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Evaluation of nutritional status in intensive care unit patients

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ABSTRACT

Aims: Malnutrition and systemic inflammation are known to be associated with poor prognosis in critically ill patients. This study aimed to investigate the prognostic value of the Controlling Nutritional Status (CONUT) and hemoglobin, albumin, lymphocyte, and platelet (HALP) scores on mortality in intensive care unit (ICU) patients.

Methods: This retrospective study included adult patients hospitalized in the internal medicine ICUs of two tertiary centers in 2024. Patients with chronic or systemic diseases were excluded from the control group. Laboratory data, APACHE II scores, CONUT and HALP scores were recorded on admission. We conducted statistical analyses to evaluate the association between these scores and mortality.

Results: A total of 53 ICU patients were included. The mean CONUT score was significantly higher in the patient group (6.71) compared to healthy controls (1.15) (p=0.000), indicating moderate malnutrition. The HALP score was also significantly lower in the ICU group (20.90) than in the control group (63.19) (p=0.000). However, no statistically significant association was found between either CONUT or HALP scores and mortality, length of stay, or APACHE II scores.

Conclusion: Although CONUT and HALP scores differed significantly between ICU patients and healthy individuals, they did not predict mortality in this cohort. However, the potential implications of our findings are significant. These easily applicable scores may still be useful for assessing nutritional and inflammatory status in ICU patients, and our study provides a foundation for further research in this area. Further multicenter, prospective studies with larger sample sizes are needed to clarify their prognostic utility.

Keywords: CONUT score, HALP score, mortality, intensive care, malnutrition, systemic inflammation

INTRODUCTION

Malnutrition and systemic inflammation are key pathogenic factors determining prognosis in intensive care unit (ICU) patients. Therefore, these patients are monitored for nutritional and inflammatory status during clinical follow-up.[1] The Control of Nutritional Status (CONUT) score, used to assess nutritional status, draws attention as an objective assessment tool based on serum albumin level, total lymphocyte count, and total cholesterol level. Introduced in 2005, the CONUT score is used as a prognostic marker, especially in cardiovascular and critical diseases, by demonstrating the relationship between low nutritional status and high mortality.[2,3]

The hemoglobin, albumin, lymphocyte, and platelet (HALP) score was first reported in the literature in 2015, when it was found to be a significant prognostic marker in a clinical study conducted in patients with gastric cancer. The HALP score is calculated by the formula 'Hemoglobin [g/L]×albumin [g/L]×lymphocyte count [103/μL])÷platelet count [103/μL]'.[4]

HALP scoring, a biomarker that includes haematological and inflammatory parameters and reflects the systemic physiological response, has been applied to a wide variety of conditions, such as haematological and solid cancers, cardiovascular disease, surgical patients, acute pancreatitis, acute appendicitis, Fournier's gangrene, and hyperemesis gravidarum.[5-13] Its prognostic value has been determined at various levels .

The combined evaluation of CONUT and HALP scores in ICU patients has the potential to significantly enhance clinical management by providing a comprehensive

assessment of both nutritional and inflammatory status. In this study, we aimed to investigate the prognostic roles of CONUT and HALP scores on mortality in ICU patients, thereby empowering clinicians with valuable insights.

METHODS

Ethics

The study was initiated after obtaining approval from Yozgat Bozok University's Non-interventional Clinical Researches Ethics Committee (Date: 04.06.2025, Decision No: 2025-GOKAEK-2511_2025.06.04_500). In this comprehensive retrospective study, we included individuals who were followed up in Yozgat Bozok University and Sivas Cumhuriyet University Internal Medicine Intensive Care Units in 2024 as the patient group. The control group comprised individuals without any history of chronic and systemic diseases and whose examinations did not reveal any pathology. All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

Study Design

We recorded age, gender, laboratory data obtained on admission to the ICU, including hemogram, BUN, creatinine, total protein, albumin, ALT, AST, cholesterol and electrolyte levels from the hospital data system. Duration of hospitalization until mortality and APACHE scores during hospitalization were recorded from the ICU data system. CONUT (Table 1) and HALP scores were calculated and recorded to evaluate nutritional and inflammation status and to predict prognosis. HALP score was calculated with the formula "[hemoglobin (g/L)×albumin (g/L)×lymphocytes (/L)]/platelets (/L)".

