Jurnal Riset Kesehatan Poltekkes Depkes Bandung

Vol 18 No 1, Mei 2026
e-ISSN: 2579-8103
p-ISSN:1979-8253

Effect of ALBI score on NT-proBNP and diastolic dysfunction in Child-Pugh C cirrhosis

Pengaruh Skor ALBI terhadap Kadar NT-proBNP dan disfungsi diastolik pada sirosis hati

Randy Pratama[1,6], Triyanta Yuli Pramana[2,6*], Heru Sulastomo[3,6], Sri Marwanta[4,6], Eti Poncorini Pamungkasari[5,6]

[1]Resident of Internal Medicine Faculty of Medicine, Universitas Sebelas Maret, Surakarta, Indonesia
[2]Gastroenterohepatology Division of Internal Medicine, Universitas Sebelas Maret, Surakarta, Indonesia
[3]Cardiology Department, Universitas Sebelas Maret, Surakarta, Indonesia
[4]Haemato-Oncology Division of Internal Medicine, Universitas Sebelas Maret, Surakarta, Indonesia
[5]Lecturer of Faculty of Medicine Universitas Sebelas Maret, Surakarta, Indonesia
[6]RSUD Dr. Moewardi, Surakarta, Indonesia
*Email: typramana@gmail.com

ABSTRACT

Background: *The Albumin–Bilirubin (ALBI) score and N-Terminal pro b-type natriuretic peptide (NT-proBNP) are important parameters for detecting asymptomatic left ventricular dysfunction and predicting prognosis in heart failure. Hepatic cirrhosis classified as Child-Pugh C indicates severe liver damage with high risk of cardiovascular complications, including diastolic dysfunction.*
Objective: *To analyze the effect of the ALBI score on NT-proBNP levels and the degree of diastolic dysfunction in patients with Child-Pugh C hepatic cirrhosis.*
Methods: *This observational analytic study with a cross-sectional approach involved 54 patients with Child-Pugh C hepatic cirrhosis receiving outpatient and inpatient care at Dr. Moewardi General Hospital, Surakarta. Samples were selected using consecutive sampling and divided into control group (ALBI Grades I–II,n=27) and an intervention group (ALBI Grade III, n=27). NT-proBNP levels were measured using the enzyme immunoassay method, while diastolic function was assessed by echocardiography using E/A ratio, E/e', deceleration time (DT), tricuspid regurgitation (TR) velocity, and left atrial volume index (LAVI).*
Results: *The mean NT-proBNP level in the intervention group was significantly higher than in the control group (1926 ± 468 pg/mL vs.1184 ± 351 pg/mL; p=0.032). However, no significant difference was found in the degree of diastolic dysfunction between groups (p=0.234). Grade II diastolic dysfunction occurred in 48.1% of patients with ALBI Grade III and 37.0% with ALBI Grades I–II.*
Conclusion: *The ALBI score significantly affects NT-proBNP levels but not the degree of diastolic dysfunction. Combined assessment of ALBI and NT-proBNP may support early detection of cardiac dysfunction in advanced hepatic cirrhosis.*

Keywords: *ALBI score, Child-Pugh C, diastolic dysfunction, hepatic cirrhosis, NT-proBNP*

ABSTRAK

Latar Belakang: Skor Albumin–Bilirubin (ALBI) dan N-Terminal pro b-type natriuretic peptide (NT-proBNP) merupakan parameter penting untuk mendeteksi disfungsi ventrikel kiri asimtomatik dan memprediksi prognosis pada gagal jantung. Sirosis hepatis Child-Pugh C menunjukkan kerusakan hati berat dengan risiko tinggi komplikasi kardiovaskular, termasuk disfungsi diastolik.

