Correlation between APRI Index, MELD Sore and Child Pugh Score in Cirrhosis of Liver

Authors
Dr Jithin George1*, Dr Yeshavanth. G2

1Post Graduate, S.S. Institute of Medical Sciences and Research Centre, Davangere, Karnataka, India
2Associate Professor, S.S. Institute of Medical Sciences and Research Centre, Davangere, Karnataka, India

*Corresponding Author
Dr Jithin George
Post Graduate, S.S. Institute of Medical Sciences and Research Centre, Davangere, Karnataka, India

Abstract
Background: Liver cirrhosis is one of the most common cause of mortality. Among the causes alcoholism leads the first. Several scoring are available for the severity in cirrhosis and hepatic fibrosis.
Aims and Objectives: 1) To calculate APRI INDEX, child pugh score and MELD score in liver cirrhosis patients. 2) To find the correlation between APRI index, MELD score and Child pugh Score.
Materials and Methods: retrospective study among 50 patients with cirrhosis of liver. Cirrhosis of liver was confirmed by ultrasound and biochemical reports. Cirrhosis due to alcohol, Hepatitis B, Hepatitis C, NAFLD leading to cirrhosis were included in the study. APRI Index, Child Pugh Score, MELD Score were calculated and the correlation was obtained.
Results and Conclusion: The study found out the relationship of MELD Score and Child Pugh Score, and MELD Score and APRI index with significant p value. The study also showed significant p value between APRI Index and Child Pugh Score. The study also showed that raised APRI Index, higher Child Pugh classification and higher MELD score for patients who died in the hospital during the course of treatment. Among those who are dead, APRI index has a median value of 12.58 and Child Pugh score of median 15. Among the dead, had a MELD score of mean of 36.08 with standard deviation of 5.946.
Keywords: correlation, APRI Index, Child Pugh Score, MELD score.

Introduction
Liver cirrhosis is the 14th most common cause of death all over the world. It causes around 1.03 million deaths per year in the world.1 Alcohol is the most common aetiology of cirrhosis, in developed countries.
In alcoholic liver disease Histological abnormalities can range from steatosis to hepatocellular carcinoma.

Alcohol consumption is measured by the count of “drinks”. The National Institute on Alcohol Abuse and Alcoholism defines a standard drink as 11-14 g of alcohol. It is approximately one drink of 40% spirit, one glass of wine or one glass of wine or 0.33 l (12-oz) beer.
Many studies have shown that the amount of undiluted (“pure”) alcohol consumed and the duration of that consumption are closely related to
cirrhosis. According to some reports, cirrhosis does not develop below a lifetime alcohol consumption of 100 kg of undiluted alcohol. This amount corresponds to an average daily intake of 30 grams of undiluted alcohol for 10 years. Heavy alcoholics consuming at least 80 g of alcohol per day for more than 10 years will develop liver disease at a rate of nearly 100%.

Data from the “Dionysos” study show, however, that consumption of more than 30 g of pure alcohol daily, regardless of sex, already increases the risk of liver disease.

8–20% of chronic alcoholics develop micronodular or Laennec’s cirrhosis. Secondary factors that accelerate the progression to cirrhosis are: patterns of alcohol drinking (chronic daily heavy drinkers more than binge drinkers), female gender (due to low levels of gastric alcohol dehydrogenase, and higher body fat proportion and oestrogen levels).

Various scores are available for predicting the prognosis and mortality in liver cirrhosis. Most common are child pugh score and MELD score. Child pugh score was developed in 1973 as a modification of child turcotte score. But subjective variability of assessing ascites grades and hepatic encephalopathy stage makes its a less reliable.

Model for end-stage liver disease (MELD) score was initially created to predict the survival of patients undergoing transjugular intrahepatic portosystemic shunts (TIPS). MELD score has only 3 objective variables: total bilirubin, creatinine, and INR.

Until now, a large number of studies compared their discriminative abilities. But the results remained controversial. Some studies favored the Child–Pugh score, but the others were on the opposite side.

Aims and Objectives
- To calculate APRI INDEX, child pugh score and MELD score in liver cirrhosis patients
- To find the correlation between APRI index, MELD score and Child pugh Score.

Method of Study
We conducted a retrospective study among the patients who were treated in the department of General Medicine, SSIMS& RC, Davangere, Karnataka. A total of 50 patients having liver cirrhosis were selected.

Inclusion Criteria
Patients with cirrhosis of liver
Patients between age 18-75 years

Exclusion Criteria
- Age less than 18 years
- Age more than 75 years
- Primary haematological disorders
- Acute infectious diseases

Cirrhosis of liver was confirmed by ultrasound and biochemical reports. Cirrhosis due to alcohol, Hepatitis B, Hepatitis C, NAFLD leading to cirrhosis were included in the study.

