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CORRELATION ANALYSIS OF THE CHILD PUGH SCORE, APRI INDEX, AND MELD SCORE IN LIVER CIRRHOSIS

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ABSTRACT **Introduction:** Liver cirrhosis is a significant cause of mortality worldwide, primarily recognized to factors such as alcohol consumption and viral hepatitis infections. Various scoring systems, including the Child-Pugh Score, Model for End-Stage Liver Disease (MELD) Score, and Aspartate Amino transferase to Platelet Ratio Index (APRI Index), are employed to assess the severity and prognosis of liver cirrhosis. This study aimed to evaluate the correlation between these scoring systems in liver cirrhosis patients. **Methods:** A cross-sectional observational study was conducted at GS Medical College, Hapur, Uttar Pradesh, from July 2023 to December 2023. A total of 110 participants with chronic liver disease were enrolled. The Child-Pugh Score, MELD Score, and APRI Index were determined for each participant. Statistical analyses, including correlation coefficient calculations, were performed using SSPS 25. **Results:** The study participants, mostly male, had liver cirrhosis primarily due to alcohol consumption. The severity of liver cirrhosis, as indicate by the Child-Pugh Score, MELD Score, and APRI Index, correlated positively. Particularly, a strong positive correlation was observed between the Child-Pugh Score and MELD Score ($r = 0.881$, $p = 0.0001$), while a weaker but significant correlation existed between the Child-Pugh Score and APRI Index ($r = 0.250$, $p = 0.016$), as well as between the MELD Score and APRI Index ($r = 0.210$, $p = 0.049$). **Conclusion:** This study shows a positive correlation between the APRI Index, MELD Score, and Child-Pugh Score in assessing liver cirrhosis severity. The APRI Index applied as a cost-effective choice for predicting the severity and prognosis of liver cirrhosis, optional to existing scoring systems.

KEYWORDS : Liver cirrhosis, Child-Pugh Score, MELD Score, APRI Index, Correlation Analysis

INTRODUCTION

The 14th most common cause of mortality worldwide is liver cirrhosis. Globally, it is responsible for over 1.03 million fatalities annually.[1] The most prevalent cause of cirrhosis in developed nations is alcohol consumption. The number of "drinks" is a measure of alcohol intake. A standard drink is defined by the National Institute on Alcohol Abuse and Alcoholism as 11–14 g of alcohol, which is about equal to one glass of wine, one drink of 40% spirit, or 0.331(12-oz) of beer.[2] Cirrhosis is a medical condition characterised by the widespread development of fibrosis and the creation of nodules. It is the end outcome of the fibrogenesis that happens with chronic liver damage. Cirrhosis can be caused by various factors, including metabolic, inflammatory, congenital, and toxic liver disease.[3] The primary factors contributing to the development of cirrhosis are long-term alcohol abuse and chronic infections of hepatitis B and C. These are followed by biliary disorders and hemochromatosis.[4] The most widely used bed-side scores are child-turcotte-Pugh score (CTP) and model for end stage liver disease (MELD) score. The recent additions to the list are aspartate amino transferase to-platelet ratio index (APRI) and gamma-glutamyl transpeptidase to platelet ratio index.[5]

AST (U/L)/(upper limit of the normal range) ×100/platelet count (109/L) was the formula used to determine APRI. The upper bound of the normal range was set at 40 U/L of AST. It is a mathematical formula with just two factors that is based on standard blood tests and is contrasted with the MELD and Child Pugh scores.[6] The APRI score is a more straightforward, economical, and straightforward way to compute than the MELD and Child Pugh scores. It indicates the degree of liver damage and the compensatory state of the hepatic function. Significant fibrosis was found to be predicted by an 86% Negative Predictive Value (NPV) and an 88% Positive Predictive Value (PPV), while cirrhosis was found to be predicted by a 98% Negative Predictive Value (NPV) and a 57% Positive Predictive Value (PPV).[7]

An ideal non-invasive diagnostic test for hepatic cirrhosis should be simple, available, inexpensive, and accurate. Thus, the purpose of this study was to determine the correlation between the APRI Index, MELD score, and Child Pugh score in patients with liver cirrhosis.

MATERIAL AND METHODS

The study was carried out in the Department of Medicine, GS Medical College, Hapur, Uttar Pradesh, and was designed as a cross-sectional observational study. It took place from July 2023 to December 22023 with complete enumeration to establish the sample size.