Table 1. The Controlling Nutritional Status (CONUT) score

Parameters	Normal	Mild	Moderate	Severe
Serum albumin (g/ml)	≥3.50	3.00–3.49	2.50–2.99	<2.50
Score	0	2	4	6
Total lymphocyte/ml	>1600	1200-1599	800-1199	<800
Score	0	1	2	3
Cholesterol (mg/dl)	≥180	140–179	100–139	<100
Score	0	1	2	3
Total score	0-1	2-4	5-8	9-12

Inclusion Criteria

Individuals aged 18 years and older, hospitalized in the internal medicine ICU, and without a known diagnosis of malabsorption were included as the patient group. Individuals with no known history of disease and no pathology detected in physical examination and laboratory data were included as the control group.

Exclusion Criteria

The study excluded patients under 18 years of age, those hospitalised in the ICU for postoperative reasons, those with a non-intact gastrointestinal system, those with known malabsorption, and those diagnosed with chronic pancreatitis. The 183 patients obtained from the registration system were evaluated according to these criteria. A total of 120 patients were excluded according to the exclusion criteria, and 10 patients were excluded due to missing data (Figure).

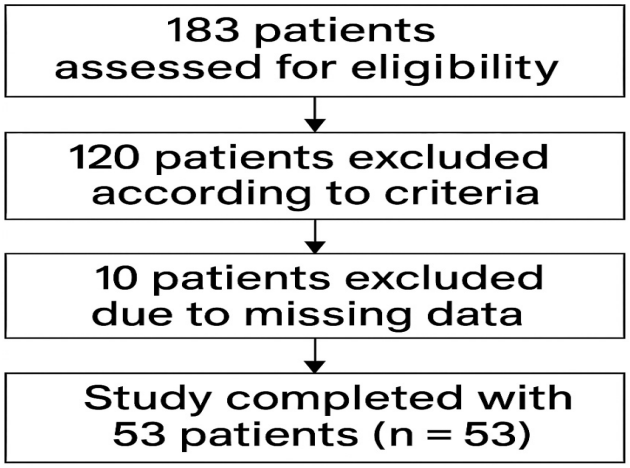

Figure. Study flow chart

Statistical Analysis

The data analyses were performed using the software SPSS 20.00 (Statistical Package for The Social Sciences, SPSS Inc, Chicago, IL). Descriptive statistics were given as mean±standard deviation for continuous variables, median, quartile distribution, and % for categorical variables for data not conforming to normal distribution. Whether the groups were normally distributed was determined by the Kolmogorov-Smirnov test. In the measurement values between the groups, independent groups were evaluated using a t-test and categorical variables were evaluated using a Chi-square test. Mann-Whitney U test was used for the groups not normally distributed. p values below 0.01 and 0.05 were considered statistically significant. The Pearson correlation method was used when the data were normally distributed and the Spearman correlation method was used when the data were not normally distributed.

RESULTS

Of the 53 ICU patients included in the study, 28 were male and 25 were female. The mean age of the patients included in the study was 71.11±13.09 years (min-max: 42-93). There was no statistical difference in age distribution between genders (p=0.684). ICU patients' mean number of hospitalisation days was 19, with a minimum of 1 and a maximum of 300 days. ICU patients' mean APACHE II score was 29.83±9.09 (min-max: 10-49). Laboratory data of the patients are given in Table 2. The relationship between mortality and nutritional status of ICU patients was evaluated, and no statistical relationship was found between APACHE score, HALP score and CONUT score (Table 3). In the comparison of ICU patients and the healthy control group, the CONUT score was in the normal range (1.15) in the healthy group and moderate nutritional deficit (6.71) in the patient group. The difference between them was statistically significant (p=0.000). The HALP score was lower in the patient group (20.90) compared to the healthy group (63.19) (p=0.618) (Table 4).

