Original Article

Elevated C-Reactive Protein and In-Hospital Mortality in Patients with Decompensated Liver Cirrhosis at a Tertiary Care Hospital, Karachi

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ABSTRACT

Objective: To determine the frequency of elevated C-reactive protein (CRP) and evaluate its association with in-hospital death in patients with decompensated chronic liver disease who present to a tertiary care hospital in Karachi.

Study Design: Cross-sectional study.

Place and Duration of Study: This study was conducted at the Department of Medicine, Dr. Ruth Pfau Civil Hospital, Karachi, over a period of five months from July 2025 to November 2025.

Methods: Non-probability consecutive sampling was used to select 150 patients with decompensated chronic hepatic illness, ranging in age from 30 to 70 years. The Child-Pugh classification was used to record clinical and demographic characteristics as well as assess the condition's severity. Serum CRP levels were measured when the patient arrived and categorised as mild (6–50 mg/L), moderate (51–100 mg/L), severe (>100 mg/L), or normal (<5 mg/L). Patients were observed throughout their hospital stay, and the results of in-hospital death were recorded. SPSS version 24 was used for data analysis. The chi-square test was used to evaluate associations; a p-value of less than 0.05 was considered statistically significant.

Results: A total of 114 patients had raised CRP (76.0%). Those with moderate and severe CRP elevation had a significantly higher overall in-hospital death rate of 8.0% (12/150) ($p<0.05$) than those with normal or moderately elevated CRP. Furthermore, patients in the advanced Child-Pugh class were more likely to have elevated CRP.

Conclusion: People with decompensated chronic hepatic disease frequently have elevated CRP, which is strongly linked with higher in-hospital mortality. Because of its affordability and ease of use, CRP may be a useful addition to established prognostic methods in the early risk assessment and treatment of hospitalised patients with decompensated cirrhosis.

Key Words: Decompensated chronic liver disease; C-reactive protein; Child–Pugh classification; in-hospital mortality.

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INTRODUCTION

Worldwide morbidity and mortality rates are still rising sharply due to chronic hepatic diseases including cirrhosis, which are major public health issues. Recent global estimates indicate that cirrhosis and its complications kill over a million people annually, and millions of people suffer from chronic hepatic illness[1,2]. Even with significant advancements in supportive treatment and antiviral drugs, patients with decompensated cirrhosis still have poor prognoses, mostly because of infections, sepsis, variceal haemorrhage, and the onset of multiple organ failure. The burden of chronic hepatic disease is particularly apparent in Asia, where viral hepatitis remains a major cause of cirrhosis. Delays in diagnosis, limited access to specialised care, and late disease presentation are still problems in many South Asian countries.

Hepatitis C virus infection continues to be one of the most prevalent causes of chronic hepatic illness in Pakistan, with cirrhosis and eventual decompensation developing in a considerable proportion of individuals affected[3-5].

Bacterial infections and systemic inflammation are common in patients with decompensated hepatic cirrhosis, and both significantly worsen the prognosis. However, because hypersplenism, beta-blocker

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medications, or hepato cerebral syndrome can occasionally mask the usual indicators of a systemic inflammatory response, it may be challenging to identify infection in cirrhotic individuals. In this case, readily available inflammatory biomarkers could be crucial in directing medical judgement. Even in advanced stages of liver illness, C-reactive protein (CRP), a widely available and reasonably priced indicator of systemic inflammation, has been shown to retain its therapeutic use[6].

Numerous recent studies have found that individuals with cirrhosis who have high CRP levels are more likely to suffer from adverse outcomes such as in-hospital death and rapid detrioration[7,8]. But there is a dearth of data from Pakistan and the larger South Asian region, especially when it comes to hospitalised patients with decompensated cirrhosis and combining CRP levels with established predictive criteria like the Child-Pugh classification.

Thus, the aim of this study was to determine the frequency of elevated CRP levels and the rate of in-hospital death among patients who arrived at a tertiary care hospital in Karachi with decompensated hepatic illness. The study also sought to assess how CRP categories related to Child-Pugh class and in-hospital outcomes.

METHODS

This cross-sectional study was carried out in the Dr. Ruth Pfau Civil Hospital's Department of Medicine in Karachi with permission from Dow University of Health Sciences' Institutional Review Board (Ref: IRB-3996/DUHS/Approval/2025/255). From July 2025 to November 2025, a five-month period, the study was conducted. All subjects gave their written informed consent before being enrolled, and patient information was kept strictly confidential during the entire study. Using the World Health Organization's (WHO) sample size calculator, the sample size was determined. With a 95% confidence level, a margin of error of 8%, and a 46% prevalence of high CRP, a total sample size of 150 patients was calculated.