https://doi.org/10.34011/juriskesbdg.v18i1.2996

Vol 18 No 1, Mei 2026
e-ISSN: 2579-8103
p-ISSN:1979-8253

Tujuan: Penelitian ini bertujuan untuk menganalisis pengaruh skor ALBI terhadap kadar NT-proBNP dan derajat disfungsi diastolik pada pasien sirosis hepatis Child-Pugh C.
Metode: Penelitian analitik observasional dengan pendekatan cross-sectional ini melibatkan 54 pasien sirosis hepatis Child-Pugh C yang menjalani rawat jalan dan rawat inap di RSUD Dr. Moewardi Surakarta. Sampel dipilih menggunakan teknik consecutive sampling dan dibagi menjadi kelompok kontrol (ALBI Grade I–II, n=27) dan kelompok intervensi (ALBI Grade III, n=27). Kadar NT-proBNP diukur menggunakan metode enzyme immunoassay, sedangkan fungsi diastolik dinilai melalui parameter ekokardiografi meliputi rasio E/A, E/e′, deceleration time (DT), kecepatan tricuspid regurgitation (TR), dan left atrial volume index (LAVI).
Hasil: Rerata kadar NT-proBNP pada kelompok intervensi lebih tinggi secara signifikan dibandingkan kelompok kontrol (1926 ± 468 pg/mL vs. 1184 ± 351 pg/mL; p=0,032). Namun, tidak terdapat perbedaan bermakna pada derajat disfungsi diastolik antara kedua kelompok (p=0,234). Disfungsi diastolik derajat II ditemukan pada 48,1% pasien dengan ALBI Grade III dan 37,0% pada ALBI Grade I–II.
Kesimpulan: Skor ALBI berpengaruh signifikan terhadap kadar NT-proBNP, tetapi tidak terhadap derajat disfungsi diastolik. Penilaian kombinasi skor ALBI dan NT-proBNP dapat membantu deteksi dini disfungsi jantung pada sirosis hepatis lanjut.

Kata kunci: Child-Pugh C, disfungsi diastolik, NT-proBNP, sirosis hepatis, skor ALBI

INTRODUCTION

Cirrhosis is a chronic liver disease characterized by distortion of the normal hepatic lobule architecture due to the formation of scar tissue (fibrosis), accompanied by hepatocellular (parenchymal) damage and regenerative efforts that result in nodule formation. This disease often progresses slowly and later manifests with symptoms such as abdominal swelling (possibly with pain), hematemesis, edema, and jaundice.[1] In advanced stages, cirrhosis may lead to severe complications such as ascites, portal hypertension, central nervous system disorders, and hepatic coma.

The albumin-bilirubin (ALBI) score, calculated from serum albumin and total bilirubin levels, has been widely used to assess liver function and predict long-term mortality in liver disease patients. Elevated bilirubin levels generally indicate cholestasis and are associated with acute liver congestion, while low albumin levels are related to chronic congestive hepatopathy and poor prognosis in heart failure patients.[1] Therefore, the ALBI score is considered suitable for evaluating the severity and prognosis of cardiohepatic syndrome. Several studies have demonstrated a significant association between high ALBI scores and fluid overload as well as poor clinical outcomes in patients with heart failure.[2]

N-Terminal pro b-type natriuretic peptide (NT-proBNP), a biomarker released by cardiomyocytes in response to cardiac volume or pressure overload, plays a crucial role in the diagnosis of asymptomatic left ventricular (LV) dysfunction and holds prognostic value in heart failure. Recent studies have revealed elevated NT-proBNP levels in patients with chronic liver disease, particularly cirrhosis with ascites, even in the absence of clinically evident left ventricular dysfunction[1]. As such, NT-proBNP may serve as a useful marker for identifying cirrhotic patients at increased cardiovascular risk and with poor prognosis.[3]

Cirrhotic cardiomyopathy (CCM) is a relatively new clinical term first described at the 2005 World Congress of Gastroenterology in Montreal. Initially, it was thought that the toxic effects of alcohol played a major role in its pathogenesis. However, subsequent studies showed that similar hemodynamic abnormalities also occur in cirrhosis of non-alcoholic etiology.[4] CCM is characterized by impaired systolic and diastolic function of

https://doi.org/10.34011/juriskesbdg.v18i1.2996

Vol 18 No 1, Mei 2026
e-ISSN: 2579-8103
p-ISSN:1979-8253

the left ventricle and electrophysiological abnormalities, particularly QT interval prolongation. Due to its subclinical course, CCM often goes unrecognized unless the patient is subjected to physiological stress. Circulatory decompensation may occur during liver transplantation, leading to increased perioperative mortality from cardiovascular causes.[5]

Despite increasing recognition of cardiohepatic interactions, the precise relationship between hepatic functional reserve (as measured by the ALBI score) and cardiac biomarkers such as NT-proBNP remains poorly understood in advanced cirrhosis.[6,7]

In particular, evidence is limited on whether higher ALBI scores are associated with the severity of diastolic dysfunction in patients with end-stage liver disease (Child-Pugh C).[8]Based on this background, the present study aims to analyze the effect of ALBI score on NT-proBNP levels and the degree of diastolic dysfunction in patients with Child-Pugh C hepatic cirrhosis.

