RESEARCH ARTICLE

CYPRUS
JOURNAL OF MEDICAL SCIENCES

DOI: 10.4274/cjms.2026.2026-67
Cyprus J Med Sci 2026;11(4):303-309

Blood Urea Nitrogen to Albumin Ratio in Acute Pancreatitis: A Potential Supportive Marker for Early Triage between Ward and Intensive Care

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Abstract

BACKGROUND/AIMS: This study aimed to evaluate the prognostic significance of the blood urea nitrogen (BUN) to albumin ratio (BAR) in patients with acute pancreatitis (AP) by comparing the clinical, biochemical, and hematological profiles of patients directly admitted to the ward and the intensive care unit (ICU). Unlike previous studies that primarily evaluated BAR in critically ill populations or focused on mortality outcomes, the present study investigates its potential role in the early clinical assessment of AP by comparing ward and ICU patients.

MATERIALS AND METHODS: This study was a retrospective, single-center analysis of the medical records of patients with AP admitted to the ward or the ICU. Biochemical and hematological data, including BAR values, were obtained from initial laboratory measurements at hospital admission. Patients were stratified into two groups based on their initial admission location; comparisons between groups were performed using appropriate statistical tests to assess the relationship between BAR levels and illness severity.

RESULTS: Among the 111 patients included (59 ward and 52 ICU), BAR levels were found to be significantly higher in those requiring ICU-level care (p=0.001). Receiver operating characteristic (ROC) analysis demonstrated that BAR exhibited good discriminatory performance in distinguishing patients admitted to the ICU from those admitted to the ward (area under the curve =0.836), supporting its potential role as a marker for early risk stratification.

CONCLUSION: BAR is a simple, cost-effective biomarker that may support early risk stratification in patients with AP. Elevated BAR levels at admission may help identify patients who require closer monitoring or ICU-level care. The favorable discriminative performance observed in ROC analysis suggests that BAR may complement, rather than replace, clinical assessment in early decision-making. However, prospective multicenter studies are needed to validate these findings and establish optimal cut-off values.

Keywords: Acute pancreatitis, blood urea nitrogen to albumin ratio, intensive care, risk stratification, ward

INTRODUCTION

Acute pancreatitis (AP) is characterized by an inflammatory process initiated by the intra-pancreatic activation of digestive enzymes, leading to local tissue injury and systemic inflammatory responses.[1] This leads to autodigestion, inflammation, edema, and even necrosis of the pancreas.[2] The clinical presentation of AP varies considerably, ranging from mild, self-limiting forms to severe disease associated with systemic complications and organ failure.[3] AP is one of the leading causes of gastrointestinal-related hospital admissions worldwide, with reported

To cite this article: Erdem M, Kıran TR, Yumrutepe S, İnceoğlu F. Blood urea nitrogen to albumin ratio in acute pancreatitis: a potential supportive marker for early triage between ward and intensive care. Cyprus J Med Sci. 2026;11(4):303-309

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Received: 09.04.2026
Accepted: 24.07.2026
Publication Date: 27.08.2026

incidence rates ranging from approximately 13 to 45 cases per 100,000 individuals.[3-5] A nationwide Turkish study (n~2144) similarly reported biliary causes as the leading etiology (~67%), followed by idiopathic causes (12%), hyperlipidemic causes (6%), and alcoholic causes (4.2%). In this cohort, 73% of cases were mild, while only 2.6% progressed to severe AP.[6] Recognizing patients at higher risk for unfavorable outcomes at an early stage remains challenging, given that clinical status may worsen rapidly despite an initially mild presentation.[2,3] Despite extensive investigation of various laboratory parameters such as C-reactive protein (CRP), procalcitonin, blood urea nitrogen (BUN), and lactate, their applicability in early clinical decision-making remains constrained due to their limited specificity and susceptibility to confounding by systemic factors.[7]

