

PROGNOSTIC VALUE OF BLOOD UREA NITROGEN-TO-ALBUMIN RATIO IN PATIENTS WITH UPPER GASTROINTESTINAL BLEEDING

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DOI: <https://doi.org/10.5281/zenodo.15862780>

Keywords

Gastrointestinal Hemorrhage,
Blood Urea Nitrogen, Serum
Albumin, Prognosis

Article History

Received: 06 April, 2025

Accepted: 26 June, 2025

Published: 10 July, 2025

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Abstract

Objective: Finding the prognostic role of the BAR score in predicting in-hospital death and clinical outcomes in patients suffering with upper gastrointestinal hemorrhage (UGIB).

Methodology: This is a descriptive cross-sectional study that was carried out at DUHS, civil hospital, Karachi and was conducted for period of 6 months. We included 193 adult patients aged 18–70 years diagnosed with UGIB using consecutive sampling. Demographics, comorbidities, symptom duration, and laboratory investigations (including serum bun and albumin) were recorded. Bar score was calculated and patients were followed until discharge or death. Data were analyzed with SPSS version 25. Statistical analyses were performed with Pearson correlation, chi-square tests to assess associations and prognostic utility.

Results: The mean age was 55.7 ± 11.9 years and 52.8% of the patients were males. Hypertension and diabetes mellitus were observed in 39.4% and 50.8% respectively. Mean bar score was 14.9 ± 7.5 , while in-hospital mortality was detected in 56% of patients. Patients with bar >10.5 have higher mortality ($p = 0.000$). Bar significantly correlated with mortality ($r = -0.73$, $p < 0.001$) and moderately with age ($r = 0.58$), serum bun ($r = 0.67$) and hospital stay ($r = 0.37$) but inversely with serum albumin ($r = -0.56$).

Conclusion: In this research the bar score was shown to be a simple yet powerful prognostic marker in UGIB patients. Higher values of bar were significantly associated with mortality status, older age, longer duration of symptoms, and longer duration of hospital stay.

INTRODUCTION

A significant portion of our health issues can be traced back to the gut, making gastrointestinal (GI) bleeding a major clinical concern, as it can originate

from any part of the digestive tract. Among the causes, ulcers remain the most frequent reason for hospital admissions due to upper GI bleeding.

Consequently, most therapeutic trials for upper GI bleeding have focused on ulcer-related cases. In Western countries, the incidence of upper GI bleeding is approximately 0.103 cases per 100,000 adults per year, according to acute population-based audits (1).

Variceal bleeding accounts for only about 4% of these cases. Among hospitalized patients, the overall mortality rate from GI bleeding is around 14%, with 11% occurring in emergency admissions and 3% among inpatients. Notably, mortality rises significantly with age—27% in patients over 80 years old—compared to earlier study that reported a 10–14% mortality rate (2, 3).

Several scoring systems have been created to predict clinical outcomes of patients with GI bleeding, including mortality, hospital length of stay, or requirement for endoscopy or other interventions. The two most widely adopted scoring systems include the Glasgow-Blatchford score (GBS) (4) and the Rockall score (RS) (5). However, these scores are impractical and challenging to use also it requires endoscopic findings to develop the RS. Recently, an easy and precise AIMS65 score system has been presented (6-8). Sweep Gap History based Match Many Patients since 65 yr. old PS1-may be not prover of their base disease and sickness (melena, syncope presentation etc.) due to intoxication-no medical caretakers-neurodegenerative disease or confused mentality due to aggravated bleeding.

Patients with high-grade gastrointestinal hemorrhage commonly exhibited hypovolemia and dehydration. In its dehydrated form, the kidney increases urea reabsorption while keeping blood urea nitrogen (BUN) high (9). However, the prognosis of patients with pneumonia could be determined by the serum albumin and the BUN: albumin ratio (B/A ratio) (9-11).

For BUN – Albumin ratio the AUROC of the S120 to predict ICU admission was 0.682. In patients with upper GI bleeding, the AUROC for prediction of in-hospital mortality was 0.770. (12). The other study showed that the AUC of BUN-Albumin ratio was 0.784 (95% CI, 0.677–0.892) based on the in-hospital mortality of patients with upper GI bleeding. The cutoff point of this outcome was 16.26. The sensitivity at this cut-off value was

71.43%, specificity 82.84%, PPV 30.00% and NPV 96.57% (13).