METHODS

Study design

This study utilized an analytical observational design with a cross-sectional approach. A cross-sectional study is an observational method in which data is collected at a single point in time from a sample selected based on inclusion and exclusion criteria.[9] This research was conducted at the Gastroenterohepatology Polyclinic and Inpatient Department of Dr. Moewardi General Hospital, Surakarta, over a specified research period from August 27, 2024, to February 14, 2025.

Data source and sampling procedures

The study population comprised inpatients at Dr. Moewardi General Hospital, Surakarta, and outpatients with Child-Pugh C liver cirrhosis who attended the Gastroenterohepatology Polyclinic. Subjects were recruited using a consecutive sampling method, in which all eligible patients meeting the inclusion criteria during the study period were enrolled, while those fulfilling the exclusion criteria were omitted. A total of 54 participants were included, consisting of 27 patients in the intervention group and 27 in the control group.

The inclusion criteria were: (1) patients aged ≥18 years; (2) a confirmed diagnosis of Child-Pugh C liver cirrhosis based on clinical and laboratory findings; and (3) willingness to undergo anamnesis, physical examination, blood sampling, electrocardiography, and echocardiographic assessment.

The exclusion criteria comprised patients with hypertension according to JNC VII criteria within the last 12 weeks, coronary artery disease or history of myocardial infarction, valvular heart disease, atrial fibrillation, bundle branch block, second- or third-degree atrioventricular block, malignant arrhythmia at rest, cardiac or paracardiac tumor, constrictive pericarditis or significant pericardial effusion, chronic kidney disease stage IV–V, diabetes mellitus with HbA1c ≥8.1% within the last three months, hemoglobin ≤8 g/dL within the last two weeks, or active gastrointestinal bleeding within one week prior to enrollment.

The intervention group consisted of patients classified with a higher Albumin–Bilirubin (ALBI) Score (Grade III), while the control group included those with lower ALBI Scores (Grade I–II). Both groups underwent identical evaluations to ensure comparability.

Variables of the study

The independent variable in this study was the Albumin–Bilirubin (ALBI) Score. The dependent variables were NT-proBNP levels and the degree of diastolic dysfunction in patients with Child-Pugh C liver cirrhosis.

https://doi.org/10.34011/juriskesbdg.v18i1.2996

Vol 18 No 1, Mei 2026
e-ISSN: 2579-8103
p-ISSN:1979-8253

Measurement and instruments

Echocardiographic assessment included specific parameters such as E/A ratio, E/e′ ratio, deceleration time (DT), tricuspid regurgitation (TR) velocity, and Left Atrial Volume Index (LAVI), which were used to evaluate diastolic function.

The degree of diastolic dysfunction was determined according to the ASE/EACVI 2016 guideline and categorized as follows[10]:

- Normal: septal e′ ≥7 cm/s, E/e′ <15, LAVI ≤34 mL/m², TR velocity ≤2.8 m/s.
- Grade I (Impaired relaxation): E/A ≤0.8 with E ≤50 cm/s, or E/A ≤0.8 with E >50 cm/s and one abnormal criterion (E/e′ ≥15, TR velocity >2.8 m/s, or LAVI >34 mL/m²).
- Grade II (Pseudonormal): E/A 0.8–2 with at least two abnormal criteria.
- Grade III (Restrictive filling): E/A ≥2.

These parameters were analyzed to determine the relationship between ALBI Score, NT-proBNP levels, and the severity of diastolic dysfunction in patients with Child-Pugh C liver cirrhosis.

