Journal of Chemical Health Risks

www.jchr.org

JCHR (2025) 15(4), 1426-1431 | ISSN:2251-6727

# "Assessment of Protein Energy Malnutrition in Cirrhosis and Comparing Severity of Pem with Prognosis of Cirrhosis"

**Sachithanandam[1], Aravind Mirajkar[2], Shankar S[3], Raja M[4]**

[1]Postgraduate, Department of General Medicine, AVMC, Puducherry.

[2]Professor, Department of General Medicine, AVMC, Puducherry.

[3]Assistant Professor, Department of Medical Gastroentorology, AVMC, Puducherry.

[4]Assistant Professor, Department of General Medicine, AVMC, Puducherry.

***(Received: 16 May 2025 Revised: 20 June 2025 Accepted: 24 July 2025)***

**KEYWORDS**

Protein-Energy Malnutrition, Cirrhosis, Subjective Global Assessment, Child-Turcotte-Pugh Score, Nutritional Assessment, Prognosis

**ABSTRACT:**

Background: Cirrhosis is a progressive liver disease linked to substantial morbidity and mortality, with protein-energy malnutrition (PEM) being a common yet often overlooked complication. PEM significantly worsens patient outcomes by increasing susceptibility to complications and negatively impacting prognosis. Despite its high prevalence, the relationship between PEM severity and cirrhosis prognosis remains insufficiently explored, especially within specific local populations. Early identification and nutritional intervention may play a critical role in improving patient outcomes.

Aim: To assess the prevalence of protein-energy malnutrition in patients with cirrhosis and to evaluate the association between the severity of PEM and the prognosis of cirrhosis.

Materials and Methods: This cross-sectional study was conducted at Aarupadai Veedu Medical College and Hospital over 18 months, involving 80 patients diagnosed with cirrhosis. Nutritional status was assessed using Subjective Global Assessment (SGA), and cirrhosis severity was classified using the Child-Turcotte-Pugh (CTP) score. Anthropometric measurements, biochemical parameters, and handgrip strength were evaluated. The association between PEM severity and cirrhosis prognosis was analyzed using chi-square and ANOVA tests, with statistical significance set at $p < 0.05$.

Results: The study population had a mean age of 49.82 years, with 96.3% male predominance. Alcohol consumption was observed in 92.5% of patients. Based on CTP classification, 50.0% were in Class C, 33.8% in Class B, and 16.3% in Class A. SGA assessment showed 50.0% were well-nourished, 42.5% moderately malnourished, and 7.5% severely malnourished. A significant association was found between CTP classification and SGA scores (Chi-square = 21.62, $p = 0.01$), demonstrating that worsening liver function correlates with severe malnutrition. The highest mean CTP score ($11.5 \pm 1.9$) was observed in SGA Class C, indicating a strong link between malnutrition and advanced cirrhosis.

Conclusion: The study highlights a significant correlation between worsening liver function and increasing severity of PEM in cirrhosis. These findings emphasize the importance of early nutritional assessment and targeted interventions to improve patient prognosis. A multidisciplinary approach integrating hepatology and nutrition is crucial for optimal disease management. Further research with larger sample sizes and objective nutritional markers is needed to develop standardized nutritional guidelines for cirrhotic patients.

Journal of Chemical Health Risks

www.jchr.org

JCHR (2025) 15(4), 1426-1431 | ISSN:2251-6727

**Introduction:**

Cirrhosis is a long-term liver condition marked by widespread fibrosis and the transformation of normal liver structure into irregular regenerative nodules, leading to significant alterations in hepatic architecture.(1) In 2016, India recorded an estimated 188,575 deaths due to cirrhosis, representing 18.3% of the global cirrhosis-related mortality burden. The factors contributing to morbidity in cirrhotic patients are multifaceted, with malnutrition being a significant contributor.(2,3)

The quality of life in end-stage cirrhosis is severely compromised, further deteriorating due to complications such as infections (particularly spontaneous bacterial peritonitis), gastrointestinal bleeding, encephalopathy, renal failure, and other associated conditions. Early identification of malnutrition using bedside parameters could be valuable in initiating timely medical nutritional therapy, potentially reducing both morbidity and mortality in cirrhotic patients.(4,5)

