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CALLY index in patients admitted in the intensive care unit with a diagnosis of decompensated heart failure

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ABSTRACT

Aims: This study aimed to investigate whether the CALLY index is associated with mortality in patients admitted to intensive care due to decompensated heart failure.

Methods: In this retrospective study, 130 patients diagnosed with decompensated heart failure admitted to the intensive care unit between 15 October 2023 and 15 October 2024 were included. Demographic data, comorbidities, stages of heart failure, length of stay in the intensive care unit, and mortality status were examined. CALLY index were calculated, and their relationship with mortality was examined.

Results: The CALLY index was found to be statistically significant in distinguishing mortality (p=0.018). A higher mortality rate was observed in the group with a low CALLY index (≤0.12) (% 26.9% vs % 10.3%) (p=0.013).

Conclusion: In patients with decompensated heart failure followed in the intensive care unit, mortality was inversely related to the CALLY index. The CALLY index, a straightforward method for calculation, can serve as a guide for clinicians in determining prognosis.

Keywords: Heart failure, CALLY index, intensive care unit

INTRODUCTION

Heart failure is one of the most common reasons for admission to intensive care units from emergency departments worldwide.[1] According to the European Society of Cardiology (ESC) guidelines, heart failure is classified into three groups based on ejection fraction: heart failure with reduced ejection fraction, heart failure with mildly reduced ejection fraction, and heart failure with preserved ejection fraction (**Figure**).[2]

Admission to hospital for decompensated heart failure is frequently seen in patients with low ejection fraction, but it can be observed in all EF groups, regardless of ejection fraction.[3] Decompensated heart failure is a clinical condition characterised by acute worsening of heart failure symptoms and haemodynamic instability, often requiring intensive care unit admission and having a risk of mortality.[2,4]

Decompensated heart failure may also occur due to causes such as fluid overload, coronary ischaemia, arrhythmia, tachycardia, toxic damage, oxidative stress, thyroid dysfunction, anaemia, renal dysfunction, infection, and inflammation.[3,5-9] Malnutrition, one of the factors affecting prognosis and mortality in intensive care units, is also one of the factors that lead to decompensated heart failure.[10,11]

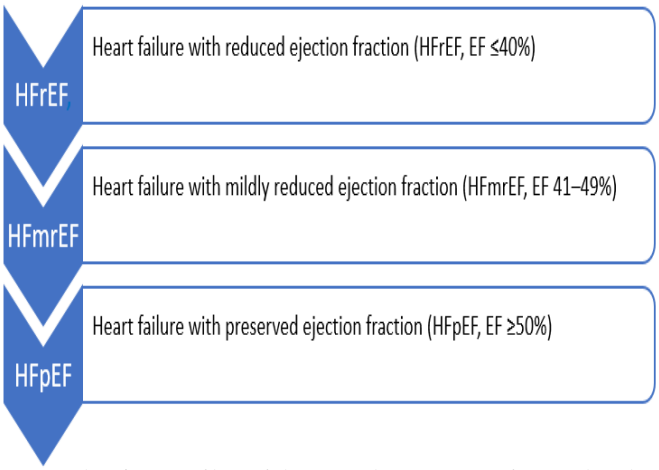

Figure. Classification of heart failure according to ejection fraction, based on the European Society of Cardiology Guidelines[2]

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It is known that blood tests showing the immune system and inflammation status, such as albumin, lymphocyte, and C-reactive protein, can be used separately to evaluate malnutrition.[12,13] Lately, the CALLY index, which is formed by combining these three components—CRP, albumin, and lymphocytes—has been used to assess the prognosis and mortality of cancer patients. It has been reported that the CALLY index can be used to predict poor prognosis and mortality in cancer patients.[14,15]

This study investigated whether the CALLY index is associated with mortality in patients admitted to intensive care due to decompensated heart failure, thereby aiming to provide new evidence regarding the clinical value of this integrated biomarker in critical care practice.

METHODS

Ethics

The study was performed retrospectively. It was conducted in the coronary care units of a tertiary care hospital. Ethics committee approval has been obtained from the Ethics Committee for Non-interventional Clinical Researches at Gaziantep City Hospital (Date: 17.09.2025, Decision No: 2025/297). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

Selection of Participants

Patients diagnosed with decompensated heart failure and who were hospitalised in the intensive care unit between 15 October 2023 and 15 October 2024 were included in the study. A total of 130 patients aged 18 years and older with complete medical records in the intensive care unit were included.

Measurements and Outcomes

The study examined patients' demographic data, comorbidities, stages of heart failure, EF, mortality, and length of intensive care unit stay. Routine biochemical and haematological blood parameters taken during admission to the intensive care unit were examined.