Data collection

The data collection procedure began with patient recruitment and the acquisition of informed consent. This was followed by the collection of clinical and laboratory data, including NT-proBNP, albumin, and bilirubin measurements. Echocardiographic examinations were then performed to determine diastolic function. Subsequently, the ALBI score was calculated and classified. All measurements were conducted by trained medical personnel in accordance with standardized protocols.

Ethical Considerations

This research received ethical approval from the Health Research Ethics Committee of Dr. Moewardi General Hospital, Surakarta, with the ethical clearance number: 1.425/V/ HREC /2024. All participants signed informed consent forms prior to participation in the study.

Data Analysis

Statistical analysis was conducted using SPSS software. A Simple Ordinal Regression test was used to evaluate the effect of the ALBI score on the degree of diastolic dysfunction and NT-proBNP levels. A p-value < 0.05 was considered statistically significant.

RESULTS

Table 1. Demographic and Clinical Characteristics of Respondents (n = 60)

Variable	Category	Intervention (ALBI III) (n=30)	Control (ALBI I–II) (n=30)	p-value
Age (years)	≤50	18 (60.0%)	20 (66.7%)	0.592
	>50	12 (40.0%)	10 (33.3%)	
Sex	Male	21 (70.0%)	20 (66.7%)	0.781
	Female	9 (30.0%)	10 (33.3%)	
Duration of illness (years)	<5	17 (56.7%)	19 (63.3%)	0.602
	≥5	13 (43.3%)	11 (36.7%)	
Mean ALBI score ± SD	—	-1.45 ± 0.22	-2.33 ± 0.18	<0.001*
NT-proBNP level (pg/mL)	Mean ± SD	478.5 ± 65.2	315.6 ± 57.4	0.014*
Degree of diastolic dysfunction	Normal	3	10	0.021*
	Grade I	12	15	
	Grade II–III	5	5	

**Notes: Values are expressed as frequency (%), mean ± SD; p < 0.05 = statistically significant.*

Table 1 presents the demographic and clinical characteristics of the respondents, divided into two groups based on the Albumin–Bilirubin (ALBI) Score: the intervention

https://doi.org/10.34011/juriskesbdg.v18i1.2996

Vol 18 No 1, Mei 2026
e-ISSN: 2579-8103
p-ISSN:1979-8253

group (ALBI Grade III) and the control group (ALBI Grades I–II). The intervention group (ALBI Grade III) showed a significantly higher mean NT-proBNP level and greater severity of diastolic dysfunction compared to the control group ($p < 0.05$). This suggests worsening cardiac diastolic function with higher ALBI grades.

Influence of ALBI Score on NT-proBNP Levels

The analysis of the influence of the ALBI Score on NT-proBNP levels in Child-Pugh C liver cirrhosis patients is presented in table 2:

Table 2. Influence of ALBI Score on NT-proBNP Levels

Predictor	Estimate (B)	SE	Wald χ^2	df	p-value	OR (Exp(B))	95% CI for OR
Thresholds							
NT_PRO = 1	-0.262	0.194	1.84	1	0.176	—	0.53–1.12
NT_PRO = 2	0.910	0.221	16.94	1	<0.001	—	1.61–3.83
Predictors (ALBI Category)							
ALBI = 1	-8.553	—	—	—	—	—	—
ALBI = 2	-0.938	0.438	4.59	1	0.032	0.39	0.17–0.92
ALBI = 3 (ref.)	—	—	—	—	—	—	—

**Notes: ALBI = Albumin–Bilirubin Score; NT_PRO = NT-proBNP level (1 = low, 2 = moderate, 3 = high); OR = Odds Ratio; p < 0.05.*

The ALBI Score had a significant influence on NT-proBNP levels ($p = 0.032$). Patients with ALBI Grade II had lower odds (OR = 0.39; 95% CI: 0.17–0.92) of elevated NT-proBNP levels compared to those with ALBI Grade III. This finding indicates that higher ALBI grades (reflecting worse liver function) are associated with higher NT-proBNP levels.

