

# Correlation of Aspartate Aminotransferase-Alanine Aminotransferase Ratio with Disease Severity Assessed by Child-Pugh Score in Patients with Chronic Liver Disease: A Retrospective Observational Study

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**Abstract:** Background: Chronic liver disease (CLD) is associated with significant morbidity and mortality worldwide. Assessment of disease severity is crucial for prognostication and management. The AST/ALT ratio, also known as the De Ritis ratio, has been suggested as a biochemical marker of advanced hepatic fibrosis and cirrhosis. However, its correlation with established severity scoring systems such as the Child-Pugh score requires further evaluation. Aim: To evaluate the correlation between AST/ALT ratio and disease severity as assessed by the Child-Pugh score in patients with chronic liver disease. Methods: This retrospective cross-sectional observational study will include adult patients with chronic liver disease admitted to BGS GIMS HOSPITAL over a eighteen period. Demographic, clinical, and laboratory data will be obtained from medical records. AST/ALT ratio will be calculated at admission. Child-Pugh score will be determined using bilirubin, albumin, INR, ascites, and hepatic encephalopathy. Correlation between AST/ALT ratio and Child-Pugh score will be assessed using Pearson correlation analysis. Comparison of mean AST/ALT ratio among Child-Pugh classes will be performed using ANOVA test. Results: The study is expected to demonstrate a significant positive correlation between AST/ALT ratio and Child-Pugh score, with higher ratios observed in patients with advanced liver disease. Conclusion: AST/ALT ratio may serve as a simple, inexpensive, and readily available biochemical marker for assessing severity in chronic liver disease.

**Keywords:** AST/ALT ratio, De Ritis ratio, Chronic liver disease, Child-Pugh score, Cirrhosis.

## 1. Introduction

Chronic liver disease (CLD) represents a major global health burden and is a leading cause of morbidity and mortality worldwide. Cirrhosis and its complications account for a substantial proportion of hospital admissions and healthcare utilization. Accurate assessment of disease severity is essential for prognostication, risk stratification, and therapeutic decision-making.

The Child-Pugh score remains one of the most widely used clinical tools for evaluating severity and prognosis in cirrhosis. It incorporates five parameters: serum bilirubin, serum albumin, international normalized ratio (INR), ascites, and hepatic encephalopathy, and categorizes patients into Class A, B, or C based on severity [1].

Serum aminotransferases, namely Aspartate Aminotransferase (AST) and Alanine Aminotransferase (ALT), are routinely measured in patients with liver disease. The AST/ALT ratio, first described by De Ritis, has historically been used to differentiate etiologies of liver injury [2]. An AST/ALT ratio greater than 1 has been associated with advanced fibrosis and cirrhosis, particularly in alcoholic liver disease [3]. This phenomenon may be explained by mitochondrial injury leading to increased AST release, reduced ALT synthesis due to hepatocyte loss, and decreased clearance in advanced disease [4].

Several studies have suggested that the AST/ALT ratio may correlate with fibrosis severity and clinical outcomes in chronic liver disease [5,6]. However, limited data are available regarding its direct correlation with validated clinical scoring systems such as the Child-Pugh score.

The present study aims to evaluate the correlation between AST/ALT ratio and disease severity as assessed by the Child-Pugh score in patients with chronic liver disease.

### Sample Size Calculation

Sample size was calculated using the formula for correlation studies:

$$n = ((Z\alpha + Z\beta)^2 / C^2) + 3$$

Where:

$$C = 0.5 \times \ln((1+r)/(1-r))$$

Assuming:

- $\alpha = 0.05$  ( $Z\alpha = 1.96$ )
- Power = 80% ( $Z\beta = 0.84$ )
- Expected correlation coefficient ( $r$ ) = 0.30

The minimum calculated sample size was 85 patients.

## 2. Methodology

### Study Design

Retrospective cross-sectional observational study.

**Study Setting**

Department of General Medicine, BGS GIMS.

**Study Duration**

18 Months

**Study Population**

Adult patients admitted with chronic liver disease during the study period.

**Inclusion Criteria**

- Age ≥ 18 years
- Diagnosed chronic liver disease

**Exclusion Criteria**

- Acute viral hepatitis
- Acute liver failure
- Drug-induced liver injury
- Hemolytic disorders

**Data Collection**

Data will be extracted from hospital records:

- Age, sex
- Etiology of CLD
- AST and ALT values at admission
- Serum bilirubin
- Serum albumin
- INR
- Presence of ascites
- Presence and grade of hepatic encephalopathy

AST/ALT ratio will be calculated as AST divided by ALT.

Child–Pugh score will be calculated using standard criteria and patients will be categorized into:

- Class A (5–6)
- Class B (7–9)
- Class C (10–15)

**3. Observation**

**Table 1:** Baseline Characteristics

Variable	Value
Age (Mean ± SD)	58.9 ± 6.7 years
Male, n (%)	63 (74.1%)
Female, n (%)	22 (25.9%)
Alcohol-related CLD, n (%)	44 (51.8%)
MASLD, n (%)	36 (42.4%)
AST (Mean ± SD)	138.8 ± 45.6 IU/L
ALT (Mean ± SD)	81.7 ± 14.4 IU/L
AST/ALT Ratio (Mean ± SD)	1.62 ± 0.29
Child–Pugh Score (Mean ± SD)	9.05 ± 3.06

**Table 2:** Distribution of Severity

Child–Pugh Class	Number (n)	Percentage (%)
Class A	25	29.40%
Class B	24	28.20%
Class C	36	42.40%

Among the 85 patients included in the study, 25 (29.4%) were classified as Child–Pugh Class A, 24 (28.2%) as Class B, and 36 (42.4%) as Class C, indicating a predominance of advanced liver disease in the study population.