BUN reflects renal perfusion, catabolic status, and systemic inflammation; elevated BUN on admission has been associated with increased mortality in AP.[8] Similarly, serum albumin is a negative acute-phase reactant and an indicator of nutritional and inflammatory status, with hypoalbuminemia linked to worse outcomes in critically ill patients, including those with AP.[9] Recent studies have proposed the BUN to albumin ratio (BAR) as a simple, cost-effective, and clinically accessible prognostic marker in sepsis, severe coronavirus disease 2019 (COVID-19), and acute exacerbations of chronic obstructive pulmonary disease. Because BAR incorporates both inflammatory and metabolic components, it may better reflect systemic stress responses than either BUN or albumin alone.[10-12] In recent years, growing evidence has supported the prognostic significance of BAR in patients with AP. These studies have reported that elevated BAR levels are associated with increased disease severity and higher short- and long-term mortality rates in AP. Therefore, BAR has been proposed as a simple and readily available biomarker that may help clinicians identify high-risk patients at an early stage.[13-15] Given that intensive care unit (ICU) admission in AP is frequently associated with persistent organ failure and markedly elevated mortality, there is a need for pragmatic biomarkers that can discriminate risk at the time of hospital presentation.[16]

This study investigated the relationship between BAR levels and disease severity in AP by comparing patients managed in the ward to those requiring ICU admission at initial presentation. Unlike previous studies that focused primarily on mortality or on critically ill patients, the present study examines the potential utility of BAR in early triage to determine whether it provides supportive information for initial clinical decision-making about the appropriate level of care.

MATERIALS AND METHODS

Study Plan and Participants

This retrospective, single-center, observational study was conducted at Malatya Turgut Özal University Training and Research Hospital, Malatya, Türkiye. All adult patients who presented to the emergency department with abdominal pain suggestive of AP during the study period were evaluated retrospectively. Patients were allocated to the ward or the ICU based on their clinical status at presentation. Patients who were hemodynamically stable, had no evidence of organ dysfunction, and did not require close monitoring or advanced supportive care were admitted to the ward. In contrast, patients with hemodynamic instability, respiratory compromise requiring support, acute kidney injury or oliguria, altered mental status, or evidence of significant organ dysfunction were admitted to the ICU. Admission decisions were made by experienced clinicians based on an integrated assessment of clinical findings and laboratory results, in accordance with routine institutional practice. A total of 111 patients admitted between October 1, 2024, and March 31, 2025 (59 to the ward and 52 to the ICU) were included in the analysis, and all relevant biochemical markers were retrieved from the electronic medical records. Comorbid conditions such as hypertension, diabetes mellitus, coronary artery disease, and chronic kidney disease were documented. Individuals with incomplete clinical or laboratory data were excluded from further evaluation.

Ethical approval for the study was granted by the Malatya Turgut Özal University Health Sciences Scientific Research Ethics Committee (approval no: 2025/208, date: 30.07.2025). The study protocol adhered to the principles outlined in the Declaration of Helsinki and relevant institutional and national guidelines. Patient confidentiality and data protection were strictly maintained throughout the study.

Definition

During the study period, adult patients presenting with clinical suspicion of AP were screened. The diagnosis was established by meeting at least two of the three criteria defined by the Revised Atlanta classification:

(1) Characteristic abdominal pain,

(2) Serum amylase/lipase ≥3× the upper limit of normal,

(3) Imaging findings consistent with AP.[17]

The study population consisted of patients aged 18 years or older who met the revised Atlanta criteria for AP and for whom comprehensive clinical and laboratory data were available at initial presentation. Patients were excluded from the analysis if any admission-time variable was missing or could not be assessed. Individuals with chronic pancreatitis, pancreatic malignancy, or a history of pancreatic surgery were not eligible. Pregnant patients and those under 18 years of age were also excluded. Cases representing recurrent episodes during the study period were omitted, with only the initial (index) admission considered. Patients whose diagnosis could not be reliably supported by imaging or biochemical findings were similarly excluded. In addition, individuals who left the hospital against medical advice, those transferred to another healthcare facility, and patients hospitalized primarily for another condition in which AP was a secondary diagnosis were not included in the study. In this cohort, biliary etiology accounted for the majority of AP cases, consistent with epidemiological patterns reported in Türkiye. One patient had hereditary spherocytosis as an underlying hematological condition, and another had a history of chronic alcohol consumption without a diagnosis of chronic pancreatitis.

