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A Study to Assess Risk Stratification by Using Child-Pugh Score, Rate of Admission and Management Strategies of Inpatients with Alcoholic Liver Disease

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Abstract

Objective: To assess risk stratification using the Child-Pugh scoring system, evaluate hospital admission profiles, and audit real-world pharmacological management in hospitalized patients with Alcoholic Liver Disease (ALD).

Methodology: A six-month prospective observational study included 123 confirmed ALD inpatients admitted to the General Medicine Department of ESIC Medical College & Model Hospital, Bengaluru. Demographic characteristics, alcohol consumption history, clinical features, laboratory parameters, and treatment patterns were recorded. Statistical analyses included Chi-square test, one-way ANOVA, Kruskal-Walli's test, Spearman's rank correlation, and Odds Ratio (OR) analysis.

Results: The mean age was 47.30 ± 9.07 years, with 95.12% males. Most patients were classified as Child-Pugh Class C (58.54%), followed by Class B (29.26%) and Class A (12.20%). Alcohol consumption for >10 years was significantly associated with advanced liver disease ($p = 0.0096$; OR = 2.12). Disease severity was significantly associated with portal hypertension (79.67%, $p < 0.001$), ascites (65.85%, $p < 0.001$), hepatic encephalopathy (31.71%, $p = 0.00017$), hepatorenal syndrome (18.70%, $p = 0.0222$), coagulopathy (22.76%, $p = 0.0216$), and esophageal varices (49.60%, $p = 0.0437$). Laboratory abnormalities, including reduced albumin and elevated bilirubin, INR, AST, ALT, and ALP, correlated with increasing severity ($p < 0.01$). Although hospital stay did not differ significantly across Child-Pugh classes ($p = 0.269$), Class C patients had a twofold higher readmission risk (OR = 2.02). Lactulose, rifaximin, ursodeoxycholic acid, furosemide, and spironolactone were the most frequently prescribed drugs, while corticosteroid use was limited (3.25%).

Conclusion: The Child-Pugh score is an effective bedside tool for predicting disease severity, complications, and readmission risk in ALD. Variations from evidence-based treatment, particularly excessive

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ursodeoxycholic acid use and limited corticosteroid prescribing, highlight the need for improved guideline-directed management.

Keywords: Alcoholic Liver Disease, Child-Pugh Score, Risk Stratification, Portal Hypertension, Prescribing Patterns.

Introduction

Alcoholic liver disease (ALD) is a major cause of chronic liver disease and liver-related mortality worldwide, accounting for a substantial proportion of cirrhosis, hepatic decompensation, and liver transplantation. Persistent excessive alcohol consumption results in a spectrum of hepatic injury ranging from simple steatosis and alcoholic hepatitis to fibrosis, cirrhosis, and hepatocellular carcinoma. The increasing prevalence of harmful alcohol consumption, particularly in developing countries such as India, has contributed to a growing burden of ALD-related hospitalizations and healthcare utilization. Despite advances in medical management, patients with advanced ALD continue to experience high rates of complications, recurrent hospital admissions, and poor survival.

Accurate assessment of disease severity is essential for prognostication, therapeutic decision-making, and optimal allocation of healthcare resources. Among the available prognostic tools, the Child-Pugh scoring system remains one of the most widely accepted bedside methods for evaluating hepatic functional reserves. By incorporating five clinical and biochemical parameters—ascites, hepatic encephalopathy, serum bilirubin, serum albumin, and international normalized ratio (INR)—the Child-Pugh score classifies patients into three prognostic categories (Class A, B, and C), reflecting increasing severity of liver dysfunction and mortality risk. Several studies have demonstrated the usefulness of the Child-Pugh score in predicting complications such as portal hypertension, ascites, hepatic encephalopathy, variceal bleeding, and mortality in patients with chronic liver disease. Other investigations have compared the Child-Pugh score with newer prognostic models such as the Model for End-Stage Liver Disease (MELD), highlighting that although MELD provides objective laboratory-based assessment, the Child-Pugh classification remains clinically valuable because of its simplicity, ease of bedside application, and ability to assess functional liver reserve. However, most previous studies have primarily focused on mortality prediction or individual complications, while limited evidence is available regarding its association with hospital admission characteristics, readmission risk, and real-world pharmacological management, particularly in Indian tertiary-care settings.