Influence of ALBI Score on the Degree of Diastolic Dysfunction

The relationship between ALBI Score and diastolic dysfunction severity was analyzed using ordinal regression, as shown in Table 3

Table 3. Influence of ALBI Score on the Degree of Diastolic Dysfunction

Predictor	Estimate (B)	SE	Wald χ^2	df	p-value	OR (Exp(B))	95% CI for OR
Thresholds							
DDD = 1 (Normal)	0.019	0.189	0.01	1	0.919	—	0.68–1.22
DDD = 2 (Mild)	1.317	0.249	28.06	1	<0.001	—	1.55–3.81
DDD = 3 (Moderate–Severe)	2.227	0.433	28.40	1	<0.001	—	1.38–3.07
Predictors (ALBI Category)							
ALBI = 1	-8.114	—	—	—	—	—	—
ALBI = 2	0.450	0.378	1.42	1	0.234	1.57	0.74–3.31
ALBI = 3 (Ref.)	—	—	—	—	—	—	—

No significant effect of the ALBI Score on the degree of diastolic dysfunction was observed ($p = 0.234$) (Table 3). Although patients with higher ALBI grades tended to have more advanced diastolic dysfunction, this relationship was not statistically significant.

DISCUSSION

In this study, patients with Child-Pugh C liver cirrhosis were divided into two comparison groups based on their Albumin–Bilirubin (ALBI) Score.

https://doi.org/10.34011/juriskesbdg.v18i1.2996

Vol 18 No 1, Mei 2026
e-ISSN: 2579-8103
p-ISSN:1979-8253

The control group consisted of patients with low ALBI Scores (Grade I–II), indicating relatively preserved liver function, whereas the intervention group consisted of patients with high ALBI Scores (Grade III), indicating more severe hepatic dysfunction.
This grouping aimed to compare the levels of NT-proBNP and the degree of diastolic dysfunction between patients with milder and more advanced liver impairment, thereby assessing whether the severity of liver dysfunction—represented by ALBI Score—was associated with cardiac functional changes

The present study demonstrated a significant increase in NT-proBNP levels in the intervention group compared with the control group.This finding suggests that elevated NT-proBNP may serve as an early indicator of cardiac stress or subclinical cardiac dysfunction in patients with advanced liver cirrhosis. Similarly, Mihailovici et al. reported that NT-proBNP levels were elevated in cirrhotic patients and correlated with the severity of liver disease as reflected by MELD scores and the presence of ascites. These results reinforce the close interaction between liver dysfunction and cardiac strain in patients with advanced hepatic disease.[11]

The ALBI score was originally introduced to assess hepatic functional reserve and prognosis in hepatocellular carcinoma (HCC) patients. Compared to the Child-Pugh score, it offers greater objectivity because it uses only serum albumin and bilirubin levels, thereby reducing subjectivity and interobserver variation. Toyoda & Johnson demonstrated that ALBI provides a robust prognostic model across all stages of chronic liver disease and even extends its applicability to other systemic conditions such as heart failure and brain tumors.[12]

In the context of liver cirrhosis, the ALBI score has been increasingly used for evaluating hepatic function and predicting outcomes, including hepatic decompensation and overall survival.[13] Sungur et al. emphasize the objectivity of ALBI compared to Child-Pugh and its reliability for assessing liver function.[14]

The increase in NT-proBNP observed in patients with a high ALBI score may reflect early cardiac dysfunction. This aligns with the clinical picture of cirrhosis as a chronic liver disease associated with hyperdynamic circulation characterized by increased cardiac output and reduced peripheral vascular resistance, potentially leading to cirrhotic cardiomyopathy with abnormal contractile responses and impaired diastolic relaxation without pre-existing heart disease.[11]

Further studies also indicate that ALBI grade III patients have a higher risk and incidence of gastroesophageal varices than those with ALBI grades I-IIa, reflecting a correlation between higher ALBI scores and severity of cirrhosis complications.[15] Moreover, the ALBI score has shown good predictive performance not only for mortality but also for liver disease decompensation events.[16]

Han et al. reinforced these findings by demonstrating that combining NT-proBNP with ALBI enhances predictive accuracy compared to NT-proBNP alone. Therefore, the results of this study underline the significance of the ALBI score as a prognostic tool that extends beyond liver function assessment, providing deeper insight into cardiovascular status in cirrhosis patients.[17]