Patients were allocated to the ward or the ICU based on their clinical status at presentation. Patients who were hemodynamically stable, without evidence of organ dysfunction, and who did not require close monitoring or advanced supportive care were admitted to the ward. In contrast, patients with hemodynamic instability, respiratory compromise requiring support, acute kidney injury or oliguria, altered mental status, or evidence of significant organ dysfunction were admitted to the ICU. Admission decisions were made by experienced clinicians based on an integrated assessment of clinical findings and laboratory results, in accordance with routine institutional practice.

Data Sources and Collection

Clinical characteristics, demographic data, laboratory results, and disease severity information were obtained from the hospital's electronic health record database. All analyses were based on laboratory measurements obtained from the initial blood samples collected at hospital presentation for both ward and ICU patients.

Serum biochemical parameters, including urea, amylase, lipase, glucose, creatinine, aspartate aminotransferase (AST), alanine aminotransferase (ALT), alkaline phosphatase (ALP), gamma-glutamyl transferase (GGT), total bilirubin (TBil), direct bilirubin (DBil), total protein, albumin, calcium (Ca^{2+}), sodium (Na^{+}), potassium (K^{+}), and CRP, were measured using an automated biochemistry analyzer (Abbott Architect c16000, Illinois, United States of America).

Hematological parameters, including white blood cell (WBC) count, platelet count, hemoglobin, hematocrit, neutrophil, lymphocyte, and monocyte counts, were analyzed using an automated hematology analyzer (Sysmex XN-10, Sysmex Corporation, Kobe, Japan).

Statistical Analysis

Statistical analyses were carried out using SPSS software (version 28.0; IBM Corp., Armonk, NY, USA) and R (version 4.3.1). Continuous variables were summarized as medians interquartile range, while categorical variables were presented as counts and percentages. The distributions of variables were evaluated using the Kolmogorov-Smirnov test. As the data did not follow a normal distribution, group comparisons were performed using the Mann-Whitney U test. The discriminative ability of urea, BUN, and BAR for predicting ICU admission was assessed using receiver operating characteristic (ROC) curve analysis. The area under the curve (AUC) with 95% confidence intervals (CIs), optimal cut-off values based on the Youden index, and sensitivity and specificity with their corresponding 95% CIs were calculated. Differences between AUCs were examined using the DeLong test. To adjust for the potential confounding effect of age while accounting for the non-normal distribution of the data, a rank-based analysis of covariance (rank-based ANCOVA) was performed. The dependent variables (urea, BUN, and BAR) and age were rank-transformed; admission group (ward vs. ICU) was included as the fixed factor, with age entered as the covariate. A two-sided p-value of <0.05 was considered statistically significant.

RESULTS

Gender Characteristics and Age Comparison Between Ward and ICU Groups

A total of 111 patients were included, of whom 59 (53.2%) were admitted to the ward and 52 (46.8%) were admitted to the ICU. Sex distribution did not differ significantly between the ward and ICU groups (p=0.277) (Table 1). However, patients admitted to the ICU were significantly older than those admitted to the ward [77.00 (63.75-80.00) vs. 62.00 (53.50-73.50), p=0.001]. These findings indicate that older age was more common among patients who required ICU care than among those managed on the ward, suggesting a possible association between advanced age and the need for higher-level clinical support (Table 2).