Furthermore, adherence to evidence-based treatment recommendations in hospitalized ALD patients remains variable. While current hepatology guidelines recommend appropriate management of complications such as hepatic encephalopathy, ascites, portal hypertension, and severe alcoholic hepatitis, real-world prescribing practices frequently differ because of institutional protocols, physician preferences, and resource availability. Evaluating these treatment patterns alongside disease severity may identify important gaps between clinical practice and guideline-directed care.

Therefore, the present study was undertaken to assess risk stratification using the Child-Pugh scoring system, evaluate hospital admission and readmission profiles, and audit pharmacological management strategies among hospitalized patients with Alcoholic Liver Disease at a tertiary care teaching hospital. The findings are expected to provide evidence regarding the prognostic utility of the Child-Pugh score and identify opportunities to optimize evidence-based management of ALD in routine clinical practice.

Materials and Methods

This institutional, cross-sectional observational study was carried out in the In-patient Department of General Medicine at ESIC Medical College, PGIMSR & Model Hospital, Rajajinagar, Bengaluru, India. The study protocol commenced following formal approval from the Institutional Ethics Committee and obtaining written informed consent from all participants or legal guardians.

A total of 123 subjects meeting the specified eligibility criteria were prospectively enrolled over a structured six-month duration. Data collection utilized a rigorously validated, self-designed case report form (CRF)

compiled via detailed direct patient/guardian interviews and comprehensive medical record reviews. Collected points mapped baseline demographics, detailed social history, cumulative duration of alcohol exposure, baseline clinical presentations, concurrent laboratory values, and complete medication profiles.

Inclusion Criteria

- Patients are diagnosed with Alcoholic liver disease with or without other associated chronic co-morbidities.
- Patients above 18 years of age.
- Both male and female gender representation.
- Patient/guardian fully willing to provide written Informed Consent.

Exclusion Criteria

- Pregnant and breast-feeding women.
- Patient with incomplete medical report, laboratory profiles, or chart documentation records.
- Alcohol withdrawal and alcohol dependence syndrome presentations displaying pure psychiatric anomalies.
- Prior severe or active chronic psychiatric diseases that prevent reliable clinical communication.

Statistical Analysis Plan

Risk stratification was calculated utilizing the standard Child-Pugh scoring template, aggregating points across hepatic encephalopathy grading, ascites severity, serum bilirubin, serum albumin, and INR parameters. All recorded data were entered into Microsoft Excel software. Frequencies and percentages summarize categorical variables. Chi-square ($\chi 2$) tests examined the associations between clinical complications, historical alcohol duration, and Child-Pugh severity classes. Quantitative readmission indices and severity risks were framed via Odds Ratio (OR) computations with 95% confidence intervals (CI). Spearman's rank correlation (rs) evaluated interactions between dynamic laboratory measures. Association between duration of hospital stay and severity class was tested through a one-way analysis of variance (ANOVA), whereas a non-parametric Kruskal-Walli's test audited variations in baseline liver enzymes across the severity spectrum, with the threshold of significance established at $p < 0.05$.

Results

Out of the 123 analyzed ALD inpatients, a distinct male predominance was confirmed, comprising 117 males (95.12%) and 6 females (4.88%). The mean age of the study population was 47.30 ± 9.07 years, with the majority clustering between 45–50 years (26.02%) and 39–44 years (22.76%). Analysis of alcohol history showed that 42.28% drank for up to 10 years, 43.09% for 11–20 years, and 14.63% had a chronic exposure history extending beyond 20 years.

In terms of baseline clinical status, 43.90% exhibited a single major medical comorbidity, 31.71% presented with multiple comorbidities, and 24.39% had none. Stratification by Child-Pugh classification demonstrated a high burden of late-stage disease: 72 patients (58.54%) were classified under Class C (scores 10–15), 36 patients (29.26%) under Class B (scores 7–9), and 15 patients (12.20%) under Class A (scores 5–6).