Hence, simultaneous monitoring of NT-proBNP levels and the ALBI score in Child-Pugh C cirrhosis patients may facilitate early detection of cardiac dysfunction, enabling timely intervention and improved clinical management and care planning. The results of this study revealed no significant correlation between the ALBI score and the degree of diastolic dysfunction in patients with Child-Pugh C liver cirrhosis. This finding is consistent with the study conducted by Qiao et al, which reported no significant relationship between high ALBI scores and echocardiographic parameters such as left atrial diameter and myocardial wall thickness. One explanation for this is that

https://doi.org/10.34011/juriskesbdg.v18i1.2996

Vol 18 No 1, Mei 2026
e-ISSN: 2579-8103
p-ISSN:1979-8253

echocardiography has limitations in sensitivity and precision compared to advanced imaging modalities such as cardiac magnetic resonance (CMR), which may better characterize myocardial structural abnormalities.[18]

Similarly, Cholongitas et al. found no correlation between the severity of liver disease and diastolic dysfunction as assessed by echocardiography in patients with decompensated liver cirrhosis. In that study, the presence or absence of diastolic dysfunction did not significantly influence either the Child-Pugh or MELD scores. This suggests that the pathophysiology of diastolic dysfunction in cirrhosis may be influenced by factors not adequately captured by liver function scoring systems.[19]

The ALBI score, though widely used to assess liver function and predict mortality in chronic liver disease, primarily reflects synthetic liver function through serum albumin and bilirubin levels. It does not account for myocardial stiffness or relaxation properties, which are central to diastolic dysfunction. Factors such as cardiac fibrosis, ventricular hypertrophy, and aging have been shown to play a more direct role in diastolic impairment.[6] Chronic systemic inflammation, which contributes to myocardial remodeling, is also not reflected in the ALBI score.[7]

Furthermore, the ALBI score is known to be more strongly associated with outcomes related to systolic dysfunction and mortality rather than diastolic changes, as noted by Sungur et al.[14] Jurkiewicz lalso suggest that while the ALBI score is sensitive to systemic congestion and fluid overload, it lacks specificity for the subtler myocardial alterations that characterize early diastolic dysfunction.[8]

Diastolic dysfunction in liver cirrhosis is multifactorial, involving impaired calcium handling during relaxation, increased left ventricular wall stiffness, and the effects of pro-inflammatory mediators such as TNF-α and TGF-β.[6,7] These mechanisms are not necessarily reflected in changes to albumin or bilirubin levels, which limits the predictive value of ALBI in this context. Additionally, standard echocardiographic measurements such as the E/A ratio, E/e', and LAVI can be confounded by high heart rate, ascites, or hemodynamic instability in cirrhotic patients, further complicating assessment.[20]

In contrast, advanced imaging methods such as cardiac MRI have shown promise for detecting diastolic dysfunction more accurately. Behairy demonstrated that CMR could grade diastolic dysfunction effectively, with findings closely matching echocardiography but with superior reproducibility and independence from body habitus.[21] Although the ALBI score remains a valuable and cost-effective tool for liver function evaluation, the current study indicates that it does not significantly correlate with the degree of diastolic dysfunction in cirrhosis patients at the Child-Pugh C stage. Diastolic dysfunction typically becomes clinically significant in cirrhosis when the left ventricle faces sudden increases in preload due to volume expansion, such as after liver transplantation or TIPS procedures.[1] Assessment through mitral inflow patterns using Doppler echocardiography allows for indirect estimation of left ventricular diastolic function.[22] However, given the limitations of echocardiography in this population, supplementary imaging modalities like CMR are recommended for comprehensive cardiac evaluation.

Further research is necessary to identify optimal diagnostic strategies for assessing diastolic dysfunction in cirrhotic patients and to better understand the interplay between liver and cardiac function. This may ultimately improve clinical risk stratification and guide more tailored therapeutic interventions. Building upon these findings, this study has several strengths, including the use of a quasi-experimental design with a control group, which allowed for a comparative analysis of the effectiveness of birthing ball exercises. Furthermore, the application of three validated and reliable measurement tools for pain and anxiety (VAS, FPRS, NAS) enhanced methodological rigor and improved the accuracy of outcome measurements.

https://doi.org/10.34011/juriskesbdg.v18i1.2996

Vol 18 No 1, Mei 2026
e-ISSN: 2579-8103
p-ISSN:1979-8253

However, there are notable limitations. The non-randomized approach and use of consecutive sampling may introduce selection bias. The absence of a pre-test in the control group limits the interpretation of within-group changes. Additionally, psychosocial factors such as family support, previous childbirth experiences, and maternal self-efficacy were not analyzed, despite their potential influence on pain and anxiety perceptions.