Comparison of Clinical Parameters between Ward and ICU Patients

Serum urea, creatinine, TBil, DBil, CRP, and neutrophil levels were significantly higher in ICU patients than in those admitted to the ward ($p<0.05$). In contrast, total protein, albumin, Ca^{2+}, and lymphocyte levels were significantly higher among ward patients ($p<0.05$). No significant differences were observed between the groups in terms of amylase, lipase, glucose, AST, ALT, ALP, GGT, Na^{+}, K^{+}, WBC, platelet, hemoglobin, hematocrit, and monocyte levels ($p>0.05$) (Table 3).

Evaluation of BUN and BAR Levels

Median BUN levels were significantly higher in ICU patients than in ward patients [21.59 (16.93-29.21) vs. 14.02 (11.17-18.22), p=0.001]. Similarly, BAR values were significantly elevated in the ICU group [6.35 (4.55-8.14) vs. 3.54 (2.83- 4.75), p=0.001] (Table 4).

Receiver Operating Characteristic Analysis

ROC curve analysis was performed for urea, BUN, and the BAR, as these parameters differed significantly between ward and ICU patients ($p<0.05$). BAR demonstrated the highest discriminative performance, with an AUC of 0.836, compared with 0.788 for both urea and BUN. Pairwise comparisons of ROC curves, performed using the DeLong test, demonstrated that the diagnostic performance of BAR was significantly superior to both urea (Z=2.393, p=0.023) and BUN (Z=2.393, p=0.023). These findings support the superior discriminative performance of BAR compared with individual parameters for identifying patients requiring ICU (Table 5, Figure 1).

Age-Adjusted Comparison of Urea, BUN, and BAR Between Ward and ICU Groups

After adjustment for age using rank-based ANCOVA, urea, BUN, and BAR levels remained significantly higher in ICU patients than in ward patients ($p<0.001$), indicating that these differences were not solely explained by age (Table 6).

DISCUSSION

This study demonstrated that BAR levels were significantly higher in patients requiring ICU admission than in those managed in the ward (p=0.001). ROC analysis demonstrated that BAR had superior discriminative performance compared with urea and BUN, suggesting its potential utility in early risk stratification.

Table 2. Age comparison between ward and ICU groups

Variable	Group	Median (IQR)	U	p
Age	Ward	62.00 (53.50-73.50)	966.500	**0.001**
	ICU	77.00 (63.75-80.00)		

ICU: Intensive care unit, IQR: Interquartile range, U: Mann-Whitney U test, $p<0.05$: indicates statistical significance (bold value).

Table 1. Gender characteristics of the ward and ICU groups

Variable	Group	Ward (n, %)	ICU (n, %)	Total (n, %)	χ^2	p
Gender	Male	18 (30.51%)	21 (40.38%)	39 (35.14%)	1.183	0.277
	Female	41 (69.49%)	31 (59.62%)	72 (64.86%)		

ICU: Intensive care unit, n: Frequency, %: Percentage.