Clinical presentation profiles revealed a high prevalence of decompensation signs, with Peripheral Edema noted in 67.48% and Abdominal Distension in 61.79%, followed by Icterus (32.52%), Abdominal Pain (26.02%), Melena (15.45%), Hematemesis (8.13%), and Altered mental status (3.25%). Objective ascites grading showed that 54.47% presented with moderate/severe ascites, 11.38% had mild ascites, and 34.15% had none. Hepatic Encephalopathy (HE) evaluation revealed that 19.51% had Grade 1, 9.76% Grade 2, and 2.44% Grade 3 symptoms, while 68.29% were free of HE.

Table 1: Baseline Demographics and Stratification of the Cohort (N=123)

Primary Parameter	Clinical Matrix Subdivision	Frequency (n)	Percentage (%)
Gender Spectrum	Male	117	95.12%
	Female	6	4.88%
Smoking Cohort	Active Smoker	57	46.34%
	Non-Smoker	66	53.66%
Alcohol Exposure	Up to 10 Years	52	42.28%
	11 – 20 Years	53	43.09%
	More than 20 Years	18	14.63%
Comorbidities Profile	Single Comorbidity	54	43.90%
	Multiple Comorbidities	39	31.71%
	None Documented	30	24.39%
Child-Pugh Class	Class A (Score 5–6)	15	12.20%
	Class B (Score 7–9)	36	29.26%
	Class C (Score 10–15)	72	58.54%

Table 2: Breakdown of Age Distribution Across Child-Pugh Classes

Age Intervals (Years)	Class A (n=15)	Class B (n=36)	Class C (n=72)	Segment Total (N)	Cohort Percentage (%)
27 – 32	4 (3.25%)	2 (1.63%)	1 (0.81%)	7	5.69%
33 – 38	1 (0.81%)	3 (2.44%)	9 (7.32%)	13	10.57%
39 – 44	4 (3.25%)	5 (4.10%)	19 (15.44%)	28	22.76%
45 – 50	3 (2.44%)	8 (6.50%)	21 (17.10%)	32	26.02%
51 – 56	2 (1.63%)	10 (8.13%)	12 (9.76%)	24	19.51%
57 – 62	1 (0.81%)	3 (2.44%)	8 (6.50%)	12	9.76%
63 – 68	0 (0.00%)	3 (2.44%)	2 (1.63%)	5	4.07%
69 – 74	0 (0.00%)	2 (1.63%)	0 (0.00%)	2	1.63%
Verified Totals	15 (12.20%)	36 (29.27%)	72 (58.54%)	123	100.00%

Table 3: Scoring Decompositions for Ascites and Hepatic Encephalopathy

Core Scoring Component	Component Staging	Class A (n=15)	Class B (n=36)	Class C (n=72)	Cumulative Percentage
Ascites	None	15	21	6	34.15% (n=42)
	Mild	0	4	10	11.38% (n=14)
	Moderate / Tense	0	11	56	54.47% (n=67)
Hepatic Encephalopathy	Grade 0 (None)	15	30	39	68.29% (n=84)
	Grade 1	0	5	19	19.51% (n=24)
	Grade 2	0	0	12	9.76% (n=12)
	Grade 3	0	1	2	2.44% (n=3)
	Grade 4	0	0	0	0.00% (n=0)

Table 4: Baseline Biomarkers and Index Length of Stay (LOS)