The CALLY index was calculated using the formula: CALLY index=(albumin (g/L)×lymphocyte count (10^9/L))/CRP (mg/dl)x10^4.[16]

Statistical Analysis

The data analyses were performed using 'IBM SPSS Statistics for Windows. Version 25.0 (Statistical Package for the Social Sciences, IBM Corp., Armonk, NY, USA)'. Descriptive statistics were presented as n and %, for categorical variables, and mean±SD and median (min-max) for continuous variables. Independent t-tests were used for binary group comparisons. Pearson Chi-square tests were used for comparisons of categorical variables. ROC curve analysis was used for CALLY score mortality discrimination. $p<0.05$ was considered statistically significant.

RESULTS

The mean age of the patients included in the study was 67.59±12.40. The mean intensive care unit stay was 5.27±4.44 days. The patients were 50.8% male (n=66). The prevalence of diabetes mellitus (DM) was 63.1% (n=82), hypertension (HT) was 83.8% (n=109), coronary artery disease (CAD) was 58.5% (n=76), and hyperlipidemia was 36.9% (n=48). The prevalence of chronic kidney disease (CRF) was 50.0% (n=65). In terms of cardiac function, those with an ejection fraction (EF) <40 were 78.5% (n=102), those between 40-49 were 6.9% (n=9), and those ≥50 were 14.6% (n=19). The rate of patients with a history of stroke was determined to be 2.3% (n=3). When mortality was considered, 83.1% (n=108) of patients were alive during the follow-up period, while 16.9% (n=22) had an exitus (Table 1).

Table 1. Distribution of clinical data of patients

Variables	n	%
Age		
Mean±SD	67.59±12.40	
Median (min-max)	68.5 (35-95)	
Length of hospital admission (day)		
Mean±SD	5.27±4.44	
Median (min-max)	4.0 (1.0-25.0)	
Gender		
Male	66	50.8
DM		
Yes	82	63.1
HT		
Yes	109	83.8
CAD		
Yes	76	58.5
Hyperlipidaemia		
Yes	48	36.9
CRF		
No	65	50.0
CRF present, no dialysis	54	41.5
CRF present, irregular dialysis	7	5.4
CRF present, regular dialysis	4	3.1
HF		
EF<40 %	102	78.5
EF:40-49 %	9	6.9
EF≥50 %	19	14.6
Stroke		
Yes	3	2.3
EF %		
Mean±SD	32.31±11.61	
Median (min-max)	30.0 (15.0-55.0)	
Mortality		
Exitus	22	16.9

DM: Diabetes mellitus, HT: Hypertension, CAD: Coronary artery disease, CRF: Chronic renal failure, HF: Heart failure, EF: Ejection fraction, SD: Standard deviation, Min: Minimum, Max: Maximum

Table 2 shows the statistics regarding the patients' laboratory parameters. The mean albumin level was 35.42±5.20, the mean lymphocyte count was 1.80±0.87, and the mean CRP level was 33.03±38.28 (Table 2).

As shown in Table 3, the CALLY score was found to be statistically significant in discrimination mortality (p=0.018).

The study was divided into two groups based on the CALLY index: ≤0.12 (n=52) and >0.12 (n=78). A significant difference

Table 2. Patients' biochemical and haematological data

Variables	Min	Max	Avg.	SD
Glukose (mg/dl)	50.00	535.00	191.10	100.79
Urea (mg/dl)	21.80	181.00	70.24	35.27
Serum creatinine (mg/dl)	0.37	8.10	1.47	1.06
Sodium (mmol/L)	115.00	145.00	136.36	5.07
Potassium (mmol/L)	3.02	6.88	4.52	0.71
Albumin (g/L)	19.60	45.90	35.42	5.20
ALT (U/L)	5.00	468.00	39.72	70.46
AST (U/L)	10.00	726.00	57.45	105.44
ALP (U/L)	20.00	584.00	118.01	89.75
GGT (U/L)	9.00	1107.00	102.31	147.87
Total cholestrol (mg/dl)	82.00	352.00	173.80	53.09
TG (mg/dl)	47.00	819.00	131.10	88.90
LDL (mg/dl)	26.00	244.00	106.79	41.86
HDL (mg/dl)	17.00	119.00	42.60	16.01
WBC (10^9/L)	2.10	28.30	11.35	4.92
PLT (10^9/L)	40.00	750.00	282.39	121.15
HB (g/dl)	6.40	17.30	11.79	2.25
Lymphocyte (10^9/L)	0.10	17.00	1.81	1.82
Neutrophil (10^9/L)	1.50	26.90	8.69	4.67
CRP (mg/L)	0.30	215.60	33.03	38.28
CALLY index	0.10	1.89	.30	0.29