CONCLUSION

In conclusion, this study demonstrates that the ALBI Score has a significant influence on NT-proBNP levels in patients with Child-Pugh C liver cirrhosis, indicating a relationship between liver dysfunction and subclinical cardiac dysfunction. However, the ALBI Score does not show a significant association with the degree of diastolic dysfunction in these patients. This suggests that while the ALBI Score can be considered an additional tool for cardiovascular risk screening, particularly in identifying the potential for cirrhotic cardiomyopathy, it may not be sufficient to predict diastolic impairment. Routine NT-proBNP monitoring in patients with elevated ALBI Scores could facilitate early detection and timely management of cardiac complications.

This study has several limitations. The relatively small sample size and single-center design may limit the generalizability of the findings. The cross-sectional nature of the study precludes causal inference between ALBI Score and cardiac dysfunction. In addition, echocardiographic evaluation was used as the sole method for assessing diastolic function, which may be less sensitive than advanced imaging modalities such as speckle-tracking echocardiography or cardiac magnetic resonance imaging (MRI). Furthermore, potential confounding factors such as medication use, volume status, and comorbidities (e.g., hypertension or diabetes) were not fully controlled, which may have influenced NT-proBNP levels. Further multicenter prospective studies with larger cohorts and more comprehensive cardiac assessments are warranted to confirm these findings and to elucidate the underlying pathophysiological mechanisms linking hepatic and cardiac dysfunction in cirrhotic patients.

REFERENCES

1. Loscalzo J, Fauci A, Kasper D, Hauser S, Longo D, Jameson JL. Harrison's Principles of Internal Medicine,. In: *Harrison's Principles of Internal Medicine, 21e*. McGraw-Hill Education; 2022.
2. Matsue Y, Kagiyama N, Yamaguchi T, et al. Clinical and Prognostic Values of ALBI Score in Patients With Acute Heart Failure. *Heart Lung Circ*. 2020;29(9):1328-1337. doi:10.1016/j.hlc.2019.12.003
3. Pimenta J, Paulo C, Gomes A, Silva S, Rocha-Gonçalves F, Bettencourt P. B-type natriuretic peptide is related to cardiac function and prognosis in hospitalized patients with decompensated cirrhosis. *Liver Int*. 2010;30(7):1059-1066. doi:10.1111/j.1478-3231.2010.02266.x
4. Chayanupatkul M, Liangpunsakul S. Cirrhotic cardiomyopathy: review of pathophysiology and treatment. *Hepatol Int*. 2014;8(3):308-315. doi:10.1007/s12072-014-9531-y
5. Rimbaş RC, Baldea SM, Guerra RDGA, et al. New Definition Criteria of Myocardial Dysfunction in Patients with Liver Cirrhosis: A Speckle Tracking and Tissue Doppler Imaging Study. *Ultrasound Med Biol*. 2018;44(3):562-574. doi:10.1016/j.ultrasmedbio.2017.11.013
6. Røe ÅT, Aronsen JM, Skårdal K, et al. Increased passive stiffness promotes diastolic dysfunction despite improved Ca2+ handling during left ventricular concentric hypertrophy. *Cardiovasc Res*. 2017;113(10):1161-1172. doi:10.1093/cvr/cvx087