Diagnostic Variable	Class A (n=15)	Class B (n=36)	Class C (n=72)	Statistical Metric Summary
Serum Albumin (g/L)	3.74 ± 0.75	2.87 ± 0.73	2.42 ± 0.74	As severity increases, albumin decreases
Total Bilirubin (mg/dL)	1.27 ± 7.51	3.43 ± 7.54	9.08 ± 7.45	Progression Clearance Marker
INR Coagulation Profile	1.30 ± 0.67	1.45 ± 0.65	2.06 ± 0.65	Severity Indicator Axis
AST Liver Enzyme (U/ L)	48.80 ± 22.80	70.16 ± 71.89	111.27 ±115.86	Kruskal-Wallis: H = 21.17, p < 0.001
ALT Liver Enzyme (U/ L)	29.98 ± 15.34	29.55 ± 18.70	43.01 ± 37.18	Kruskal-Wallis: H = 9.99, p = 0.0068
ALP Enzyme Profile (U/ L)	101.68 ±69.52	153.42 ±114.37	154.55 ±61.40	Kruskal-Wallis: H = 10.94, p = 0.0042
Duration of Stay (Days)	7.86 ± 4.40	7.58 ± 4.55	9.03 ± 4.61	One-Way ANOVA: F = 1.33, p = 0.269

Table 4b: Spearman's Rank Correlation Analysis for Laboratory Parameters (N=123)

Analyzed Lab Parameters Axis	Spearman's Rank Correlation	Pearson's Correlation of Rank	Clinical Interpretation Profile
Albumin VS Bilirubin	-0.19467	-0.19492	Weak or poor negative correlation
Bilirubin VS INR	0.580935	0.58088	Moderate positive correlation
Albumin VS INR	-0.3391	-0.33952	Moderate negative correlation

Table 5: Symptom Presentation Matrix Across Severity Classes

Symptom Presentation Profile	Class A	Class B	Class C	Total Freq (n)	Cohort Percentage (%)
Peripheral Edema	4	23	56	83	67.48%
Abdominal Distension	3	19	54	76	61.79%
Icterus (Clinical Jaundice)	1	8	31	40	32.52%
Abdominal Pain	5	11	16	32	26.02%
Easy Fatiguability	5	12	11	28	22.76%
Fever Manifestations	1	4	14	19	15.45%
Melena Passage	2	5	12	19	15.45%
Vomiting Episodes	5	5	6	16	13.01%
Loss of Appetite (Anorexia)	2	2	7	11	8.94%
Hematemesis Events	2	5	3	10	8.13%
Constipation Patterns	0	2	7	9	7.32%
Diarrhea Presentations	3	3	2	8	6.50%
Hematuria Events	0	0	8	8	6.50%
Decreased Urine Output	0	2	3	5	4.07%
Altered Mental Status	0	2	2	4	3.25%
Scrotal Swelling	0	0	4	4	3.25%

Table 6: Multi-System Complications Sorted by Child-Pugh Class vs. Alcohol Exposure Duration

Secondary Complication Matrix	Class A	Class B	Class C	Up to 10 Yrs	11-20 Yrs	>20 Yrs	Total (n)	p-value (Class)	p-value (Alcohol)
Portal Hypertension	6	24	68	38	46	14	98	< 0.00001	0.21269
Ascites Development	0	15	66	30	40	11	81	< 0.00001	0.14223
Esophageal Varices	4	15	42	23	28	10	61	0.04374	0.58383
Splenomegaly	7	8	32	21	21	5	47	0.06275	0.61304
Hepatic Encephalopathy	0	6	33	12	22	5	39	0.00017	0.11832
Coagulopathy	0	6	22	9	15	4	28	0.02162	0.40495

Jaundice Pathophysiology	1	8	19	12	8	8	28	0.25224	0.03710
Portal HTN Gastropathy	3	8	17	16	10	2	28	0.95096	0.15389
Hepatorenal Syndrome	0	4	19	7	10	6	23	0.02222	0.17596
Anemia Presentations	2	5	10	8	7	2	17	0.99830	0.88938
Hepatopulmonary Synd.	0	2	4	2	4	0	6	0.64530	0.39531
Spontaneous Bacterial Perit.	0	1	4	2	1	2	5	0.54916	0.22961

Table 7: Endoscopic Distribution and Grading of Esophageal Varices (EV)

Endoscopic Staging Category	**Class A**	**Class B**	**Class C**	**Total Frequency (n)**	**Cumulative Percentage (%)**
No Varices Identified	11	21	30	62	50.41%
Grade 1 (Small Varices)	2	6	14	22	17.89%
Grade 2 (Medium Varices)	1	7	18	26	21.14%
Grade 3 (Large Varices)	1	1	9	11	8.94%
Grade 4 (Imminent Rupture Stigmata)	0	1	1	2	1.63%
Verified Totals	15	36	72	123	100.00%