SD: Standard deviation, Min: Minimum, Max: Maximum, ALT: Alanine aminotransferase, AST: Aspartate aminotransferase, ALP: Alkaline phosphatase, GGT: Gamma glutamyl transferase, LDL: Low-density lipoprotein cholesterol, HDL: High-density lipoprotein cholesterol, PLT: Platelet, WBC: White blood cell, Hb: Hemoglobin, CRP: C-reactive protein

Table 3. Analysis of the predictive value of the CALLY index in predicting mortality in patients

Variables	AUC	95% CI	Cut-off	Sensitivity (%)	Specificity (%)	p
CALLY	0.661	0.534-0.787	≤0.12	54.7	54.4	0.018

AUC: Area under the curve, 95% CI: Confidence interval

was found in terms of mortality; the mortality rate was 26.9% in the group with a low CALLY index (≤0.12), while it was 10.3% in the group with a high CALLY index (>0.12) (p=0.013). There was no difference between the groups in terms of intensive care hospitalisation days (5.23±5.22 vs. 5.30±3.88; p=0.923). When heart failure (HF) staging was examined, EF<40 values were predominant in both groups, and no statistically significant difference was observed in terms of distribution (p=0.339). When comparing ejection fraction (EF) values, the mean EF was 30.05±11.49 in the low CALLY group and 33.82±11.51 in the high CALLY group, with a borderline significant difference between the two (p=0.070) (Table 4).

Table 4. Comparison of different variables according to CALLY groups

	CALLY		
	≤0.12 (n=52)	>0.12 (n=78)	p
Mortality			
Survivor	38 (73.1)	70 (89.7)	0.013[a]
Exitus	14 (26.9)	8 (10.3)	
Length of hospital admission (day)	5.23±5.22	5.30±3.88	0.923[b]
HF-EF %			
<40%	44 (84.6)	58 (74.4)	0.339[a]
40-49%	2 (3.8)	7 (9.0)	
≥50%	6 (11.6)	13 (16.7)	
EF %	30.05±11.49	33.82±11.51	0.070[b]

HF: Heart failure, EF: Ejection fraction, a: Pearson Chi-Square test, b: Independent t-test, p<0.05 statistically significant

DISCUSSION

In this study, which examined the relationship between the CALLY index and mortality in patients admitted to intensive care due to decompensated heart failure, it was observed that the CALLY index was statistically significant in distinguishing mortality. It showed that mortality was higher in the group with a low CALLY index.

The CALLY index, which provides information about patients' immune status, nutritional status, and inflammation status based on CRP, albumin, and lymphocyte parameters, was first used in cancer patients.[17] In cancer patients with a low CALLY index, increased preoperative complications, increased infection and increased mortality have been observed.[17,18]

Later, it has been used in other diseases related to inflammation. A study conducted on 17.946 asthma patients showed a negative correlation between asthma and CALLY index.[19] In another inflammatory disease, rheumatoid arthritis, a negative relationship has been demonstrated between disease activity and the CALLY index.[20]

According to studies performed in intensive care units, the CALLY index can be used to predict one-month mortality in sepsis patients admitted to intensive care units.[21] It has also been reported that the CALLY index can predict mortality in patients admitted to intensive care units due to stroke.[22]

Regarding the CALLY index, looking at cardiac patients, a study involving 16.291 patients with angina pectoris, in which inflammation also plays a role in the formation mechanisms, observed a negative correlation between angina pectoris and the CALLY index.[23] CALLY index has also been shown to be useful in predicting major adverse cardiovascular events (MACE) and mortality in patients with ST-elevation myocardial infarction (STEMI) undergoing percutaneous intervention.[24] The CALLY index has been shown to be useful in predicting atrial fibrillation (AF) recurrence in patients undergoing AF ablation.[25] Candemir et al.[26] reported in a retrospective study that there was a negative correlation between length of hospital stay and CALLY index in patients hospitalised with decompensated heart failure.

In our study, consistent with the literature, it was determined that the CALLY index can be used to predict mortality in patients admitted to the intensive care unit with the diagnosis of decompensated heart failure, and that higher mortality was seen in patients with a low CALLY index.

Limitations

Our study has several limitations. Firstly, the nutritional parameters of the patients are unknown. The body mass index of the patients is unknown for subgroup analysis. The nutritional status of patients who died during the period of intubation is unknown.

CONCLUSION

The CALLY index was negatively associated with mortality in patients with decompensated heart failure monitored in the intensive care unit. This index, which is easy to calculate in the intensive care unit and does not require any additional costs, can be automatically calculated by software programmes and used by clinicians as a guide for prognosis in patients with heart failure.

ETHICAL DECLARATIONS

Ethical Committee Approval

Ethics committee approval has been obtained from the Ethics Committee for Non-interventional Clinical Researches at Gaziantep City Hospital (Date: 17.09.2025, Decision No: 2025/297).

Informed Consent

Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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