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# Lactate Free Aarc Aclf Score (Lafas Score) And Albi Score As A Prognostic Marker In Acute On Chronic Liver Failure

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***ABSTRACT:***
***Background:*** *Cirrhosis and liver diseases are becoming more prevalent globally. A significant factor in the mortality in this population is the progression of liver disease, from fibrosis to cirrhosis, decompensation, and critical illness. Acute-on-chronic liver failure (ACLF) is a clinical syndrome characterised by acute decompensation of chronic liver disease associated with multiple organ failures and high short-term mortality[1]. It is a relatively recently described entity and characterised by a combination of hepatic and extrahepatic organ failures. Two novel user friendly prognostic scores in ACLF - LAFAS and ALBI scores have been found to predict mortality as accurately as standard validated scores according to several studies. This study aims to find the prognostic value of these scores in predicting short term mortality in ACLF.*
***Objectives:****. To estimate LaFAS and ALBI scores in patients with ACLF and to assess the severity of ACLF and predict short term mortality using these scores.*
***Methodology:*** *A prospective observational study was conducted on 140 patients admitted with acute on chronic liver failure under the department of General Medicine in Government Medical College, Kottayam during the period of 6 months. All patients included in the study were subjected to detailed history, clinical examination, biochemical and radiological investigations as per the well designed proforma after obtaining informed consent. LaFAS and ALBI scores were calculated based on the study variables at presentation. Severity of ACLF was determined using LaFAS Score and ALBI Score. Outcome was observed in patients during in-hospital stay or after discharge on follow-up for a period of 28 days from the day of presentation*
***Results:*** *The 28 days mortality in patients with ACLF according to this study is 69.3%. The mean LAFAS Score in the study population was 7.91±1.872. 80.7% of the population had LAFAS Score >7. The mean LAFAS Score of the patients who died was 8.61 ±1.68 whereas the mean score for those who were alive at 28 days was 6.35±1.19. The mean ALBI Score was -0.6619 ± 0.40. For patients with an ALBI score more than or equal to -0.57, 95.8% had expired and only 4.2% survived whereas for those with an ALBI score less than -0.57, 58.8% were alive and 41.2% had died.*
***Conclusion:*** *ALBI score is a better predictor of 28 days mortality than LaFAS score in patients with ACLF. There is statistically significant association for ALBI score and LAFAS score with the outcome with a cut off of 7.5 and -0.755 for LaFAS and ALBI scores respectively.*
***Keywords:*** *Acute on chronic liver failure(ACLF), LaFAS score, ALBI score*

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## I. Introduction

Acute-on-chronic liver failure (ACLF) is a clinical syndrome characterised by acute decompensation of chronic liver disease associated with multiple organ failures and high short-term mortality[1]. It is a relatively recently described entity and characterised by a combination of hepatic and extrahepatic organ failures. Excessive systemic inflammation appears to be a major factor in the pathogenesis of ACLF.

Decompensated cirrhosis is characterised by the onset of ascites, gastrointestinal haemorrhage, hepatic encephalopathy, and/or hepatorenal syndrome (HRS). ACLF can occur as a result of triggering events such as viral hepatitis, drug-induced liver injury, or alcohol-related hepatitis being superimposed on chronic liver disease. In contrast to decompensated cirrhosis, ACLF has a high short-term mortality[2]. The APASL ACLF Research Consortium (AARC) modified the definition of ACLF that was first published by the Asian Pacific Association for the Study of the Liver (APASL). Patients with compensated cirrhosis (diagnosed or undiagnosed) and those with non-cirrhotic chronic liver disease are included in this classification if they experience an episode of acute deterioration of liver function as a result of an acute insult to the liver. Jaundice (total bilirubin levels ≥5 mg/dl)

and coagulopathy (INR ≥ 1.5) worsened within 4 weeks by clinical ascites, hepatic encephalopathy, or both, constitute an acute hepatic insult[3].