The inclusion criteria for the study include:

1. Patients aged above 18 years.
2. Patients with chronic liver disease.

The exclusion criteria are:

1. Cirrhosis of the liver as evidenced by abdominal ultrasound and liver profile derangement.
2. Liver disorders other than cirrhosis.
3. Accompanying illnesses like haematological disorders, malignancy, and chronic disorders like diabetes, hypertension, cardiac diseases, renal failure.
4. Any surgical history.
5. Patient's unwillingness to participate in the study.

All enrolled individuals provided informed consent, and participants who fit the inclusion criteria were selected from the hospital's inpatient and outpatient departments. In addition to clinical examination and pertinent tests, demographic information was gathered, such as age, gender, and pertinent medical history, in order to validate the diagnosis of chronic liver disease and gauge the degree of cirrhosis. Using pre-established methods, the Child-Pugh Score, APRI Index, and MELD Score were determined for every participant.

The APRI score was determined in this manner: Platelet count (109/l)×100 = 6AST/upper limit of normal. [8]Child Pugh score was calculated as given by Pugh et al shown in Table 1.[9]Meld score was computed using the initial formula that the Mayo Clinic group - logarithmic bilirubin (mg/dl) + 11.2 logarithmic INR + 9.6 logarithmic creatinine (mg/dl) + 6.4. Three classes were randomly selected from the MELD score.[10]

Table 1: Child Pugh classification of cirrhosis

Factor	Units	1	2	3
Serum Bilirubin	µmol/L (mg/dL)	<34 (<2.0)	34-51 (2.0-3.0)	>51 (>3.0)
Serum Albumin	g/L (g/dL)	>35 (>3.5)	30-35 (3.0-3.5)	<30 (<3.0)

Prothrombin Time	Seconds	<4 (<1.7)	4-6 (1.7-2.3)	>6 (>2.3)
Ascites		None	Easily Controlled	Poorly Controlled
Hepatic Encephalopathy		None	Minimal	Advanced

SSPS 25 was used for statistical analysis. When comparing two groups of quantitative data, the student t-test was utilised, and when comparing qualitative data, the Fischer exact test. The correlation between the APRI, CTP, and MELD scores was determined using the Pearson correlation coefficient.

OBSERVATION AND RESULTS

A total 110 study participants were included in the study who gave informed consent. The age distribution of the was between 25-80 years with mean age of 45.61 and standard deviation of 11.01. There were 101 male and 9 females. In the study participants alcohol was the most common cause, accounting for 72.73% of cases, followed by hepatitis B infection (14.55%) and hepatitis C infection (9.09%). Autoimmune, NAFLD, and cryptogenic causes were less common, each contributing to less than 1% of cases.

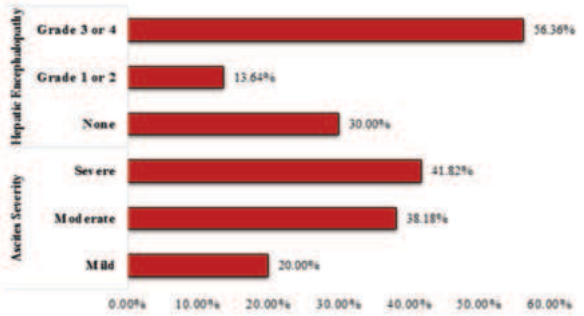

Figure 2 Distribution of study participant based on complications of cirrhosis

The severity of ascites was found to vary: 20.00% was categorized as mild, 38.18% as moderate, and 41.82% as severe. There was variation in the hepatic encephalopathy as well; 30.00% did not have any encephalopathy, 13.64% were classified as Grade 1 or 2, and 56.36% as Grade 3 or 4 (Figure 1).

The relationships between the Child-Pugh Score, MELD Score, and APRI Index in determining the severity of liver cirrhosis are highlighted in the table 2 along with the correlation coefficients (r) and corresponding p-values. The Child-Pugh Score and MELD Score show a strong positive correlation (r = 0.881, p = 0.0001), indicating that an increase in one score is likely to result in an increase in the other.

Table 2: Correlation matrix of Child-Pugh scores, MELD scores, and APRI Index.

Scores	Child-Pugh Score	MELD Score	APRI Index
Child-Pugh Score	-	r=0.881 (p = 0.0001)	r=0.250 (p = 0.016)
MELD Score	r=0.881 (p = 0.0001)	-	r=0.210 (p = 0.049)
APRI Index	r=0.250 (p = 0.016)	r=0.210 (p = 0.049)	-

r = correlation coefficient (Pearson)

Furthermore, there is a weaker but statistically significant positive correlation (r = 0.250, p = 0.016) between the Child-Pugh Score and the APRI Index, suggesting some degree of association between these scoring systems. The MELD Score and APRI Index also show a moderately positive correlation (r = 0.210, p = 0.049), supporting the idea that these scoring systems typically move in unison.

