Submitted: 31 January, 2025 Accepted: 01 August, 2025 Published: 08 December, 2025 DOI:10.22514/sv.2025.180

Open Access
Signa Vitae

ORIGINAL RESEARCH

A modified risk model for upper gastrointestinal bleeding: comparative evaluation of the H3B2A1 score

Meliha Fındık[1,*], Muhammet Çakas[1], Ahmet Buğra Önler[1], Murat Başcı[1], Selman Gümüş[1], Ramazan Kıyak[1]

[1]Department of Emergency Medicine, Faculty of Medicine, Balikesir University, 10145 Balikesir, Türkiye

***Correspondence**
Meliha.findik@balikesir.edu.tr
(Meliha Fındık)

Abstract

Background: Acute upper gastrointestinal bleeding (UGIB) remains a critical emergency with significant morbidity and mortality despite advances in diagnostic and therapeutic approaches. Risk stratification is essential for the early identification of high-risk patients, guiding clinical decisions, and optimizing resource allocation. The H3B2A1 score is a modified version of the H3B2 score that incorporates albumin as an additional parameter. This study aimed to evaluate the predictive performance of the H3B2A1 score in comparison to established risk models, including AIMS65, Glasgow-Blatchford Score (GBS), and modified GBS (mGBS), in assessing mortality and intensive care unit (ICU) admission in UGIB patients. **Methods**: In this retrospective study, 233 patients with UGIB confirmed by endoscopic evaluation at a tertiary care center were included. The predictive accuracy of the H3B2A1 score for mortality and ICU admission was assessed and compared with AIMS65, GBS, mGBS, and H3B2 scores. Receiver operating characteristic (ROC) curve analysis was performed to determine the area under the curve (AUC), cutoff values, sensitivity and specificity for each scoring system. **Results**: The H3B2A1 score demonstrated comparable accuracy in predicting mortality (AUC: 0.750, sensitivity 88%) to the AIMS65 score (AUC: 0.754, sensitivity 88%), with both scores exhibiting moderate predictive power (AUC = 0.70–0.90). In predicting ICU admission, the AIMS65 score had the highest predictive accuracy (AUC: 0.844, sensitivity 96.1%), followed by H3B2A1 (AUC: 0.645; sensitivity 64.7%) and H3B2 (AUC: 0.624; sensitivity 82.4%). Incorporating albumin in the H3B2A1 score improved its prognostic performance compared to the original H3B2 model. **Conclusions**: The H3B2A1 score is a practical and effective tool for risk stratification in UGIB patients, demonstrating moderate predictive ability for mortality and ICU admission. Its simplicity and clinical applicability make it valuable to existing risk assessment models. Further prospective studies are warranted to validate its utility in diverse patient populations.

Keywords

Upper gastrointestinal bleeding; Mortality; ICU admission; Prognostic scoring

1. Introduction

Upper gastrointestinal bleeding (UGIB), one of the gastrointestinal emergencies, is the most important cause of mortality and morbidity worldwide. Despite advancements in diagnostic and treatment, the mortality rate remains between 5% and 15% because of the growing elderly population and comorbid conditions [1, 2]. UGIB accounts for more than 50% of all gastrointestinal bleeding cases and hospitalizations [3, 4]. Accurate early risk stratification of patients with UGIB is essential for guiding clinical decision-making, including the need for intensive care unit (ICU) admission, urgent endoscopic intervention, or safe discharge. Over the years, various prognostic scoring systems have been developed to assess the severity of UGIB and predict outcomes, including mortality, the need for transfusion, rebleeding, and the length of hospital stay [4]. These scoring systems are typically classified into two categories: pre-endoscopy and post-endoscopy models. Commonly used pre-endoscopy scores include the Glasgow-Blatchford Score (GBS), AIMS65, the Assessment of Blood Consumption (ABC) score, and the pre-endoscopy Rockall score (pRS) [5]. However, despite their widespread use, many scoring systems remain underutilized in emergency settings due to complexity and poor memorability, defined as the clinician's ability to recall and apply the tool rapidly under time constraints. Tools requiring numerous inputs or subjective assessments may delay critical decision-making in acute care. Specifically, the GBS and modified GBS (mGBS) require

multiple clinical and laboratory inputs, which may hinder their rapid application at the bedside [6].