Protein-energy malnutrition (PEM) is a common complication of liver cirrhosis, affecting approximately 20% of patients with compensated cirrhosis and over 60% of those with decompensated cirrhosis. PEM can emerge early in the disease course, regardless of its etiology. Its development is multifactorial, with key contributors including insufficient dietary intake, impaired digestion and absorption of both macro- and micronutrients, and abnormal metabolic processes. Additionally, decreased protein synthesis and heightened protein loss play a significant role in the progression of PEM in cirrhotic patients.(6–8)

PEM is linked to weakened immunity, particularly in advanced liver disease, making patients more susceptible to infections due to underlying intestinal bacterial overgrowth and compromised intestinal barrier function. Additionally, PEM may heighten the risk of severe complications, including variceal bleeding, ascites, hepatic encephalopathy, and hepato-renal syndromeNutritional status plays a crucial role in quality of life and can significantly impact graft function, as well as patient morbidity and mortality following liver transplantation. However, despite its clinical significance, PEM often goes undetected in cirrhotic patients, particularly in the early stages, due to confounding factors such as fluid retention, obesity, and metabolic alterations. While previous studies have established a link between PEM and cirrhosis, they have not extensively examined the correlation between PEM severity and cirrhosis prognosis. This study, conducted within a local population and setting, aims to bridge this gap by offering valuable insights that contribute to the existing body of knowledge. Present study aimed to assess the Protein Energy Malnutrition in patients with cirrhosis and to compare the association between severity of PEM with the prognosis of cirrhosis.

**Material & Method:**

This cross-sectional study was conducted at Aarupadai Veedu Medical College and Hospital over 18 months, involving both inpatients and outpatients from the Department of General Medicine and Medical Gastroenterology. The study focused on patients diagnosed with cirrhosis based on clinical, biochemical, and imaging parameters, aged between 18 and 60 years. Patients with hepatic encephalopathy and pregnant women were excluded. A total of 80 participants were selected through consecutive sampling. The sample size was determined using a statistical formula based on a 54.3% expected proportion of malnutrition among cirrhotic patients, with a relative precision of 15% and a significance level of 5%.

The methodology involved recruiting patients with cirrhosis, recording baseline demographic and clinical details, and assessing complications such as Spontaneous Bacterial Peritonitis and Hepatic Encephalopathy. Biochemical parameters, including CBC, blood glucose, LFT, stool analysis, serology, serum proteins, albumin, electrolytes, and RFT, were collected. Anthropometric measurements, including height, weight, BMI, mid-arm circumference (MAC), triceps skin fold thickness (TSFT), mid-arm muscle circumference (MAMC), and handgrip strength, were recorded to assess protein-energy malnutrition (PEM). Subjective Global Assessment (SGA) classified patients into well-nourished (SGA A), mildly to moderately malnourished (SGA B), or severely malnourished (SGA C). These nutritional parameters were then compared with the prognosis of cirrhosis using the Child-Turcotte-Pugh (CTP) score.

Statistical analysis was performed using SPSS version 22. Descriptive statistics summarized demographic and clinical characteristics, with continuous variables

Journal of Chemical Health Risks

www.jchr.org

JCHR (2025) 15(4), 1426-1431 | ISSN:2251-6727

expressed as mean ± standard deviation or interquartile range, and categorical variables as frequencies and percentages. The chi-square test was used to assess the relationship between PEM severity and cirrhosis prognosis, while ANOVA and chi-square tests compared standard error means. A p-value of <0.05 was considered statistically significant.

**Result:** Present study included total of 80 patients with mean age of 49.82±11.24yrs. Among them 96.3% were male and 3.8% were female patients, with male preponderance in the study.

Table 1: Distribution according to gender, CTP and SGA class.

| | | Count | N % |
|---|---|---|---|
| Gender | Female | 3 | 3.8% |
| | Male | 77 | 96.3% |
| Child-Turcotte-Pugh class | Class A | 13 | 16.3% |
| | Class B | 27 | 33.8% |
| | Class C | 40 | 50.0% |
| Subjective Global Assessment score | Class A | 40 | 50.0% |
| | Class B | 34 | 42.5% |
| | Class C | 6 | 7.5% |

The results indicate that based on the Child-Turcotte-Pugh (CTP) classification, a majority of patients (50.0%) were classified as Class C, suggesting severe liver disease, followed by 33.8% in Class B and 16.3% in Class A, reflecting a progressive decline in liver function across the study population. In contrast, the Subjective Global Assessment (SGA) score, which evaluates nutritional status, showed that 50.0% of patients were in Class A (well-nourished), 42.5% in Class B (moderately malnourished), and only 7.5% in Class C (severely malnourished). This discrepancy between liver function (CTP) and nutritional status (SGA) suggests that while a significant proportion of patients had advanced liver disease (CTP Class C), not all exhibited severe malnutrition. The findings highlight the complex interplay between liver disease severity and nutritional status, emphasizing the need for comprehensive nutritional assessment and intervention in patients with hepatic dysfunction.