Table 8: Hospital Readmission Profiles Over Tracking Duration

Stratified Child-Pugh Class	**Sample Base (n)**	**Documented Readmissions**	**Percentage Within Sub-group**	**Contribution to Total Cohort**
Class A	15	0	0.00%	0.00%
Class B	36	5	13.89%	4.07%
Class C	72	13	18.06%	10.57%
Verified Totals	123	18	—	14.64%

Table 9: Core Pharmacological Audit Mapping vs. Guideline Interventions

Clinical Therapeutic Domain	**Prescribed Medication Compound**	**Class A**	**Class B**	**Class C**	**Total Cohort %**
Targeted Hepatoprotectives	Ursodeoxycholic Acid (UDCA)	11	30	69	89.43%
	B Liver Forte	0	2	13	12.20%
	Ademetionine (Nusam)	0	0	10	8.13%
	Hepamerz (L-Ornithine L-Aspartate)	0	2	6	6.50%
Encephalopathy Pathways	Rifaximin (400mg)	10	26	69	85.37%
	Lactulose Osmotic Syrup	9	28	68	85.37%
	Bifilac Probiotic Support	1	7	6	11.38%
Diuretics / Volume Control	Furosemide Loop Diuretic	7	26	65	79.67%
	Spironolactone Aldosterone Antag.	5	25	65	77.24%
Portal Hypertension Control	Carvedilol Beta-Blocker	2	11	34	38.21%
Plasma Expander Support	Human Albumin (20% Concentration)	0	6	36	34.15%
Vasoactive Interventions	Terlipressin	3	6	25	27.64%
Anti-Inflammatory Modulators	Pentoxifylline	0	1	7	6.50%

	Prednisolone Corticosteroid	0	1	3	3.25%
Vitamin Deficit Optimization	Vitamin K Prophylaxis	2	12	42	45.53%
	Opti neuron	8	13	25	37.40%
	Thiamine (Vitamin B1)	6	14	22	34.15%

Table 10: Secondary Systemic Antimicrobial Prophylaxis and Therapy Audit

Antibiotic Class Family	Specific Active Compound	Class A	Class B	Class C	Total Cohort %
Cephalosporins	Ceftriaxone	4	6	25	28.46%
	Cefixime	1	6	19	21.14%
	Cefotaxime	1	2	8	8.94%
Penicillins / β-Lactamase	Piperacillin-Tazobactam (Piptaz)	1	4	9	11.38%
	Amoxicillin-Clavulanic Acid	2	2	6	8.13%
Fluoroquinolones	Ofloxacin	0	0	12	9.76%
	Norfloxacin	0	1	4	4.07%
	Ciprofloxacin	2	0	1	2.44%
Nitroimidazoles	Metronidazole	1	3	6	8.13%
Carbapenems	Meropenem	0	0	4	3.25%
Macrolides	Azithromycin	0	1	1	1.63%
Lincosamides	Clindamycin	0	0	2	1.63%

Discussion

An observational study was performed in the General Medicine Department of ESIC MC & PGIMSR Model Hospital, Rajajinagar Bengaluru for 6 months. A total number of 123 subjects were enrolled in the study based on inclusion and exclusion criteria. In this prospective hospital-based study of 123 patients with alcoholic liver disease (ALD), the demographic profile demonstrated a striking male predominance (95.1%), with a mean age of 47.3 ± 9.07 years. This aligns with prior Indian studies (Nand et al., 2015; Tiwari et al., 2022) which also reported ALD as primarily affecting middle-aged males, reflecting cultural patterns of alcohol consumption in South Asia.

Risk Stratification by Child-Pugh Score

Most of our patients presented with advanced disease: 58.5% were in Class C, 29.3% in Class B, and only 12.2% in Class A. This indicates late presentation and poor baseline liver reserve at admission. Similar findings were noted by Parate et al. (2019–2020) and Trifan et al. (2022), where many patients were in Child-Pugh C.