Table 3. Comparison of clinical parameters between ward and ICU patients

Variable	Group	Median (IQR)	U	p
Urea (mg/dL)	Ward	30.00 (23.90-39.00)	649.000	**0.001**
	ICU	46.20 (36.22-62.50)		
Amylase (U/L)	Ward	1322.00 (698.50-2403.50)	1416.500	0.487
	ICU	1179.50 (582.25-2109.50)		
Lipase (U/L)	Ward	842.00 (588.50-1000.00)	1430.500	0.531
	ICU	761.50 (457.50-1000.00)		
Glucose (mg/dL)	Ward	137.00 (110.50-164.50)	1515.000	0.911
	ICU	134.00 (107.25-176.25)		
Creatinine (mg/dL)	Ward	0.73 (0.61-0.90)	704.500	**0.001**
	ICU	1.08 (0.76-1.41)		
AST (U/L)	Ward	106.00 (38.00-338.50)	1391.500	0.400
	ICU	95.00 (41.50-200.00)		
ALT (U/L)	Ward	104.00 (42.50-269.00)	1426.500	0.525
	ICU	103.50 (32.00-220.25)		
ALP (U/L)	Ward	136.00 (97.00-194.00)	1516.500	0.918
	ICU	126.50 (93.75-224.00)		
GGT (U/L)	Ward	93.00 (55.00-255.00)	1473.500	0.721
	ICU	102.00 (58.75-192.75)		
TBil (mg/dL)	Ward	1.10 (0.60-2.10)	1152.000	**0.024**
	ICU	1.75 (0.75-3.50)		
DBil (mg/dL)	Ward	0.56 (0.20-1.20)	1182.500	**0.037**
	ICU	0.89 (0.30-2.00)		
Protein (g/L)	Ward	7.60 (7.10-8.00)	744.000	**0.001**
	ICU	6.80 (6.07-7.40)		
Albumin (g/dL)	Ward	4.00 (3.65-4.25)	833.500	**0.001**
	ICU	3.55 (3.08-3.92)		
Ca^{2+} (mg/dL)	Ward	9.30 (8.85-9.65)	1006.000	**0.002**
	ICU	9.05 (8.28-9.33)		
Na^{+} (mmol/L)	Ward	138.00 (137.00-140.00)	1220.000	0.062
	ICU	137.00 (134.00-139.25)		
K^{+} (mmol/L)	Ward	4.00 (3.75-4.40)	1518.000	0.925
	ICU	4.00 (3.74-4.40)		
CRP (mg/dL)	Ward	0.90 (0.30-1.65)	933.500	**0.001**
	ICU	2.35 (1.08-4.05)		

Table 3. Continued

Variable	Group	Median (IQR)	U	p
Leukocyte ($10^3/\mu L$)	Ward	10.30 (8.20-14.05)	1249.000	0.092
	ICU	13.20 (9.38-15.65)		
Platelet ($10^3/\mu L$)	Ward	260.00 (215.00-320.50)	1252.000	0.096
	ICU	240.00 (190.50-296.75)		
Hemoglobin (g/dL)	Ward	14.20 (13.25-15.10)	1344.500	0.263
	ICU	13.60 (12.73-15.05)		
Hematocrit (%)	Ward	41.70 (39.55-45.55)	1250.000	0.093
	ICU	40.50 (36.50-44.25)		
Neutrophil ($10^3/\mu L$)	Ward	7.60 (5.95-10.10)	1142.000	**0.021**
	ICU	9.65 (6.80-13.22)		
Lymphocyte ($10^3/\mu L$)	Ward	1.50 (1.10-1.80)	1074.000	**0.006**
	ICU	1.10 (0.57-2.00)		
Monocyte ($10^3/\mu L$)	Ward	0.60 (0.47-0.80)	1506.000	0.868
	ICU	0.64 (0.40-1.00)		

ICU: Intensive care unit, AST: Aspartate aminotransferase, ALT: Alanine aminotransferase, ALP: Alkaline phosphatase, GGT: Gamma-glutamyl transferase, TBil: Total bilirubin, DBil: Direct bilirubin, Ca^{2+}: Calcium, Na^{+}: Sodium, K^{+}: Potassium, CRP: C-reactive protein, IQR: Interquartile range, U: Mann-Whitney U test, $p<0.05$: indicates statistical significance (bold values).

Table 4. Comparison of BUN and BAR between ward and ICU patients

Variable	Group	Median (IQR)	U	p
BUN	Ward	14.02 (11.17-18.22)	649.000	**0.001**
	ICU	21.59 (16.93-29.21)		
BAR	Ward	3.54 (2.83-4.75)	503.500	**0.001**
	ICU	6.35 (4.55-8.14)		

ICU: Intensive care unit, BUN: Blood urea nitrogen, BAR: Blood urea nitrogen to albumin ratio, IQR: Interquartile range, U: Mann-Whitney U test, $p<0.05$: indicates statistical significance (bold values).