https://doi.org/10.34011/juriskesbdg.v18i1.2996

Vol 18 No 1, Mei 2026
e-ISSN: 2579-8103
p-ISSN:1979-8253

7. Fang L, Ellims AH, Beale AL, Taylor AJ, Murphy A, Dart AM. Systemic inflammation is associated with myocardial fibrosis, diastolic dysfunction, and cardiac hypertrophy in patients with hypertrophic cardiomyopathy. *Am J Transl Res*. 2017;9(11):5063-5073.
8. Jurkiewicz M, Szczurek-Wasilewicz W, Skrzypek M, Krych S, Gąsior M, Szyguła-Jurkiewicz B. Albumin–Bilirubin (ALBI) Score Predicts Long-Term Survival in Elderly Patients with Decompensated Heart Failure. *J Clin Med*. 2025;14(3). doi:10.3390/jcm14030808
9. Sastroasmoro S. *Dasar-Dasar Metodologi Penelitian Klinis*. Sagung Seto; 2018.
10. Nagueh SF, Smiseth OA, Appleton CP, et al. Recommendations for the Evaluation of Left Ventricular Diastolic Function by Echocardiography : An Update from the American Society of Echocardiography and the European Association of Cardiovascular Imaging. *J Am Soc Echocardiogr*. 2016;29(4):277-314. doi:10.1016/j.echo.2016.01.011
11. Mihailovici AR, Donoiu I, Gheonea DI, et al. NT-proBNP and Echocardiographic Parameters in Liver Cirrhosis - Correlations with Disease Severity. *Med Princ Pract Int J Kuwait Univ Heal Sci Cent*. 2019;28(5):432-441. doi:10.1159/000499930
12. Toyoda H, Johnson PJ. The ALBI score: From liver function in patients with HCC to a general measure of liver function. *JHEP reports Innov Hepatol*. 2022;4(10):100557. doi:10.1016/j.jhepr.2022.100557
13. Navadurong H, Thanapirom K, Wejnaruemarn S, et al. Validation of the albumin-bilirubin score for identifying decompensation risk in patients with compensated cirrhosis. *World J Gastroenterol*. 2023;29(32):4873-4882. doi:10.3748/wjg.v29.i32.4873
14. Sungur A, Sungur MA, Yıldırımtürk Ö. Effect of Albumin-Bilirubin Score on Prognosis in Ambulatory Heart Failure Patients with Reduced Ejection Fraction. *Turk Kardiyol Dern Ars*. Published online October 2023. doi:10.5543/tkda.2023.04488
15. Miyamoto Y, Enomoto H, Nishikawa H, et al. Association of the Modified ALBI Grade With Endoscopic Findings of Gastroesophageal Varices. *In Vivo*. 2021;35(2):1163-1168. doi:10.21873/invivo.12364
16. Xu SX, Yang F, Ge N, Guo JT, Sun SY. Role of albumin-bilirubin score in non-malignant liver disease. *World J Gastroenterol*. 2024;30(9):999-1004. doi:10.3748/wjg.v30.i9.999
17. Han S, Wang C, Tong F, et al. Prognostic impact of albumin-bilirubin score on the prediction of in-hospital mortality in patients with heart failure: a retrospective cohort study. *BMJ Open*. 2022;12(1):e049325. doi:10.1136/bmjopen-2021-049325
18. Qiao P, Li L, Ruan H, et al. Application of the ALBI Scoring System for Mortality Outcome Prediction in Patients with Hypertrophic Cardiomyopathy. *Glob Heart*. 2022;17(1):73. doi:10.5334/gh.1163
19. Cholongitas E, Goulis I, Pagourelias E, et al. Diastolic dysfunction is associated with low urinary sodium excretion in patients with decompensated cirrhosis. *Ann Hepatol*. 2016;15(5):545-751. doi:10.5604/16652681.1212534
20. MacNamara JP, Sarma S. Faltering Under Pressure: Limitations to Noninvasive Diastolic Function Assessments. *J Am Heart Assoc*. 2021;10(18):e023189. doi:10.1161/JAHA.121.023189
21. Hosam El Din Behairy N, Homos M, Ramadan A, Osama El Sayed Gouda S. Evaluation of left ventricle diastolic dysfunction in ischemic heart disease by CMR: Correlation with echocardiography and myocardial scarring. *Egypt J Radiol Nucl Med*. 2014;45(4):1099-1104. doi:https://doi.org/10.1016/j.ejrnm.2014.07.007
22. Bodys-Pełka A, Kusztal M, Raszeja-Wyszomirska J, Główczyńska R, Grabowski M. What's New in Cirrhotic Cardiomyopathy?-Review Article. *J Pers Med*. 2021;11(12). doi:10.3390/jpm11121285

https://doi.org/10.34011/juriskesbdg.v18i1.2996