Table 2. Laboratory data of intensive care unit patients

	n	Min	Max	Mean	SD
Neutrophil (#)	53	0.01	37.60	9.3208	8.96873
Lymphocyte (#)	53	0.06	7.31	1.1462	1.25374
Monocyte (#)	53	0.01	16.85	0.9634	2.30210
Hemoglobin	53	5.90	16.00	10.8868	2.41844
Platelet	53	5.00	626.00	196.6415	150.66393
Fasting plasma glucose	53	69.00	870.00	198.8491	140.88612
Blood urea nitrogen	53	13.30	108.00	48.3094	23.69413
Creatinine	53	0.24	9.32	2.1421	1.62008
Clor	53	82.00	116.00	101.3774	6.19313
Sodium	53	115.00	151.00	136.9057	6.76320
Potassium	53	2.63	6.80	4.6321	1.02000
Albumin	53	19	38	28.20	4.086
Alanine transaminase	53	4.00	4856.00	147.1132	663.19360
Aspartate transaminase	53	6.00	8084.00	256.0566	1109.33532
C-reactive protein	53	4.95	459.00	139.6745	110.47151
Triglyceride	53	52.00	318.00	152.4717	52.01390
Cholesterol	53	48.00	269.00	148.5660	48.10426

Min: Minimum, Max: Maximum, SD: Standard deviation

Table 3. Outcomes of mortality and nutritional indicators in intensive care unit patients

	Length of stay in intensive care unit	APACHE score	CONUT score	HALP score
Length of stay in intensive care unit	1.000	-0.037	-0.145	0.153
APACHE score	-0.037	1.000	0.123	0.099
CONUT score	-0.145	0.123	1.000	-.806
HALP score	0.153	0.099	-.806	1.000

Correlation is significant at the 0.01 level (2-tailed). Abbreviations: APACHE: Acute Physiology and Chronic Health Evaluation, CONUT: Controlling Nutritional Status, HALP: Hemoglobin, albumin, lymphocyte, and platelet

Table 4. The analysis of CONUT and HALP scores of intensive care unit patients and healthy individuals

	Patient	Healthy	p
CONUT (mean)	6.71	1.15	0.000*
HALP (mean)	20.90	63.19	0.618

CONUT: Controlling Nutritional Status, HALP: Hemoglobin, albumin, lymphocyte, and platelet

DISCUSSION

Our study evaluated HALP and CONUT scores for their prognostic value in ICU patients. HALP and CONUT were not associated with mortality or prognosis. Nevertheless, our findings suggest that these scoring systems may be effective tools for the combined assessment of nutritional status and systemic inflammation in ICU patients with significantly different CONUT and HALP scores compared to healthy control subjects.

Hospitalized patients are a risky group in terms of malnutrition.[14] Malnutrition in ICU patients affects disease progression and prolongs hospital stay.[15] The prevalence of malnutrition in ICU patients is 57.6% according to a recent study of 380 patients.[16] In another study, this rate was 37.5%.[17] The variability of rates is related to many factors such as sample size, presence of comorbidities, age, and mechanical ventilation. Critically ill patients, such as ICU patients, have a severe underlying systemic inflammation. Inflammatory cytokines, an impaired immune response, protein catabolism, and inhibition of protein synthesis affect the patient's prognosis and post-discharge well-being.[18] According to a 5-year cohort study with patient data, the overall mortality rate of ICU patients was 35.9%.[19] In a larger cohort of 5834 patients, the overall mortality rate was 23.9%.[20] It is normal to expect a significant increase in mortality markers in ICU patients, a patient group with high mortality rates, compared to the healthy control group. Therefore, accurate assessment of nutritional status and systemic inflammation in this group of critically ill patients with high mortality rates is crucial for a comprehensive understanding of their prognosis and effective management of related problems.