Table 2: Showing mean blood parameters

| | Mean | SD |
|---|---|---|
| HB | 9.5 | 2.3 |
| WBC | 7746.2 | 2254.6 |
| Urea mg/dl | 25.8 | 10.1 |
| Creatinine mg/dl | .9 | .2 |
| Total bilirubin | 4.81 | 4.81 |
| albumin | 2.8 | .7 |
| INR | 1.77 | .52 |

Table 3: Association of the CTP class with SGA score class among patients

Journal of Chemical Health Risks

www.jchr.org

JCHR (2025) 15(4), 1426-1431 | ISSN:2251-6727

| | | SGA score | | | | | | Chi-square (p-value) |
|---|---|---|---|---|---|---|---|---|
| | | Class A | | Class B | | Class C | | |
| | | Count | N % | Count | N % | Count | N % | |
| CTP class | Class A | 12 | 30.0% | 1 | 2.9% | 0 | 0.0% | 21.62 (0.01)* |
| | Class B | 17 | 42.5% | 10 | 29.4% | 0 | 0.0% | |
| | Class C | 11 | 27.5% | 23 | 67.6% | 6 | 100.0% | |

The analysis of the association between the Child-Turcotte-Pugh (CTP) classification and the Subjective Global Assessment (SGA) score shows a statistically significant relationship (Chi-square = 21.62, p = 0.01), indicating that worsening liver function is correlated with poorer nutritional status. Among patients in CTP Class A (mild liver disease), the majority (30.0%) were classified as SGA Class A (well-nourished), while only a small proportion (2.9%) were in SGA Class B (moderately malnourished), and none were in SGA Class C (severely malnourished). For CTP Class B (moderate liver disease), a larger proportion (42.5%) remained well-nourished (SGA Class A), but 29.4% were moderately malnourished (SGA Class B), indicating a shift toward nutritional decline. In CTP Class C (severe liver disease), a significant deterioration in nutritional status was observed, with only 27.5% in SGA Class A, while 67.6% were in SGA Class B, and all patients classified as SGA Class C (100%) belonged to CTP Class C. These findings suggest that as liver disease severity increases, the risk of malnutrition also rises, emphasizing the need for early nutritional interventions in patients with advancing hepatic dysfunction.

Table 4: Association of SGA class with CTP mean scores

| | | CTP score | | p-value |
|---|---|---|---|---|
| | | Mean | SD | |
| SGA score | Class A | 8.2 | 2.1 | 0.01* |
| | Class B | 10.6 | 2.5 | |
| | Class C | 11.5 | 1.9 | |

The analysis of Child-Turcotte-Pugh (CTP) scores across different Subjective Global Assessment (SGA) classes reveals a statistically significant difference (p = 0.01), indicating that worsening nutritional status is strongly associated with higher CTP scores, which reflect more severe liver dysfunction. Patients classified under SGA Class A (well-nourished) had the lowest mean CTP score (8.2 ± 2.1), suggesting better liver function in this group. In contrast, those in SGA Class B (moderate malnutrition) showed an increased mean CTP score (10.6 ± 2.5), indicating a progressive decline in liver function. The highest mean CTP score (11.5 ± 1.9) was observed in SGA Class C (severely malnourished), highlighting a strong correlation between severe malnutrition and advanced liver disease. These findings emphasize the critical impact of worsening liver function on nutritional deterioration, underlining the importance of early nutritional assessment and intervention to improve patient outcomes in individuals with hepatic impairment.