Sasaki *et al.* [3] (2022) introduced the H3B2 score, a novel risk stratification model based on simple and objective clinical parameters. It is recommended for high-risk patients with UGIB who require emergency hemostatic interventions, including emergency endoscopy [3]. In line with prior efforts to simplify risk stratification, the H3B2A1 score incorporates serum albumin (ALB) into the original H3B2 model, aiming to enhance prognostic utility in UGIB.

This study aimed to evaluate the predictive performance of the H3B2A1 score in estimating in-hospital mortality among patients with UGIB. Additionally, we compared the prognostic accuracy of the H3B2A1 score with established risk stratification tools, including AIMS65, GBS, and mGBS, in predicting secondary clinical outcomes, such as ICU admission and the need for early endoscopic intervention. The ultimate goal was to validate the H3B2A1 score as a clinically practical and easy-to-use tool for early risk assessment in emergency settings.

2. Materials and methods

This retrospective single-center study was conducted at a tertiary care hospital, between 01 June 2022 and 31 July 2023. Patients aged 18 years and older who presented to the emergency department with gastrointestinal bleeding symptoms (hematemesis, hematochezia, melena, syncope, lethargy, confusion) and were diagnosed with upper gastrointestinal bleeding (UGIB) following endoscopic evaluation were included in the study.

Demographic data, presenting symptoms, comorbidities (*e.g.*, liver disease, heart disease, diabetes mellitus, chronic kidney disease, cerebrovascular disease, Alzheimer's disease, hypertension, malignancy, and hyperlipidemia), medication history (*e.g.*, proton pump inhibitors, warfarin, aspirin, clopidogrel, rivaroxaban, ticagrelor, nonsteroidal anti-inflammatory drugs (NSAIDs), vital signs, level of consciousness, laboratory results, endoscopic findings, need for blood transfusion, hospitalization status, and in-hospital mortality were collected from electronic medical records and emergency department forms. When multiple measurements were recorded before endoscopy, the most extreme values were used for analysis.

Exclusion criteria included variceal bleeding, lack of endoscopic evaluation, trauma-related bleeding, age under 18 years, and inaccessible or incomplete medical records. Patients were categorized into two groups: survivors and non-survivors.

2.1 Scoring systems

The following risk stratification scores were calculated for each patient using clinical and laboratory data at admission and before endoscopy:

- AIMS65: Composed of five parameters—albumin <3.0 g/dL, International Normalized Ratio (INR) >1.5, altered mental status, systolic blood pressure (SBP) ≤ 90 mmHg, and age ≥ 65 years. Each variable scores 1 point, with total scores ranging from 0 to 5.
- Glasgow-Blatchford Score (GBS): Calculated using blood urea nitrogen (BUN), hemoglobin level, SBP, heart rate, presentation with melena or syncope, and history of heart failure or liver disease. The score ranges from 0 to 23, with a score ≥ 7 typically associated with the need for endoscopic intervention.
- Modified Glasgow-Blatchford Score (mGBS): A simplified version of the GBS that excludes subjective parameters (melena, syncope), focusing on BUN, hemoglobin, SBP, and heart rate. The score ranges from 0 to 16, with a score of 6 or higher indicating a likelihood of more than 50% of requiring medical intervention.
- H3B2: Includes hematemesis, SBP <100 mmHg, heart rate >100 bpm, hemoglobin <12 g/dL, and BUN >20 mg/dL. Each parameter contributes 1 point, for a total score of 0 to 5. This score is designed to predict the need for endoscopic hemostatic intervention.
- H3B2A1: A modified version of the H3B2 score that incorporates serum albumin <30 g/L as an additional parameter. Total possible score: 0–6.

2.2 Statistical analysis

Statistical analyses were conducted using SPSS Statistics version 25.0 (IBM Corp., Armonk, NY, USA). Continuous variables were reported as mean $\pm$ standard deviation (SD) or median with interquartile range (IQR), depending on data distribution. Normality was tested using the Shapiro-Wilk test. Categorical variables were expressed as numbers and percentages. Comparisons between survivors and non-survivors were performed using an independent samples *t*-test or the Mann-Whitney U test for continuous variables and a chi-square or Fisher's exact test for categorical variables. To evaluate the discriminatory power of each scoring system in predicting in-hospital mortality and ICU admission, receiver operating characteristic (ROC) curve analysis was performed. The area under the curve (AUC), 95% confidence intervals (CI), optimal cutoff values, sensitivity, specificity, and Youden's J index were calculated. A p-value < 0.05 was considered statistically significant.