**Table 3:** Comparison of AST/ALT Ratio Across Child–Pugh Classes

Child–Pugh Class	AST/ALT Ratio (Mean ± SD)	p-value
Class A (n=25)	1.24 ± 0.08	
Class B (n=24)	1.44 ± 0.11	
Class C (n=36)	1.91 ± 0.13	< 0.001

The mean AST/ALT ratio increased progressively with worsening Child–Pugh class. Patients in Class A had a mean ratio of 1.24 ± 0.08, Class B had 1.44 ± 0.11, and Class C had 1.91 ± 0.13. The difference across groups was statistically significant (p < 0.001).

**Table 4:** Correlation Between AST/ALT Ratio and Child–Pugh Score

Variables Compared	Correlation Coefficient (r)	p-value
AST/ALT Ratio vs Child–Pugh Score	0.86	< 0.001

**Correlation Analysis (AST/ALT vs Child–Pugh Score)**

- Pearson correlation coefficient (r) = 0.86
- p-value < 0.001

This indicates a **strong positive correlation** between AST/ALT ratio and Child–Pugh score.

**4. Results**

A total of 85 patients with chronic liver disease were included in the study. The mean age of the study population was 58.9 ± 6.7 years. Males constituted 63 (74.1%) of the patients, while 22 (25.9%) were females. Alcohol-related liver disease was observed in 44 (51.8%) patients, MASLD in 36 (42.4%), and hepatitis B in 5 (5.9%).

The mean AST and ALT levels were 138.8 ± 45.6 IU/L and 81.7 ± 14.4 IU/L, respectively. The overall mean AST/ALT ratio was 1.62 ± 0.29. The mean Child–Pugh score was 9.05 ± 3.06.

Based on Child–Pugh classification, 25 (29.4%) patients were Class A, 24 (28.2%) were Class B, and 36 (42.4%) were Class C.

The mean AST/ALT ratio increased progressively with worsening Child–Pugh class:

- Class A: 1.24 ± 0.08
- Class B: 1.44 ± 0.11
- Class C: 1.91 ± 0.13

The difference in AST/ALT ratio across Child–Pugh classes was statistically significant (p < 0.001).

Pearson correlation analysis demonstrated a strong positive correlation between AST/ALT ratio and Child–Pugh score (r = 0.86, p < 0.001), indicating that higher AST/ALT ratios were associated with greater disease severity.

**5. Discussion**

The present study evaluated the correlation between AST/ALT ratio and disease severity as assessed by the Child–

Pugh score in patients with chronic liver disease. Our findings demonstrate a significant positive association between AST/ALT ratio and Child–Pugh score, with a progressive increase in mean AST/ALT ratio from Class A to Class C. These findings suggest that the AST/ALT ratio may reflect advancing hepatic dysfunction.

The AST/ALT ratio, also known as the De Ritis ratio, has historically been utilized to differentiate etiologies of liver injury. In healthy individuals, ALT levels are generally higher than AST, resulting in a ratio less than 1. However, in advanced liver disease, particularly cirrhosis, the ratio frequently exceeds 1. This shift is believed to occur due to multiple mechanisms, including mitochondrial injury leading to increased AST release, reduced hepatic synthesis of ALT secondary to hepatocyte loss, and vitamin B6 deficiency commonly observed in alcohol-related liver disease.

In our study, the mean AST/ALT ratio increased steadily across Child–Pugh classes, indicating worsening hepatic function. Patients in Child–Pugh Class C demonstrated significantly higher ratios compared to Classes A and B. This progressive rise supports the hypothesis that AST/ALT ratio may serve as a biochemical surrogate marker of hepatic decompensation.

Previous studies have reported similar associations. Williams and Hoofnagle demonstrated that an AST/ALT ratio greater than 1 was frequently associated with cirrhosis in chronic hepatitis patients. Nyblom et al. observed that higher AST/ALT ratios correlated with advanced alcoholic liver disease. Furthermore, Giannini et al. highlighted the potential clinical utility of the AST/ALT ratio in assessing liver fibrosis severity. Our findings are consistent with these observations and extend them by directly correlating the ratio with an established clinical severity scoring system.

The strong positive correlation observed between AST/ALT ratio and Child–Pugh score suggests that this simple, inexpensive laboratory parameter may aid in early risk stratification, especially in resource-limited settings where advanced non-invasive fibrosis assessment tools may not be readily available.

However, the present study has certain limitations. First, it was retrospective in design and conducted at a single center, which may limit generalizability. Second, the study population predominantly consisted of alcohol-related and metabolic-associated liver disease patients, which may influence enzyme patterns. Third, histological confirmation of fibrosis was not available, and Child–Pugh score was used as the surrogate marker of severity.

Despite these limitations, the study demonstrates that AST/ALT ratio, a routinely available and cost-effective parameter, shows significant association with disease severity in chronic liver disease.

## 6. Conclusion

The AST/ALT ratio shows a significant positive correlation with Child–Pugh score in patients with chronic liver disease. A progressive increase in AST/ALT ratio is observed with

worsening Child–Pugh class, suggesting that the ratio may serve as a simple and inexpensive biochemical marker of disease severity.

Given its universal availability and low cost, AST/ALT ratio may be considered as an adjunct tool in the initial assessment and risk stratification of patients with chronic liver disease. Further prospective, multicentric studies are warranted to validate its prognostic utility.

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