We sought to answer this question in patients with upper gastrointestinal bleeding by assessing the prognostic role of BUN-to-albumin ratio. We can found A BUN-Albumin ratio in various disease thus indicate it is a good prognostic marker. Moreover; the prognostic value of BUN-Albumin ratio has only been investigated few times in upper GI bleeding patients. Upper GI bleeding is associated with significant morbidity and mortality, thus it becomes indispensable in identifying parameters that can help early prognosticate the patient as per existing literature. It helps the physician to some extent in having some plans to follow to achieve better outcomes for the patient and also helps in counselling of patient.

METHODOLOGY

After getting ethical approval, this descriptive cross-sectional study was carried out for six months at the Department of Medicine, Dow University of Health Sciences (DUHS), Dr. Ruth K. M. Pfau Civil Hospital, Karachi. Consecutive non-probability sampling was used to include 193 patients. Inclusion criteria were adult patients of both genders aged 18 to 70 years admitted with upper gastrointestinal bleeding. Exclusion criteria included hematological disorder, malignancy, chronic kidney disease, chronic liver disease, and use of immunosuppressant and other drugs affecting platelet count. Demographic and clinical data such as age, sex, diabetes, hypertension and duration of symptoms were recorded after obtaining an informed consent from patients or their attendants. 5 cc aseptically drawn blood assessed for serum albumin and blood urea nitrogen (BUN) levels. Hospital outcomes including in-hospital mortality were documented on all patients during their hospital stay. Descriptive statistics was used for data analysis. Quantitative variables were reported as mean $\pm$ SD and categorical variables as frequency and percentage. Stratification was used to control for confounders like age, gender, diabetes, hypertension, symptom duration, and hospital stay, and the post-stratification correlation test was then conducted. Statistical significance was determined by using Chi-square test with $p \leq 0.05$.

RESULTS

A total of 193 patients presenting with upper gastrointestinal bleeding (UGIB) were included. The mean age of participants was 55.7 ± 11.9 years, with a majority being male (52.8%). Comorbidities included diabetes mellitus in 50.8% and hypertension in 39.4% of the patients. The mean

duration of symptoms prior to presentation was 6.7 ± 3.2 days.

The average serum albumin was 2.1 ± 0.53 g/dL, and the mean serum BUN level was 27.5 ± 9.3 mg/dL. The mean BUN-to-Albumin Ratio (BAR) was 14.9 ± 7.5 . The average duration of hospital stay was 6.6 ± 2.9 days, and in-hospital mortality occurred in 56% of patients as shown below in table 1.

Table 1: Demographic and Clinical Characteristics of the Study Population

Variable	Mean $\pm$ SD / Frequency (%)
Age (years)	55.7 ± 11.9
Gender	Male: 102 (52.8%) Female: 91 (47.2%)
Diabetes Mellitus	Yes: 98 (50.8%) No: 95 (49.2%)
Hypertension	Yes: 76 (39.4%) No: 117 (60.6%)
Duration of Symptoms (days)	6.7 ± 3.2
Serum Albumin (g/dL)	2.1 ± 0.53
Serum BUN (mg/dL)	27.5 ± 9.3
BUN-to-Albumin Ratio (BAR score)	14.9 ± 7.5
Duration of Hospital Stay (days)	6.6 ± 2.9
In-Hospital Mortality	Yes: 108 (56%) No: 85 (44%)

Patients with a higher BAR (>10.5) had significantly greater in-hospital mortality compared to those with lower BAR ($p = 0.000$), indicating that BAR may serve as a potential prognostic marker in UGIB.

Table 2: Association Between BAR Score and In-Hospital Mortality

BAR score Groups	Mortality: yes (n, %)	Mortality: No (n, %)	Total (n)	Row % Mortality
Low (≤ 10.5)	5, (7.7%)	60, (92.3%)	65	7.7%
High (>10.5)	108, (84.4%)	20, (15.6%)	128	84.4%
Total	113	80	193	---

TABLE 3: Chi-Square Test Results

Statistic test	Value	Degrees of Freedom (df)	p-value
Pearson Chi-Square	104.4	1	.000
Continuity Correction	101.3	1	.000
Likelihood Ratio	115.6	1	.000
Fisher's Exact Test ²	—	—	.000

Table 4 presents the Pearson correlation coefficients evaluating the strength and direction of the linear relationship between the BUN-to-Albumin Ratio (BAR) score and selected clinical variables among

patients presenting with upper gastrointestinal bleeding ($n = 193$).