Two novel user friendly prognostic scores in ACLF - LAFAS and ALBI scores have been found to predict mortality as accurately as standard validated scores according to several studies.[4,6] This study aims to find the prognostic value of these scores in predicting short term mortality in ACLF.

## II. Materials and Methods

Type of study: This is a prospective observational study which was approved by the institutional review board and received the ethics committee approval from the institutional ethics committee.

Study population:. Patients admitted in wards of General Medicine and MICU in Government Medical College Kottayam diagnosed with acute on chronic liver failure and meet the Inclusion criteria

Inclusion criteria: : Patients diagnosed with acute on chronic liver failure admitted in the wards of General Medicine and MICU, Government Medical College, Kottayam.

Exclusion criteria:

1. Patients with acute liver failure with no evidence of CLD.
2. Pregnancy related liver diseases
3. Hepatocellular carcinoma

Methodology: After getting Institutional Review Board clearance and consent from the patients a prospective observational study was conducted on 140patients admitted with acute on chronic liver failure under the department of General Medicine in Government Medical College, Kottayam during the period of 6 months. All patients included in the study were subjected to detailed history, clinical examination, biochemical and radiological investigations as per the well designed proforma after obtaining informed consent.

These patients underwent a physical examination and were assessed for their vital signs, presence or absence of hepatic encephalopathy. Standard laboratory parameters which includes a complete blood count, liver function tests,renal function tests and International normalized ratio [INR] were done. All lab values were collected and entered systematically. Ultrasonogram was done to assess the liver echotexture to ascertain CLD. LaFAS and ALBI scores were calculated based on the study variables at presentation. Severity of ACLF was determined using LaFAS Score and ALBI Score. Outcome was observed in patients during in-hospital stay or after discharge on follow-up for a period of 28 days from the day of presentation. Association between 28 days mortality in patients with ACLF and LaFAS and ALBI scores at presentation was determined.

Sample size:

Based on the study by Chauhan SG et al, Lactate-free AARC ACLF Score (LaFAS)-A Simple Userfriendly Score is the Best Prognostic Marker for Patients with Alcohol Induced ACLF in Western Indian Population in a Non-transplant Resource-limited Setting[5].

$$N = \frac{\left(Z_{\propto/2}\right)^2 Se(1-Se)}{d^2 p}$$

Where,

Se = sensitivity of the scoring criteria

$Z_{\propto/2}$= 1.96

P = Prevalence, d = margin of error (10%)

There for N = $(1.96)^2 \times 0.61 \times 0.39/0.1 \times 0.657 = 139.09$

Rounded off to 140

Sample Size = 140

2.7 Data collection procedure:Data was entered in Microsoft excel and analyzed using IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp.

## III. Confidentiality:

Strict confidentiality was ensured by keeping the patients anonymous with study numbers and the information gathered will only be used for scientific publication.

## IV. Ethical Issues:

The proposal of the study was presented in front of the Institutional Review Board and the approval for the study was obtained from the Institutional Ethics Committee on 02/08/2022 and informed consent was taken from all patients enrolled in the study.

## V. Analysis of Data:

Data was entered in Microsoft excel and analyzed using IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp. IBM Corp. Categorical variables were expressed as frequency (percentage) and continues variables were expressed in mean and standard deviation. Comparison of mean age, total bilirubin, albumin, INR, serum creatinine, ALBI score and LAFAS score of various levels of outcome was done using independent t- test. Association of categorical variables like Bilirubin status, Hepatic Encephalopathy status, INR status and Creatinine status with the outcome levels was done using Pearson Chi-square test. Association of gender, ALBI score categories and LAFAS score categories was evaluated using Fisher's exact test. Receiver-operating characteristics (ROC) curves were employed and the resulting area under the curve (AUC) was calculated to quantify the diagnostic value of each score. For all these statistical interpretations, $p<0.05$ was considered the threshold for statistical significance.