Timely recognition of patients at risk for severe disease remains a major challenge in AP, as clinical deterioration may occur rapidly despite an initially mild presentation.[7] Given that decisions regarding the appropriate level of care are often made at the time of emergency department presentation, reliable biomarkers that can support early triage are of particular clinical importance.[7,18] BAR is a composite parameter derived from BUN and serum albumin levels, integrating information related to renal perfusion, intravascular volume status, and systemic inflammatory burden.[19] Elevated BUN levels have been associated with hypovolemia and impaired renal perfusion, and are strongly linked to worse outcomes in AP. Notably, early increases in BUN have been shown to predict mortality.[8,20] Similarly, hypoalbuminemia reflects both systemic inflammation and poor nutritional status, and has been associated with persistent organ failure and increased disease severity in AP.[9] By integrating these parameters, BAR may better systemic stress response than either marker alone. In line with this, previous studies have proposed BAR as a practical and accessible biomarker for predicting adverse outcomes in various critical conditions, including sepsis, COVID-19, and acute exacerbations of chronic obstructive pulmonary disease.[10-12]

Table 5. ROC analysis results

Variable	AUC (95% CI)	p	Cut-off	Sensitivity (95% CI)	Specificity (95% CI)
Urea	0.788 (0.704-0.873)	0.001	34.500	0.808 (0.675-0.904)	0.644 (0.509-0.764)
BUN	0.788 (0.704-0.873)	0.001	16.121	0.808 (0.675-0.904)	0.644 (0.509-0.764)
BAR	0.836 (0.762-0.910)	0.001	5.243	0.692 (0.549-0.813)	0.864 (0.750-0.940)

ROC: Receiver operating characteristic, BUN: Blood urea nitrogen, BAR: Blood urea nitrogen to albumin ratio, AUC: Area under the curve, CI: Confidence interval, $p<0.05$: indicates statistical significance.

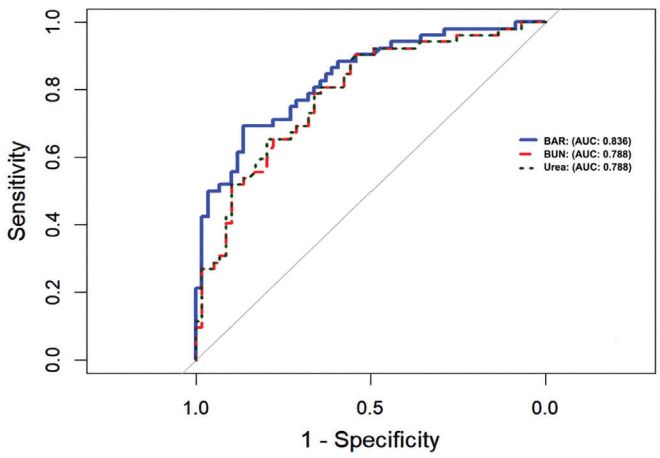

Figure 1. ROC curves for the study variables. The gray diagonal line represents the reference line corresponding to an AUC of 0.5 (no discriminatory ability).

ROC: Receiver operating characteristic, AUC: Area under the curve, BUN: Blood urea nitrogen, BAR: Blood urea nitrogen to albumin ratio.

Table 6. Age-adjusted comparison of urea, BUN, and BAR between ward and ICU groups using rank-based ANCOVA

Variables Median (IQR)		Urea Median (IQR)	BUN Median (IQR)	BAR
Ward		30.00 (23.90-39.00)	14.02 (11.17-18.22)	3.54 (2.83-4.75)
ICU		46.20 (36.22-62.50)	21.59 (16.93-29.21)	6.35 (4.55-8.14)
Groups	F	21.631	21.631	38.484
	p	0.001	0.001	0.001
Age	F	29.575	29.575	43.433
	p	0.001	0.001	0.001

ICU: Intensive care unit, BUN: Blood urea nitrogen, BAR: Blood urea nitrogen to albumin ratio, IQR: Interquartile range, p<0.05: indicates statistical significance. Because BUN is a fixed linear transformation of urea (BUN = urea/2.14), identical F statistics for these variables are mathematically expected.