**Discussion:** Protein-energy malnutrition (PEM) is a significant yet often underrecognized complication in patients with cirrhosis, contributing to increased morbidity and mortality. The interplay between malnutrition and cirrhosis is complex, as the progressive decline in liver function impacts metabolic processes, nutrient absorption, and energy homeostasis. This study aimed to assess the prevalence of PEM in patients with cirrhosis and investigate the correlation between the severity of malnutrition and the prognosis of cirrhosis. The findings provide valuable insights into the clinical significance of nutritional assessment and its potential role in predicting disease outcomes.(9,10)

Present study included total of 80 patients with mean age of 49.82yrs. Among them 96.3% were male and 3.8% were female patients, with male preponderance in the study. Alcohol consumption was seen in 92.5% of the cases. In line with current study Pashayee-Khamene F et

Journal of Chemical Health Risks

www.jchr.org

JCHR (2025) 15(4), 1426-1431 | ISSN:2251-6727

al., of the 121 participants in the study, 68.6% were male, with an average age of 54.78 years. (11) Perez-Reyes E et al., out of 103 cirrhotic patients, with a median age of 55 ± 12.2 years and 56.3% female.(12) The results indicate that based on the Child-Turcotte-Pugh (CTP) classification, a majority of patients (50.0%) were classified as Class C, suggesting severe liver disease, followed by 33.8% in Class B and 16.3% in Class A, reflecting a progressive decline in liver function across the study population. The Subjective Global Assessment (SGA) score, which evaluates nutritional status, showed that 50.0% of patients were in Class A (well-nourished), 42.5% in Class B (moderately malnourished), and only 7.5% in Class C (severely malnourished). The findings highlight the complex interplay between liver disease severity and nutritional status, emphasizing the need for comprehensive nutritional assessment and intervention in patients with hepatic dysfunction.

In another study by Miwa T et al., found the Subjective Global Assessment (SGA) classifications revealed that 54% were classified as SGA-A, 32% as SGA-B, and 14% as SGA-C. Multivariate analysis identified SGA-B and SGA-C, along with fatty free acids (FFA), as independent factors associated with energy malnutrition.(13) In study by Dumont C et al., of 95 cirrhotic patients, 45.3% were malnourished, with higher rates in more advanced cirrhosis stages (72.2% in Child-Pugh C). Malnutrition was strongly linked to increased mortality (OR 3.56) and complications (OR 2.09). Lower scores on the Braden scale and prognostic nutritional index correlated with poorer outcomes, underscoring malnutrition's impact on cirrhosis prognosis.(14) Bunchorntavakul C et al., Child-Pugh classes B (41.7%) or C (36.7%). Mortality was 26.7%, with infections (60%) and renal failure (43.3%) as common complications. Malnutrition prevalence ranged from 18% (BMI) to 92% (SGA), showing trends toward increased mortality, complications, and hospital costs, though not statistically significant. Malnutrition and advanced cirrhosis are key mortality predictors in these patients.(15)

Perez-Reyes E et al., found that 43.7% were well-nourished while 56.3% were malnourished according to Subjective Global Assessment (SGA). Malnourished patients had a higher likelihood of serious complications, including ascites and infections. The study concluded that malnutrition in cirrhotic patients was associated with an increased risk of severe complications, including ascites and bacterial or fungal infections.(12) The analysis of the association between the Child-Turcotte-Pugh (CTP) classification and the Subjective Global Assessment (SGA) score shows a statistically significant relationship (Chi-square = 21.62, p = 0.01), indicating that worsening liver function is correlated with poorer nutritional status. These findings suggest that as liver disease severity increases, the risk of malnutrition also rises, emphasizing the need for early nutritional interventions in patients with advancing hepatic dysfunction. The highest mean CTP score (11.5 ± 1.9) was observed in SGA Class C (severely malnourished), highlighting a strong correlation between severe malnutrition and advanced liver disease. These findings emphasize the critical impact of worsening liver function on nutritional deterioration, underlining the importance of early nutritional assessment and intervention to improve patient outcomes in individuals with hepatic impairment. Crisan D et al., documented with 79 patients with cirrhosis, malnutrition was significantly more prevalent in those with decompensated cirrhosis (68.4%) than in those with compensated cirrhosis (13.6%). Over a median follow-up of 27 months, overall mortality was 70%, with lower survival.(16)

**Conclusion**: Protein-energy malnutrition (PEM) is a prevalent yet often underrecognized complication in cirrhosis, significantly impacting disease progression and prognosis. These results reinforce the critical role of nutritional assessment in cirrhotic patients, as malnutrition not only worsens clinical outcomes but also increases morbidity and mortality. Early identification and intervention through dietary optimization, supplementation, and lifestyle modifications could potentially improve prognosis and quality of life. Given the strong link between hepatic dysfunction and nutritional deterioration, a multidisciplinary approach integrating hepatology, dietetics, and supportive care is essential for effective disease management. Future studies with larger sample sizes and objective nutritional markers are needed to further validate these findings and develop standardized nutritional guidelines for cirrhotic patients. Addressing PEM early in the disease course may serve as a valuable therapeutic strategy in improving overall patient survival and liver function.