## VI. Results:

**Table 6.1 : Descriptive statistics of the study population.**

**Descriptive statistics**

| Characteristic | Levels | N (%) |
|---|---|---|
| **Gender** | Male | 126 (90.0) |
| | Female | 14 (10.0) |
| **Bilirubin status** | < 15 | 105 (75.0) |
| | 15 - 25 | 26 (18.6) |
| | > 15 | 9 (6.4) |
| **Hepatic Encephalopathy Grade** | Grade 0 | 5 (3.6) |
| | Grade I | 25 (17.9) |
| | Grade II | 58 (41.4) |
| | Grade III | 38 (27.1) |
| | Grade IV | 14 (10.0) |
| **INR status** | < 1.8 | 26 (18.6) |
| | 1.8 – 2.5 | 78 (55.7) |
| | > 2.5 | 36 (25.7) |
| **Creatinine status** | < 0.7 | 17 (12.1) |
| | 0.7 – 1.5 | 79 (56.4) |
| | > 1.5 | 44 (31.4) |

**Table 6.2: Frequency of ALBI score and LaFAS score**

**Frequency of ALBI score and LAFAS score status**

| Score | Levels | N (%) |
|---|---|---|
| **ALBI score** | **≥- 0.57** | 72 (51.4) |
| | **<- 0.57** | 68 (48.6) |
| **LAFAS score** | **≥ 7** | 113 (80.7) |
| | **< 7** | 27 (19.3) |

**Table 6.3: Frequency of outcome**

**Frequency of outcome**

| | Status | N (%) |
|---|---|---|
| **Outcome** | **Death** | 97 (69.3) |
| | **Alive** | 43 (30.7) |

**Table 6.4: Comparison of baseline characteristics across the outcome groups**

**Comparison of baseline characteristics across the outcome group**

| Baseline characteristics | Outcome (28days) | N | Mean (S.D) | P value |
|---|---|---|---|---|
| **Age** | Death | 97 | 60.13 (12.68) | 0.23 |
| | Alive | 43 | 57.30 (12.70) | |
| **Total Bilirubin** | Death | 97 | 13.77 (5.98) | <0.001* |
| | Alive | 43 | 8.75 (2.00) | |
| **Albumin** | Death | 97 | 2.41 (0.35) | <0.001* |
| | Alive | 43 | 2.88 (0.29) | |
| **INR** | Death | 97 | 2.38 (0.57) | <0.001* |
| | Alive | 43 | 1.85 (0.35) | |
| **Serum Creatinine** | Death | 97 | 1.42 (0.55) | <0.001* |

| | | | | |
|---|---|---|---|---|
| | Alive | 43 | 1.05 (0.42) | |

**Inference**

There is a statistically significant difference between the mean values of total bilirubin, albumin, INR and serum creatinine across the outcome groups. Total bilirubin, INR and Serum creatinine were lower among the alive patients, however the mean albumin levels were higher among the alive patients.

**Table 6.5: Comparison of mean scores across the outcome groups.**

**Comparison of mean scores across the outcome groups**

| | | | | |
|---|---|---|---|---|
| **ALBI Score** | Death | 97 | -0.51 (0.34) | <0.001* |
| | Alive | 43 | -1.01 (0.26) | |
| **LAFAS Score** | Death | 97 | 8.61 (1.69) | <0.001* |
| | Alive | 43 | 6.35 (1.19) | |

*P value <0.05 is considered statistically significant*
*Independent t- test*

**Inference**

There is a statistically significant difference between the mean ALBI and LAFAS scores across the outcome groups. Both scores were lower among the alive patients.

**Table 6.6: Association of scores with the outcome.**

**Association of score levels with outcome**

| **Score** | **Levels** | **Outcome(28days)-Death** | | $\chi^2$ | **P value** |
|---|---|---|---|---|---|
| | | Death | Alive | | |
| **ALBI score** | **≥ - 0.57** | 69 (95.8) | 3 (4.2) | 49.09 | <0.001* |
| | **< - 0.57** | 28 (41.2) | 40 (58.8) | | |
| **LAFAS score** | **≥ 7** | 93 (82.3) | 20 (17.7) | 46.64 | <0.001* |
| | **< 7** | 4 (14.8) | 23 (85.2) | | |

*P value <0.05 is considered statistically significant*

**Inference**

There is a statistically significant association for ALBI score and LAFAS score with the outcome. Majority of patients with ALBI score more than or equal to - 0.57 had death as the outcome whereas majority of patients with ALBI score less than - 0.57 were alive.