The role of BAR as a prognostic indicator in AP has attracted considerable research interest in recent years. Findings from retrospective cohort analyses consistently show that increased BAR values are independently associated with higher mortality in both short- and long-term follow-up.[14,19] For example, Huang et al.[14] reported that higher BAR values were significantly associated with increased 90-day mortality in patients with AP. Similarly, a large database study using the MIMIC-IV dataset demonstrated that BAR was significantly associated with both short- and long-term mortality in patients with AP and that it had superior prognostic performance compared with several individual laboratory parameters.[4] In ICU-based cohorts, the predictive performance of BAR has also been compared with traditional severity scoring systems. Wang et al.[15] reported that BAR demonstrated a high predictive value for mortality in ICU patients with AP, with AUC values ranging between 0.71 and 0.76. Similarly, Cai et al.[13] showed that BAR had strong predictive ability for both 28-day and 90-day mortality in patients with AP, with AUC values approaching 0.80. These findings highlight the potential clinical utility of BAR as a simple laboratory-based index capable of providing prognostic information comparable to more complex scoring systems.[13] Another important aspect of the current literature is the comparison of BAR with established clinical scoring tools. For instance, Efgan et al.[21] compared BAR with the Bedside Index for Severity in Acute Pancreatitis score and demonstrated that BAR had comparable diagnostic accuracy for identifying severe cases of pancreatitis in the emergency department. Because the calculation of BAR requires only two routinely measured laboratory parameters, it may represent a practical alternative or complementary tool to multivariable scoring systems that require multiple clinical inputs.[21] However, most of these studies have focused on mortality prediction or on critically ill patient populations.

The findings of this study provide additional insight into the existing literature by focusing specifically on the early triage phase of AP management. While many previous studies have primarily evaluated BAR as a predictor of mortality or adverse outcomes in ICU populations, our study directly compared patients admitted to the ward with those admitted to the ICU at the time of initial hospital presentation. This approach allows the evaluation of BAR for early clinical decision-making about the appropriate level of care, a critical step in managing patients presenting with AP. Consistent with previous reports, our results showed that BAR values were significantly higher in patients requiring ICU admission than in those managed in the ward. Additionally, ROC analysis demonstrated that BAR showed good discriminative ability for identifying patients requiring ICU admission, with an AUC value of 0.836. This diagnostic performance appears to be comparable to that reported in previous studies evaluating BAR in AP, in which AUC values have generally ranged from approximately 0.67 to 0.80.[13-15] This finding suggests that BAR may serve as a supportive marker for early risk stratification in patients presenting with AP. Compared with individual laboratory parameters such as urea and BUN, BAR demonstrated slightly better diagnostic performance, which supports the concept that composite biomarkers may better reflect the complex pathophysiological processes involved in AP. The higher AUC value of BAR compared with those of BUN or urea alone may be explained by the fact that this composite parameter reflects not only changes in renal function but also systemic inflammation and nutritional status. During acute inflammatory processes, serum albumin levels decrease as a negative acute-phase reactant, whereas elevated BUN levels may reflect hypovolemia and impaired renal perfusion. Therefore, BAR may more comprehensively represent the underlying pathophysiological processes in AP by integrating these two mechanisms and thus potentially better reflect disease severity than either parameter alone. These findings support the hypothesis that BAR may reflect the overall physiological stress associated with more severe forms of AP. In our study, patients admitted to the ICU were older than those managed in the ward, which is consistent with the established association between advanced age and more severe disease in AP. Although ICU patients were older, rank-based ANCOVA demonstrated that urea, BUN, and BAR levels remained significantly higher after adjustment for age (p<0.001). Furthermore, the persistence of significant group differences after age adjustment using rank-based ANCOVA suggests that the observed association between BAR and ICU admission is unlikely to be explained solely by differences in patient age and may instead reflect underlying disease severity. Therefore, evaluating BAR at the time of initial presentation could provide clinically meaningful insight into which patients may require enhanced monitoring or higher levels of supportive care. Although BAR demonstrated a slightly higher AUC compared with BUN and urea, pairwise comparisons using the DeLong test confirmed its superior discriminative performance.