The analysis revealed that BAR score had a moderate positive correlation with age ($r = 0.58$, $p < 0.001$), suggesting that older patients tend to have higher

BAR scores. This may reflect the impact of age-related renal and nutritional decline on BUN and albumin levels.

A weak but statistically significant positive correlation was observed between BAR and duration of symptoms ($r = 0.26$, $p < 0.001$), indicating that a longer delay in presentation could be associated with worsening biochemical profiles.

As expected, BAR was moderately negatively correlated with serum albumin ($r = -0.56$, $p < 0.001$), and moderately positively correlated with serum BUN ($r = 0.67$, $p < 0.001$), both of which are components of the BAR calculation. These findings confirm the reliability and internal consistency of the BAR score.

BAR also showed a moderate positive correlation with the duration of hospital stay ($r = 0.37$, $p < 0.001$), implying that patients with higher BAR scores tend to require prolonged hospitalization, likely due to more severe illness or complications.

Importantly, there was a strong negative correlation between BAR score and in-hospital mortality ($r = -0.73$, $p < 0.001$), indicating that higher BAR scores are significantly associated with increased mortality risk.

Overall, these findings suggest that the BAR score not only reflects the physiological status of patients with UGIB but may also serve as a useful prognostic marker, particularly in predicting mortality and hospital course.

Table 4: Pearson Correlation between BAR score and Clinical Variables.

Variable	r-value	p-value	Interpretation
Age (years)	0.58	0.000	Moderate positive correlation (significant)
Duration of symptoms (days)	0.26	0.000	Very weak correlation (significant)
Serum Albumin (g/dL)	-0.56	0.000	Moderate negative correlation (significant)
Serum BUN (mg/dL)	0.67	0.000	Moderate positive correlation (significant)
Duration of hospital stay	0.37	0.000	Moderate positive correlation (significant)
In hospital mortality	-0.73	0.000	Strong positive correlation (significant)

Figure 1: BAR groups and in hospital mortality.

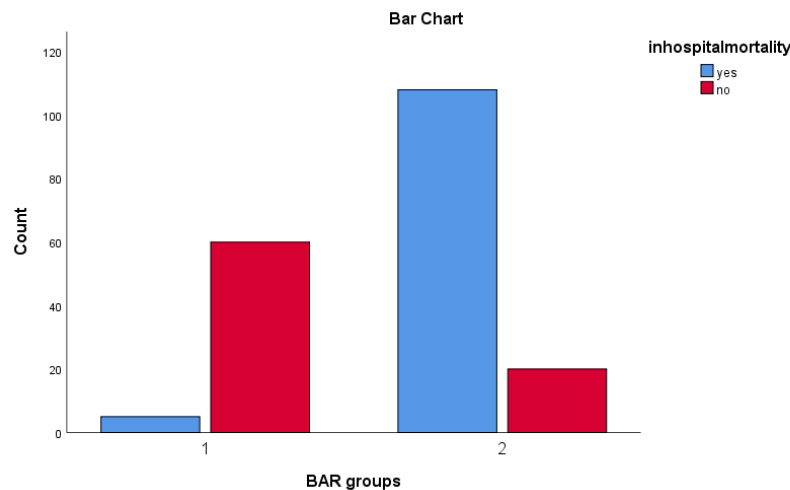
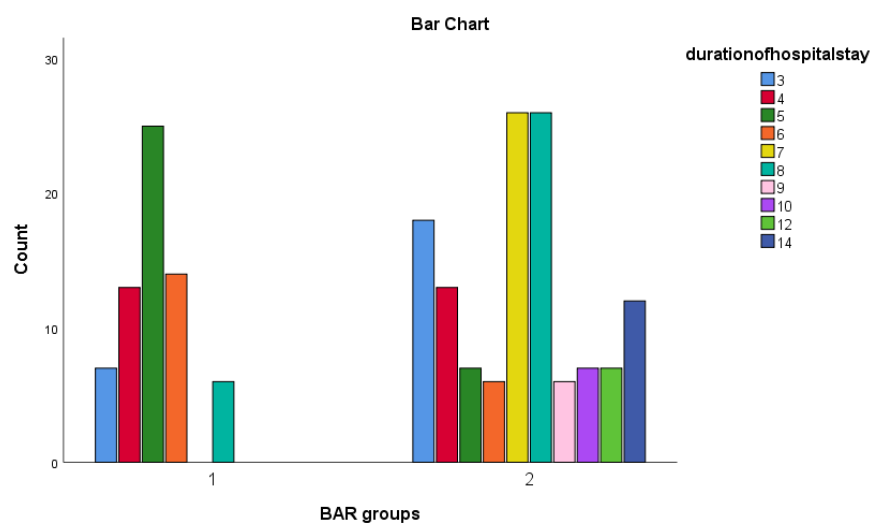