Participants in the trial were patients between the ages of 30 and 70 who had been diagnosed with chronic hepatic illness for more than a year and who had experienced acute decompensation that necessitated hospitalisation. Both male and female patients could be included.

Exclusion criteria included a history of hepatocellular cancer, solid or haematological malignancy, recent hospitalisation or sepsis within the last month, or admission for decompensated liver cirrhosis during the last six months.

In order to enlist 150 patients who met the inclusion criteria, a non-probability consecutive sampling procedure was used. Using a pre-made proforma, baseline demographic and clinical data were documented, including age, gender, the length and cause of liver cirrhosis, concomitant diseases (diabetes mellitus, hypertension, and dyslipidaemia), and smoking status. The Child-Pugh score was used to determine the severity of hepatic disease, and patients were assigned to either class A, B, or C based on their results.

Aseptic blood samples were taken at the time of hospital admission in order to assess CRP, and the hospital laboratory performed the analysis. Patients were divided into four groups according to their serum CRP levels: mildly elevated (6–50 mg/L), moderately elevated (51–100 mg/L), severely elevated (>100 mg/L), and normal (<5 mg/L).

The main outcome, in-hospital mortality, which is defined as death that occurs within the same hospital admission, was monitored throughout the duration of the patients' hospital stay.

The statistical software SPSS version 24 was used to enter and analyse the data. Frequencies and percentages were used to represent categorical variables, whereas the mean and standard deviation were used to represent continuous variables. The chi-square test was used to evaluate the relationships between CRP and Child-Pugh class and within-hospital outcomes. The p-value was deemed statistically significant if it was less than 0.05.

RESULTS

The study comprised 150 individuals with chronic hepatic illness that was decompensated. The average age was 50.0 ± 9.6 years, and 62% of the participants were male. With severe liver disease, over half of the patients were in Child-Pugh class C. Hepatitis C was the primary cause of cirrhosis, while diabetes mellitus was the most common comorbidity (Table 1).

Table No. 1: Demographic characteristics, comorbidities, and etiology of liver cirrhosis in patients with decompensated chronic liver disease (n = 150)

Variable	n (%)
Demographics	
Age (years), Mean ± SD	50.0 ± 9.6
Male	93 (62.0)
Female	57 (38.0)
Disease severity	
Child–Pugh class A	29 (19.3)
Child–Pugh class B	51 (34.0)
Child–Pugh class C	67 (44.7)
Comorbidities	
Diabetes mellitus type II	63 (42.0)
Hypertension	31 (20.7)
Dyslipidemia	0 (0.0)
Smoking	3 (2.0)
Etiology of liver cirrhosis	
Hepatitis C	90 (60.0)
Hepatitis B	41 (27.3)
Alcohol-related	9 (6.0)
NAFLD	7 (4.7)

As hepatic function deteriorated, a rising trend of CRP rise was noted. The majority of Child-Pugh class C patients had moderate to severe CRP increase, indicating a substantial correlation between systemic inflammation and advanced hepatic impairment (Table 2).

Table No. 2: Distribution of C-reactive protein (CRP) categories according to Child–Pugh class (n = 150)

CRP category	Child–Pugh A n (%)	Child–Pugh B n (%)	Child–Pugh C n (%)
Normal (<5)	16 (55.2)	16(31.4)	4 (6.0)
Mild (6–50)	9 (31.0)	18(35.3)	18 (26.9)
Moderate (51–100)	4 (13.8)	14(27.5)	39 (58.2)
Severe (>100)	0 (0.0)	3 (5.9)	6 (9.0)

Chi-square test demonstrated a statistically significant association between CRP category and Child–Pugh class (χ^2 = 37.73, df = 6, p = 0.0000).Three patients were excluded from this analysis due to missing Child–Pugh classification; therefore, totals in this table sum to 147. As CRP levels rose, in-hospital death gradually climbed as well. Patients with normal CRP readings did not have any deaths. The mortality rate was significantly greater for patients with moderate and severe CRP elevation, suggesting that CRP is a valuable indicator of short-term prognosis in decompensated chronic hepatic illness (Table 3).