From a clinical perspective, BAR represents a simple and readily available biomarker that may assist in early risk stratification in patients with AP. As BUN and albumin are routinely measured in emergency settings, BAR can be easily calculated without additional cost or time, and may help identify patients requiring closer monitoring or intensive care.

Overall, these findings support the potential clinical utility of BAR in early triage. However, larger prospective multi-center studies are needed to validate these results, establish optimal cut-off values, and confirm the generalizability of the ROC-derived thresholds identified in this study.

Study Limitations

Several factors should be considered when interpreting the present findings. The retrospective design and single-center setting may limit generalizability and increase susceptibility to bias, while the relatively small sample size, particularly among ICU patients, may have reduced statistical power. Furthermore, BAR was assessed only at admission, and the absence of serial measurements limits the evaluation of its dynamic relationship with disease progression. In addition, ICU admission was used as a surrogate marker of disease severity and may have been influenced by clinical judgment and institutional practices. Finally, residual confounding cannot be excluded because factors such as comorbidities and underlying renal function may have affected BUN and BAR levels.

CONCLUSION

BAR may serve as a simple, accessible biomarker to support early risk stratification in patients with AP. Elevated BAR levels at presentation may provide complementary information to support the identification of patients who may require closer monitoring or ICU-level care, particularly when the initial disposition decision is uncertain. However, BAR should be considered an adjunct to, rather than a replacement for, comprehensive clinical assessment. Prospective multicenter studies are needed to validate its potential role in early triage.

MAIN POINTS

- Blood urea nitrogen to albumin ratio (BAR) is significantly higher in acute pancreatitis patients requiring intensive care unit (ICU) admission at initial presentation than in those managed on the ward.
- BAR demonstrates good discriminative performance in identifying ICU admission at presentation, performing slightly better than blood urea nitrogen and urea.
- The association between BAR and ICU admission at initial presentation remained significant after adjusting for age using a rank-based ANCOVA.
- BAR can be easily calculated from routine laboratory parameters obtained at admission, making it a practical tool in the emergency setting.
- BAR may provide supportive information for early risk stratification and help identify patients who may require ICU-level care at initial clinical evaluation.

ETHICS

Ethics Committee Approval: The requisite approval was obtained from the Malatya Turgut Özal University Health Sciences Scientific Research Ethics Committee (approval no: 2025/208, date: 30.07.2025). All procedures were carried out in accordance with the ethical standards of the institutional and/or national research committee and the 1964 Declaration of Helsinki. In addition, the privacy and data of all patients were respected and protected.

Informed Consent: Because of the retrospective design of the study and the use of anonymized data obtained from existing medical records, the requirement for obtaining written informed consent was waived by the ethics committee. Patient confidentiality and data protection were strictly maintained throughout the study.

Footnotes

Authorship Contributions

Concept: M.E., T.R.K., Design: M.E., T.R.K., S.Y., Data Collection and/or Processing: M.E., S.Y., Analysis and/or Interpretation: M.E., F.İ., Literature Search: M.E., T.R.K., Writing: M.E., T.R.K., S.Y., F.İ.

DISCLOSURES

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

Declaration on the Use of Artificial Intelligence (AI): No artificial intelligence tools were used in the preparation of this manuscript.

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