APRI was calculated using the formula:
\[ \text{APRI} = \left( \frac{\text{AST}}{\text{PLATELET} \times 10^9} \right) \times 100 \]

MELD SCORE is calculated using the formula:
\[ \text{MELD} = 3.78 \times \ln[\text{serum bilirubin (mg/dL)}] + 11.2 \times \ln[\text{INR}] + 9.57 \times \ln[\text{serum creatinine (mg/dL)}] + 6.43 \]

Child Pugh is calculated based on Table 1.

Analysis was based on the score obtained and divided into 3 classes: A, B and C
- Child pugh class A Score = 5 TO 6
- Child Pugh class B Score = 7 to 9
- Child Pugh class c score >10
APRI SCORE, MELD SCORE, and Child Pugh score were compared and were analysed using spss statistical analysing software. Fischer test and chi square test were applied. And the results were obtained.

**Observations and Results**

Based on the observations, the data was divided into various classes as follow:

| Factor                  | Units               | Points Toward Total Score |
|-------------------------|---------------------|---------------------------|
|                         |                     | 1  | 2  | 3  |
| Serum bilirubin         | µmol/L              | <34| 34–51| >51|
|                         | mg/dL               | <2.0| 2.0–3.0| >3.0|
| Serum albumin           | g/L                 | >35| 30–35| <30|
|                         | g/dL                | >3.5| 3.0–3.5| <3.0|
| Prothrombin time        | seconds prolonged   | <4 | 4–6  | >6 |
|                         | INR<sup>a</sup>     | <1.7| 1.7–2.3| >2.3|
| Ascites                 | None                |      |      |    |
|                         | Easily controlled   |      |      |    |
|                         | Poorly controlled   |      |      |    |
| Hepatic encephalopathy | None                |      |      |    |
|                         | Minimal             |      |      |    |
|                         | Advanced            |      |      |    |

<sup>a</sup>International normalized ratio.

**Note:** The Child-Pugh score is calculated by adding the scores for the five factors and can range from 5 to 15. The resulting Child-Pugh class can be A (a score of 5–6), B (7–9), or C (≥10). Decompensation indicates cirrhosis, with a Child-Pugh score of ≥7 (class B). This level has been the accepted criterion for listing a patient for liver transplantation.

| APRI CLASS | 1 | 2 | 3 | Total |
|------------|---|---|---|-------|
|            |   |   |   |       |

| APRI CLASS | 1 | 2 | 3 | Total |
|------------|---|---|---|-------|
|            |   |   |   |       |

| CHILD PUGH CLASS | 1 | 2 | 3 | Total |
|------------------|---|---|---|-------|
|                  |   |   |   |       |

| MELD | 1 | 18 TO 36 | Total |
|------|---|----------|-------|
|      | 1 | <18      |       |
|      | 2 | 18 TO 36 |       |
|      | 3 | >36      |       |

**APRI CLASS AND CHILD PUGH CLASS Cross tabulation**

| APRI CLASS | 1 | 2 | 3 | Total |
|------------|---|---|---|-------|
|            |   |   |   |       |

| APRI CLASS | 1 | 2 | 3 | Total |
|------------|---|---|---|-------|
|            |   |   |   |       |

| CHILD PUGH CLASS | 1 | 2 | 3 | Total |
|------------------|---|---|---|-------|
|                  |   |   |   |       |

| MELD | 1 | 18 TO 36 | Total |
|------|---|----------|-------|
|      | 1 | <18      |       |
|      | 2 | 18 TO 36 |       |
|      | 3 | >36      |       |
|                | MELD  | APRI | CHILD PUGH |
|----------------|-------|------|------------|
| MELD Correlation Coefficient | 1.00  | .632* | .840**     |
| p value         | <0.001| <0.001|
| N               | 50    | 50   | 50         |
| APRI Correlation Coefficient | .632  | 1.000 | .700     |
| p value         | 0.000 | <0.001|
| N               | 50    | 50   | 50         |
| CHILD PUGH Grade Correlation Coefficient | .840  | .700 | 1.000 |
| p value         | 0.000 | 0.000|
| N               | 50    | 50   | 50         |

### Alive(1) AND Expired (2)

|                | Alive(1) | Expired(2) |
|----------------|-----------|-------------|
| N              | 38        | 12          |
| Mean           | 23.16     | 36.08       |
| Std. Deviation | 6.954     | 5.946       |
| Std. Error Mean| 1.128     | 1.716       |