Table 3: Distribution of study participant based on Scores graded according to complication (Ascites)

Scores	Grades	Number	Mean	Std. Deviation
Child-Pugh Score	Mild	22	6.22	1.185
	Moderate	42	10.59	1.933
	Severe	46	13	2.887
MELD Score	Mild	22	14.53	5.038
	Moderate	42	23.88	8.52
	Severe	46	22.86	9.582
APRI Index	Mild	22	1.44	1.35
	Moderate	42	2.78	2.321
	Severe	46	4.48	2.499

The table 3 presents that the Child-Pugh Score revealed that patients classified as having mild cirrhosis had an average score of 6.22, whereas those with moderate and severe cirrhosis had average scores of 10.59 and 13, respectively. Similarly, patients with mild cirrhosis had an average MELD Score of 14.53, while those with moderate and severe cirrhosis had average scores of 23.88 and 22.86, respectively. The APRI Index exhibited a comparable trend, wherein patients classified as mild, moderate, and severe had average scores of 1.44, 2.78, and 4.48, respectively.

Table 4: Distribution of study participant based on Scores graded according to complication (Hepatic encephalopathy)

Scores	Grades	Number	Mean	Std. Deviation
Child-Pugh Score	None	33	8.61	1.786
	Grade 1 or 2	15	11.27	1.986
	Grade 3 or 4	62	13.37	1.555
MELD Score	None	33	18.63	8.01
	Grade 1 or 2	15	24.93	8.343
	Grade 3 or 4	62	29.97	6.074
APRI Index	None	33	1.84	1.611
	Grade 1 or 2	15	3.36	2.722
	Grade 3 or 4	62	3.42	2.09

The table 4 presents Child-Pugh Score, patients without cirrhosis had an average score of 8.61, whereas those with Grade 1 or 2 and Grade 3 or 4 cirrhosis had average scores of 11.27 and 13.37, respectively. Similarly, the MELD Score showed that patients without cirrhosis had an average score of 18.63, while those with Grade 1 or 2 and Grade 3 or 4 cirrhosis had average scores of 24.93 and 29.97, respectively. The APRI Index classified as having no cirrhosis, Grade 1 or 2 cirrhosis, and Grade 3 or 4 cirrhosis displayed average scores of 1.84, 3.36, and 3.42, respectively.

DISCUSSION

Liver cirrhosis represents a significant health burden globally, characterized by substantial morbidity and mortality. In our study, we observed a cohort of 110 participants, providing valuable insights into the demographic characteristics, etiological factors, and severity assessment of liver cirrhosis using various scoring systems.

One key aspect of our study was the evaluation of liver cirrhosis severity using scoring systems such as the Child-Pugh Score, MELD Score, and APRI Index. These scoring systems are instrumental in assessing the extent of liver injury and predicting patient outcomes. Our findings indicated that patients with more severe cirrhosis, as indicated by higher scores on these systems, tended to have poorer prognoses. This observation aligns with previous research by Kamimoto Y et al.[11], which demonstrated positive correlations between these scoring systems and liver cirrhosis severity, as well as associated complications.

The APRI Index emerged asa particularly noteworthy tool in our study, offering a cost-effective and objective method for assessing liver fibrosis and injury extent. This finding is supported by previous study byWai CT et al.[8], which highlighted the predictive value of the APRI Index in identifying liver-related complications and mortality in patients with HBV-related cirrhosis. Additionally, Wong et al.[12] underscored the utility of the APRI score as an alternative non-invasive marker for predicting liver fibrosis in patients with Hepatitis B and Hepatitis C infections.

Furthermore, our study corroborates existing literature regarding the utility of AST and platelet count, the components of the APRI Index, in assessing liver injury and fibrosis progression. Studies by Toghill PJ et al.[13], Aster RH et al.[14], and Nalpas B et al.[15] have elucidated the pathophysiological mechanisms underlying the alterations in ASTlevels and platelet counts in liver cirrhosis, further validating the clinical relevance of these markers.

CONCLUSION

The study demonstrated a positive correlation between the APRI index, MELD score, and Child-Pugh score. The predictive accuracy of all three measures was similar, thus supporting the use of the APRI

index can be utilised as a cost-effective and subjective alternative scoring method for predicting the severity and prognosis of liver cirrhosis.In order to improve our comprehension and treatment of liver cirrhosis, future research projects should concentrate on verifying these results in bigger and more varied patient groups.

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