive deterioration of liver function remains unclear.

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Authors Contribution:

NBS- Concept and Design of the study, Manuscript preparation, Statistically analysed and interpreted, critical revision of the manuscript; **MR**- Concept and Design of the study, Statistically analysed and interpreted, critical revision of the manuscript; **UKJ**- reviewed the literature, helped in preparing first draft of Manuscript, collected data; **RU**- collected data, Statistically analysed and interpreted, helped in preparing draft of manuscript.

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