The HALP score, a marker of systemic inflammation and nutritional status, is obtained by dividing the product of hemoglobin, albumin and lymphocyte count by the platelet count. Low hemoglobin value, which means low oxygen carrying capacity, is common in ICU patients and is associated with adverse clinical outcomes affecting many systems.[21] Hypoalbuminemia, malnutrition and predominant inflammatory process are associated in patients with serum albumin level <3 g/ml. Hypoalbuminemia is prognostic for mortality in ICU patients.[22,23] Lymphocytes, one of the main actors of immunity and inflammation, are used to determine prognosis. In a cohort of 226 ICU patients, lower lymphocyte levels were observed in patients with a mortal course.[24,25] Platelets that can interact with immune cells and secrete proinflammatory cytokines are also used for predicting mortality rates and prognosis.[26,27] Low hemoglobin, albumin, lymphocyte, and high platelet levels result in a low HALP score. A low HALP score has been associated with mortality.[28]

A retrospective study of 1533 patients with chronic obstructive pulmonary disease (COPD) revealed that a low HALP score was associated with an increased risk of ICU mortality, a new prognostic marker for COPD.[29] In another retrospective study evaluating the prognostic value of the HALP score in ICU patients, APACHE II scores of patients with HALP score <37.1 were significantly higher. A 47.04-fold increase in mortality risk was observed in these patients.[30] According to a 2025 clinical study analyzing 20.083 critically ill patients, a low HALP score (HALP score <3.56) showed a higher risk of ICU mortality. According to the results of this study, HALP score was associated with short-term mortality.[31] According to a clinical study conducted on 2.968 sepsis patients in 2025, a one-point increase in HALP score was associated with a 2% decrease in 28-day mortality when the HALP score was below 24.69. According to the study, albumin was found to be the most determinant component of the HALP score.[32] According to another retrospective study of 405 patients over 65 years of age followed in a respiratory ICU, patients with higher HALP scores had lower mortality rates. These results suggest that the HALP score may be useful in determining mortality and the choice of treatment approach in geriatric patients followed in the ICU.[33] In our study, neither HALP nor CONUT scores were associated with APACHE II scores. In a retrospective study conducted

in 2022 with 250 ICU patients, the HALP score was not found to be associated with mortality, similar to ours.[34]

CONUT scoring, a classification obtained by scoring albumin level, lymphocyte count and cholesterol level and which reveals the nutritional status of patients, was evaluated in an internal medicine study of 203 patients. Its relation with mortality was revealed. According to the score, normal=0-1; mild=2-4; moderate=5-8; severe=9-12 points.[35] In a retrospective clinical study of 307 ICU patients with sepsis, a low CONUT score was found to be an independent prognostic factor.[36] In another retrospective large-scale study conducted in South Korea with data from 9763 ICU patients, the median CONUT score was found to be 5. Higher 30-day mortality rates were found in individuals with moderate (CONUT score: 5-8) and severe (CONUT: 9-12) malnutrition compared to those without malnutrition (CONUT: 0-1).[37] In a retrospective study of 1678 patients evaluating the relationship between nutritional status and mortality in critically ill patients, high CONUT values were associated with increased risk of death, intubation, age, APACHE-II scores and number of comorbidities, and patients with high CONUT scores during hospitalization had a high risk of ICU death.[38] In our study, the mean CONUT score was 6.71.

Limitations

Its retrospective nature limits the ability to establish causality and introduces potential bias due to reliance on medical records. Second, the relatively small sample size and data from only two centers may reduce the generalizability of the findings. Third, only baseline laboratory parameters were used to calculate HALP and CONUT scores, and temporal changes were not evaluated. Additionally, the control group comprised individuals without any systemic disease, which may have introduced clinical disparity in comparisons.

CONCLUSION

These practical, easily applicable and reproducible scores, which allow simultaneous and objective assessment of nutritional deficiency and systemic inflammatory burden, may be useful for early identification of high-risk patients, early initiation of targeted supportive therapies and optimization of nutrition in the ICU where clinical decision-making time is limited. However, in our study, although we found higher CONUT scores and lower HALP scores in ICU patients compared to healthy controls, we could not show an association with mortality, APACHE II and length of ICU stay. Our findings contradict studies describing HALP and CONUT scores as independent prognostic markers in ICU populations. The retrospective, single-center and relatively small number of patients in this study may limit the generalizability of the results. Supporting these findings with larger multicenter and prospective studies in the future will further strengthen the place of these scores in clinical practice.

ETHICAL DECLARATIONS

Ethics Committee Approval

The study was initiated after obtaining approval from Yozgat Bozok University's Non-interventional Clinical Researches Ethics Committee (Date: 04.06.2025, Decision No: 2025-GOKAEK-2511_2025.06.04_500).

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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