#### Levene's Test for Equality of Variances

|                | Equal variances assumed | Equal variances not assumed |
|----------------|-------------------------|-----------------------------|
| F              | 0.710                   | -                           |
| Sig.           | 0.404                   | 0.000                       |
| t              | 48                      | -6.293                      |
| df             | 5.795                   | 6.293                       |
| Mean Difference| <0.001                  | -12.925                     |
| Std. Error Difference | 2.231     | 2.054                       |
| 95% Confidence Interval of the Difference | -17.410 | -17.192                     |
|                | Lower                  | Upper                      |
| Mean Difference| -12.925                | -17.410                     |
| Std. Error Difference | 2.231     | 2.054                       |
| 95% Confidence Interval of the Difference | -17.410 | -17.192                     |

#### t-test for Equality of Means

**Hypothesis Test Summary**

| Null Hypothesis | Test | Sig. | Decision |
|-----------------|------|------|----------|
| 1 The distribution of CHILD PUGH GRADE is the same across categories of Alive_Expired. | Independent-Samples Mann-Whitney U Test | <.000 | Reject the null hypothesis |
| 2 The distribution of APRI is the same across categories of Alive_Expired. | Independent-Samples Mann-Whitney U Test | <.000 | Reject the null hypothesis |

Asymptotic significances are displayed. The significance level is .05.

### Alive (1) Expired (2)

|                | Alive (1) | Expired (2) |
|----------------|-----------|-------------|
| N              | 38        | 12          |
| Median         | 2.02      | 10.50       |
| Minimum        | 0.29      | 5           |
| Maximum        | 11.87     | 15          |
| Percentiles    | 25        | 0.74        |
|                | 50        | 2.02        |
|                | 75        | 3.74        |
| Mean           | 12        | 15.00       |
| Minimum        | 1.55      | 13          |
| Maximum        | 55.28     | 15          |
| Percentiles    | 25        | 3.90        |
|                | 50        | 12.58       |
|                | 75        | 28.78       |
Out of 50 patients analysed, 47 were males and 3 were females. 10 had mild ascites, 18 had moderate ascites, 22 had severe ascites. 15 patients had no hepatic encephalopathy, 7 patients had grade 1 or 2 hepatic encephalopathy. 28 patients had grade 3 or 4 hepatic encephalopathy. 2 patients were in Child Pugh class A, 14 Patients were in Child Pugh class B, 26 patients were in Child Pugh class C.

The study found out the relationship of MELD Score and Child Pugh Score, and MELD Score and APRI index with significant p value. The study also showed significant p value between APRI Index and Child Pugh Score.

The study also showed that raised APRI Index, higher Child Pugh classification and higher MELD score for patients who died in the hospital during the course of treatment. Among those who are dead, APRI index has a median value of 12.58 and Child Pugh score of median 15. Among the dead, had a MELD score of mean of 36.08 with standard deviation of 5.946.

**Conclusion**

The study showed positive correlation between APRI INDEX, MELD SCORE and CHILD PUGH CLASS. Hence APRI INDEX can also be used for predicting the mortality of liver cirrhosis patients and to know the prognosis as like other parameters.
References

1. Rafael Lozano et al, Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: a systematic analysis for the Global Burden of Disease Study 2010, Lancet 2012; 380: 2095–128

2. Radan Bruha, Karel Dvorak, Jaromir Petryl, Alcoholic liver disease, World J Hepatol 2012 March 27; 4(3): 8 -90.

3. Stefano Bellentani1, Claudio Tiribelli. The spectrum of liver disease in the general population: lesson from the Dionysos study, Journal of Hepatology 35 (2001) 531–537

4. S Bellentani et al, Drinking habits as cofactors of risk for alcohol induced liver damage, Gut 1997; 41: 845–850

5. Jennifer Hatton, Drinking patterns, dependency and life-time drinking history in alcohol-related liver disease, Addiction, 104, 587–592

6. Ying Peng, Xingshun Qi, Xiaozhong Guo. Child–Pugh Versus MELD Score for the Assessment of Prognosis in Liver Cirrhosis, Medicine Volume 95, Number 8, February 2016

7. Chun-Tao Wai et al. A Simple Noninvasive Index Can Predict Both Significant Fibrosis and Cirrhosis in Patients With Chronic Hepatitis C, HEPATOLOGY, Vol. 38, No. 2, 2003.

8. Christopher M. Moore et al, The MELD Score: Limitations and consequences. WSEAS TRANSACTIONS on BIOLOGY and BIOMEDICINE, Issue 2, Volume 9, April 2012

9. Kasper et al, Harrisons Principals of Internal Medicine, 1995 Table 357-4