Majority of patients with LAFAS score more than or equal to 7 had death as the outcome whereas majority of patients with LAFAS score less than 7 were alive.

**Table 6.7: Prognostic predictors, AUC and cut off values.**

**Prognostic predictors, AUC and cut off values**

| **Scoring system** | **AUC** | **95% CI** | **P value** | **Cut of point** | **Sensitivity** | **Specificity** |
|---|---|---|---|---|---|---|
| **ALBI** | 0.884 | 0.823- 0.944 | <0.001* | -0.755 | 78.4 | 81.4 |
| **LAFAS** | 0.868 | 0.806- 0.930 | <0.001* | 7.5 | 68 | 88.4 |

**Inference.**

ALBI score ≥ 0.755 is considered a predictor for mortality. With sensitivity 78.4, specificity of 81.4 and area under curve 0.884.

LAFAS score ≥ 7.5 is considered a predictor for mortality. With sensitivity 68.4, specificity of 88.4 and area under curve 0.868.

## VII. Discussion:

In this study, 140 patients with acute on chronic liver failure who met the inclusion criteria admitted in the wards and ICU of the Department of General Medicine, Government Medical College, Kottayam were enrolled. The two prognostic scores, LAFAS and ALBI scores were calculated at the time of admission based on laboratory values and clinical findings. The patients were followed up for a period of 28 days from the day of presentation and mortality was assessed. Each variable obtained was separately studied.

The mean LAFAS Score in the study population was 7.91±1.872. 80.7% of the population had LAFAS Score >7. The mean LAFAS Score of the patients who died was 8.61 ±1.68 whereas the mean score for those who were alive at 28 days was 6.35±1.19. This was statistically significant. The mean LAFAS score was hence low for those patients who were alive.

For patients with a LAFAS score of more than or equal to 7, only 17.7% were alive and 82.3% had died within 28 days. For those with LAFAS score less than 7, 85.2% had survived and only 4% succumbed to the illness within 28 days. Hence a higher LAFAS score was associated with higher mortality.

The mean ALBI Score was -0.6619 ± 0.40. For patients with an ALBI score more than or equal to -0.57, 95.8% had expired and only 4.2% survived whereas for those with an ALBI score less than -0.57, 58.8% were alive and 41.2% had died. The difference was statistically significant. Mean ALBI score among patients who died was -0.51 ±0.34 and the mean score among those who are alive was -1.01±0.26. Hence a higher ALBI score was associated with a higher 28 day mortality.

Statistically significant association for ALBI and LAFAS score was found with the outcome. Hence majority of the patients with an ALBI score more than -0.57 and LAFAS score more than 7 had death as there outcome within 28 days. Majority of patients with score below these cutoffs were found to be alive at 28 days follow up. This was consistent with the study conducted by Chauhan et al, on 67 ACLF patients where LAFAS and ALBI scores outperformed the valid prognostic scores in ACLF.

In the ROC analysis of LAFAS score as a predictor of 28 day mortality in this study, sensitivity of 68%, specificity of 88.4%, was seen at a cut off level of 7.5 with AUC of 0.868.In the ROC analysis of ALBI score as a predictor of 28 day mortality, with a sensitivity of 78.4% and specificity of 81.4%, cut off was calculated at -0.755 with AUC of 0.884.

## VIII. Conclusion:

ALBI score is a better predictor of 28 days mortality than LaFAS score in patients with ACLF. There is statistically significant association for ALBI score and LAFAS score with the outcome with a cut off of 7.5 and -0.755 for LaFAS and ALBI scores respectively

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