However, compared with studies like Tiwari et al. (Class C: 46.8%) and Hasan et al. (37.8%), our study had a markedly higher Class C proportion, underlining more severe disease in our setting.

Complications and Clinical Presentation

The most common complications in our study were portal hypertension (79.7%), ascites (65.9%), and esophageal varices (49.6%). Hepatic encephalopathy (31.7%) and hepatorenal syndrome (18.7%) were also

frequent. Statistically significant associations were observed between Child-Pugh severity and portal hypertension, ascites, hepatic encephalopathy, coagulopathy, HRS, and varices (***p < 0.05***). These findings are consistent with Tiwari et al. (2022) and Nand et al. (2015), both of which emphasized that worsening Child-Pugh class strongly predicts complications. However, compared with Nand et al., our study reported lower rates of encephalopathy (31.7% vs. 59%) and HRS (18.7% vs. 35%), suggesting possible differences in disease progression or patient selection.

Interestingly, when compared with Trifan et al. (2022), complication rates in our study were highly similar (ascites ~65% vs. 61%, HE 31.7% vs. 28%, varices ~50%). This external validation suggests that our findings reflect global trends in ALD-related decompensation. The GI bleeding (Hematemesis, Melena) observed in our study was 23.58% as compared to Trifan et al. (2022), where it was 22%. Abdominal distension of 61.79% was observed in our study, which was similar to Parate et al. (2019–2020) at 59%.

Duration of Alcohol Use and Disease Severity

Alcohol consumption of more than 10 years was significantly associated with severe disease (Child-Pugh Class C) (***p = 0.0096***). Odds ratio analysis showed that patients with >10 years of alcohol intake had a 2.1-fold increased risk of progressing to Class C compared to those with shorter histories. Interestingly, duration of alcohol use was not consistently associated with individual structural complications, except for jaundice (***p = 0.03710***), suggesting that cumulative alcohol exposure accelerates overall global functional failure rather than isolated clinical complications.

Laboratory Correlation

Our biochemical profile demonstrated progressive hypoalbuminemia, rising bilirubin, and worsening INR across Child-Pugh classes. These trends are consistent with Ranjitha et al. (2025), Hasan et al. (2023), and international guidelines (EASL) which highlight these parameters as key markers of hepatic reserve. Furthermore, AST levels rise more sharply than ALT with severity, reinforcing the classic AST/ALT > 2 ratio seen in ALD.

Hospital Stay and Readmissions

The mean hospital stay was 8.46 ± 4.6 days, with no significant variation across Child-Pugh classes (***p = 0.269***). Readmission analysis revealed that Class C patients were twice as likely to be readmitted compared to Class A/B (OR = 2.02), reflecting the progressive and relapsing nature of ALD.

Management Strategies

The prescribing pattern in our study showed frequent use of hepatoprotectives (ursodeoxycholic acid 89.4%), rifaximin (85.4%), lactulose (85.4%), and diuretics (furosemide 79.7%, spironolactone 77.2%). Terlipressin (27.6%), albumin (34.1%), and beta-blockers (38.2%) were also commonly used. Compared with **EASL guidelines**, our findings align with standard practices for ascites, encephalopathy, varices, and HRS management. However, our routine use of ursodeoxycholic acid differs from guideline recommendations, where it is not considered standard for ALD. Notably, corticosteroid use was very low (3%), possibly due to under-diagnosis of severe alcoholic hepatitis or clinician hesitation. This highlights an area where guideline-directed therapy could be optimized in our setting.

Conclusion

Child-Pugh score remains a reliable tool for risk stratification in ALD, effectively predicting complications and readmission. Prolonged alcohol use worsens prognosis, while management strategies observed were guideline concordant for fluid management and encephalopathy. Gaps in care such as the routine over-prescribing of unindicated hepatoprotective agents like ursodeoxycholic acid and the severe under-utilization of systemic corticosteroids in inflammatory presentations emphasize critical opportunities for regional medical audits and clinical pathway corrections.

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