Table No. 3: Association of C-reactive protein (CRP) categories with in-hospital outcome in patients with decompensated chronic liver disease (n = 150)

CRP category	Expired during hospital stay n (%)	Survived to discharge n (%)	Total (n)
Normal(<5)	0 (0.0)	36 (100.0)	36
Mild(6–50)	6 (5.9)	96 (94.1)	102
Moderate (51–100)	3 (50.0)	3 (50.0)	6
Severe (>100)	3 (50.0)	3 (50.0)	6

Chi-square test demonstrated a statistically significant association between CRP category and in-hospital outcome ($p < 0.05$).

DISCUSSION

Elevated blood CRP was commonly seen in this cross-sectional research of 150 patients with decompensated liver cirrhosis, and it was clearly linked to the severity of the disease and unfavourable in-hospital outcomes. 36 patients (24.0%) had CRP values < 5 mg/L, whereas 114 patients (76.0%) had elevated CRP levels overall. Patients with higher CRP values were more likely to die, with an overall in-hospital mortality rate of 8.0%. Systemic inflammation was identified as a significant predictor of the short-term prognosis in decompensated cirrhosis, as evidenced by the steady increase in mortality observed throughout rising CRP[9,10].

An important pathophysiological mechanism in the development of serious hepatic disease is becoming more widely acknowledged: systemic inflammation. According to earlier research, inflammatory indicators are closely linked to clinical decompensation and death and increase in tandem with deteriorating hepatic function[11]. These results are corroborated by our study's finding that patients with advanced Child-Pugh class had higher CRP values more frequently, which highlights the strong correlation between increased inflammatory activity and compromised hepatic reserve.

Numerous research have examined the predictive significance of CRP and CRP-based indices in cirrhosis. According to Wang et al., the CRP-to-albumin ratio had a strong correlation with established severity levels and was an independent predictor of short-term death in patients with decompensated cirrhosis associated with hepatitis B[9]. In the same way, Oikonomou et al. showed that higher CRP-based ratios were linked to worse outcomes in decompensated cirrhosis, indicating that inflammation-based indicators might offer more predictive data than traditional scoring methods[12].

Evidence from acutely decompensated cirrhosis cohorts emphasises the significance of systemic inflammation even more. Zanetto et al. found that, independent of conventional liver severity criteria, the degree of inflammatory response, as shown by CRP levels, was the best indicator of acute-on-chronic liver failure and bleeding[6]. These findings align with the notable rise in mortality observed in our group of patients with moderate to severe CRP elevation.

Results in acute-care settings have also been demonstrated to be predicted by CRP. According to a study by Jeong et al., CRP is an independent predictor of in-hospital mortality in patients with alcoholic liver cirrhosis who present to the emergency room[13]. The constant correlation between higher CRP levels and mortality in a variety of clinical contexts underscores the marker's broad clinical importance, despite the fact that their population's etiological profile is different from ours.

Broader inflammatory profiling has shown prognostic usefulness across several stages of liver disease, surpassing single time-point assessments. The idea that inflammation transmits prognostic information throughout the disease spectrum was supported by research demonstration that inflammatory biomarkers were predictive of medium-term survival in patients with recently diagnosed cirrhosis[14]. The current study's findings are further supported by reports that hospitalised patients with decompensated cirrhosis and a larger inflammatory burden have worse short-term outcomes.

These findings have significant clinical ramifications, especially in environments with minimal resources. CRP is an effective technique for early risk

stratification since it is generally accessible, affordable, and quickly measurable. The Child-Pugh classification and CRP interpretation can help physicians identify high-risk patients who need closer monitoring, early infection assessment, and prompt care escalation[15-18]. There are limits to this study. The results may have been impacted by unmeasured factors such concomitant organ dysfunction or occult infection, and its cross-sectional design restricts the ability to draw conclusions about causality. Also, because this was a single-center study, the results might not be as broadly applicable. Notwithstanding, the findings offer significant regional support for the prognostic significance of CRP in individuals with decompensated cirrhosis.

CONCLUSION

Patients with chronic liver illness that was decompensated frequently had elevated C-reactive protein (CRP), which was significantly linked to higher in-hospital mortality, especially for those with moderate to severe CRP heightening. These results highlight how systemic inflammation plays a critical role in determining the short-term course of cirrhosis. In hospitalised patients with decompensated cirrhosis, CRP may be a useful supplement to well-established prognostic tools like the Child-Pugh classification for early risk stratification and well-informed clinical decision-making due to its low cost, broad availability, and simplicity of measurement, particularly in settings with limited resources.

Author's Contribution:

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