Figure 2: BAR groups and duration of hospital stay.



DISCUSSION

Upper gastrointestinal bleeding (UGIB) remains a critical medical emergency with significant morbidity and mortality, particularly among hospitalized patients with underlying comorbidities. In this study of 193 patients presenting with UGIB, we evaluated the prognostic value of the blood urea nitrogen-to-albumin ratio (BAR) and its association with clinical outcomes, especially in-hospital mortality. The findings demonstrated that BAR is not only significantly associated with mortality but also correlates with age, duration of symptoms, serum biochemistry, and hospital stay duration.

The mean BAR in our cohort was 14.9 ± 7.5 , and in-hospital mortality was 56%, which is consistent with reports showing high mortality rates among critically ill UGIB patients, particularly in resource-limited settings [15, 16]. Patients with a BAR score above the identified cut-off of 10.5 had significantly higher mortality ($p = 0.000$), highlighting its potential utility as a simple and cost-effective prognostic indicator.

Our study showed a strong negative correlation between BAR and in-hospital survival ($r = -0.73$), which aligns with previous research where BAR was found to predict poor outcomes in various acute illnesses, including pneumonia, sepsis, and gastrointestinal bleeding [17-19]. The rationale lies in the fact that elevated BUN may reflect renal hypo perfusion and increased protein catabolism due to stress or gastrointestinal blood digestion, while low serum albumin signifies poor nutritional status and systemic inflammation, both of which are known predictors of mortality [20].

We also observed moderate positive correlations of BAR with age ($r = 0.58$), serum BUN ($r = 0.67$), and hospital stay duration ($r = 0.37$), indicating that older patients and those with higher BAR tend to stay longer and fare worse. The negative correlation with albumin ($r = -0.56$) reaffirms its relevance in systemic disease severity and poor recovery potential. Similar associations have been observed in other studies evaluating BAR in ICU patients [21].

Interestingly, even a weak yet significant correlation was found between BAR and the duration of symptoms prior to hospital presentation ($r = 0.26$), suggesting a possible link between delayed access to care and worse prognostic scores. Early identification and stratification of high-risk UGIB patients using BAR could therefore facilitate timely interventions, resource allocation, and potentially improved outcomes [22].

Although the BAR score comprises only two laboratory values, its prognostic significance appears substantial, and it can be easily adopted in both primary and tertiary care settings due to its simplicity and cost-effectiveness. However, further studies with larger, multicentric cohorts are warranted to validate these findings and establish universal cut-off values.

CONCLUSION

Among 193 patients admitted with upper gastrointestinal bleeding (UGIB), the in-hospital mortality rate was high at 56%. A BUN-to-Albumin Ratio (BAR) greater than 10.5 was significantly associated with increased mortality ($p = 0.000$). A strong negative correlation was observed between

BAR and in-hospital survival ($r = -0.73$, $p < 0.001$), highlighting its prognostic value. BAR also showed moderate positive correlations with age ($r = 0.58$), serum BUN ($r = 0.67$), and hospital stay duration ($r = 0.37$), and a moderate negative correlation with serum albumin ($r = -0.56$). Additionally, a weak but significant correlation with symptom duration ($r = 0.26$) suggests that delayed presentation may contribute to worse outcomes.

These findings indicate that BAR is a simple, accessible, and cost-effective marker that reflects both physiological deterioration and clinical outcomes in UGIB patients. It may aid clinicians in early risk stratification, guiding timely interventions and patient counseling. Further prospective studies across diverse populations are warranted to validate and broaden the clinical applicability of the BAR score.

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