Journal of Chemical Health Risks

www.jchr.org

JCHR (2025) 15(4), 1426-1431 | ISSN:2251-6727

*Funding: Nil*

*Conflict of interest: Nil*

*Acknowledgement:*

**Reference:**

1. Pinzani M, Rosselli M, Zuckermann M. Liver cirrhosis. Best Pract Res Clin Gastroenterol. 2011;25(2):281–90.
2. Mishra D, Dash KR, Khatua C, Panigrahi S, Parida PK, Behera SK, et al. A Study on the Temporal Trends in the Etiology of Cirrhosis of Liver in Coastal Eastern Odisha. Euroasian J hepato-gastroenterology. 2020;10(1):1–6.
3. Mondal D, Das K, Chowdhury A. Epidemiology of Liver Diseases in India. Clin liver Dis. 2022;19(3):114–7.
4. Nusrat S, Khan MS, Fazili J, Madhoun MF. Cirrhosis and its complications: evidence based treatment. World J Gastroenterol. 2014;20(18):5442–60.
5. Rojas-Loureiro G, Servín-Caamaño A, Pérez-Reyes E, Servín-Abad L, Higuera-de la Tijera F. Malnutrition negatively impacts the quality of life of patients with cirrhosis: An observational study. World J Hepatol. 2017;9(5):263–9.
6. Haj Ali S, Abu Sneineh A, Hasweh R. Nutritional assessment in patients with liver cirrhosis. World J Hepatol. 2022;14(9):1694–703.
7. Chapman B, Sinclair M, Gow PJ, Testro AG. Malnutrition in cirrhosis: More food for thought. World J Hepatol. 2020;12(11):883–96.
8. Huisman EJ, Trip EJ, Siersema PD, van Hoek B, van Erpecum KJ. Protein energy malnutrition predicts complications in liver cirrhosis. Eur J Gastroenterol Hepatol. 2011;23(11):982–9.
9. Eghtesad S, Poustchi H, Malekzadeh R. Malnutrition in liver cirrhosis:the influence of protein and sodium. Middle East J Dig Dis. 2013;5(2):65–75.
10. Huisman EJ, Trip EJ, Siersema PD, van Hoek B, van Erpecum KJ. Protein energy malnutrition predicts complications in liver cirrhosis. Eur J Gastroenterol Hepatol. 2011;23(11):982–9.
11. Pashayee-Khamene F, Hajimohammadebrahim-Ketabforoush M, Shahrbaf MA, Saadati S, Karimi S, Hatami B, et al. Malnutrition and its association with the mortality in liver cirrhosis; a prospective nutritional assessment in two referral centers in Iran. Clin Nutr ESPEN. 2023;54:453–8.
12. Pérez-Reyes E, Rivera-Sánchez J, Servín-Caamaño AI, Pérez-Torres E, Abdo-Francis JM, Higuera-De La Tijera F. Malnutrition is related to a higher frequency of serious complications in patients with cirrhosis. Rev Médica del Hosp Gen México. 2016;79(1):11–6.
13. Miwa T, Hanai T, Nishimura K, Hirata S, Unome S, Nakahata Y, et al. Nutritional assessment using subjective global assessment identifies energy malnutrition and predicts mortality in patients with liver cirrhosis. Sci Rep. 2024;11–9.
14. Dumont C, Wuestenberghs F, Lanthier N, Piessevaux H, Dahlqvist G. Malnutrition is highly prevalent in hospitalized cirrhotic patients and associates with a poor outcome. Acta Gastroenterol Belg. 2022;85(2):311.
15. Bunchorntavakul C, Supanun R, Atsawarungruangkit A. Nutritional status and its impact on clinical outcomes for patients admitted to hospital with cirrhosis. J Med Assoc Thai. 2016;99(Suppl 2):S47-55.
16. Crisan D, Procopet B, Epure A, Stefanescu H, Suciu A, Fodor A, et al. Malnutrition and non-compliance to nutritional recommendations in patients with cirrhosis are associated with a lower survival. World J Hepatol. 2020;12(10):829.