3. Results

A total of 649 patients admitted to the emergency department with suspected gastrointestinal bleeding (GIB) were retrospectively analyzed. Among them, 233 patients who underwent endoscopic evaluation and were diagnosed with UGIB were included in the final analysis. Patients were divided into two groups based on in-hospital outcomes: survivors and non-survivors. The overall in-hospital mortality rate was 10.7% (n = 25). The mean age of the patients was 70.28 $\pm$ 14.96 years, with 67.38% of the cohort aged 66 years or older. Demographic and clinical characteristics of the study population are summarized in Table 1.

The mean hemoglobin (Hb) level was 8.89 $\pm$ 2.32 g/dL in the total cohort, with no statistically significant difference between survivors (8.99 $\pm$ 2.34) and non-survivors (8.10 $\pm$ 1.98) ($p = 0.068$, independent samples *t*-test). Platelet counts were similar between survivors (266.09 $\pm$ 118.94 $\times$ $10^3/\mu$L) and non-survivors (273.04 $\pm$ 225.58 $\times$ $10^3/\mu$L), with no statistically significant difference ($p = 0.881$). However, serum al-

TABLE 1. Comparison of the demographic and clinical characteristics of patients between the groups.

Variables	Survivor n (%)	Non-survivor n (%)	Total
Age (yr)			
18–45	15 (6.44%)	0 (0.00%)	15 (6.44%)
46–65	58 (24.89%)	3 (1.29%)	61 (26.18%)
≥66	135 (57.94%)	22 (9.44%)	157 (67.38%)
Female	88 (37.77%)	7 (3.00%)	95 (40.80%)
Male	120 (51.50%)	18 (7.73%)	138 (59.20%)
Hypertension (HT)	108 (46.35%)	18 (7.72%)	126 (54.07%)
Diabetes Mellitus (DM)	53 (22.75%)	4 (1.71%)	57 (24.46%)
Cerebrovascular Disease (CVD)	23 (9.87%)	7 (3.00%)	30 (12.87%)
Coronary Artery Disease (CAD)	73 (31.33%)	14 (6.01%)	87 (37.34%)
Alzheimer Disease	10 (4.29%)	6 (2.80%)	16 (6.87%)
Malignancy	19 (8.16%)	8 (3.43%)	27 (11.59%)
Acetylsalicylic acid	64 (27.48%)	10 (4.29%)	74 (31.76%)
Clopidogrel	37 (15.88%)	10 (4.29%)	47 (20.17%)
Proton pump inhibitors	37 (15.88%)	3 (1.29%)	40 (17.18%)
NSAIDs	35 (15.02%)	3 (1.29%)	38 (16.31%)
Rivaroxaban	20 (8.58%)	2 (0.86%)	22 (9.44%)
Warfarin	13 (5.58%)	0 (0.00%)	13 (5.58%)
Ticagrelor	5 (2.15%)	0 (0.00%)	5 (2.15%)

NSAIDs: Nonsteroidal anti-inflammatory drugs.

bumin levels were significantly lower in non-survivors (26.84 ± 4.45 g/L) than in survivors (31.84 ± 5.43 g/L) ($p < 0.001$, *t*-test). A comparison of laboratory parameters is presented in Table 2.

To assess the prognostic performance of each scoring system, ROC curve analyses were conducted. The AUC, 95% CI, cutoff points, sensitivity, specificity, Youden's J index, and *p*-values were calculated for in-hospital mortality and ICU admission. These results are summarized in Table 3.

All five scoring systems demonstrated statistically significant performance in predicting in-hospital mortality ($p < 0.001$ for all). The H3B2A1 score yielded an AUC of 0.750 (95% CI: 0.653–0.846), comparable to the AIMS65 score (AUC: 0.754; 95% CI: 0.655–0.852), and showed 88.0% sensitivity. H3B2 and mGBS also performed moderately well (AUC = 0.725 and 0.731, respectively). The GBS showed the lowest AUC (0.706), although it was still statistically significant.

Regarding the prediction of ICU admission, AIMS65 had the highest predictive accuracy (AUC = 0.844; 95% CI: 0.790–0.899), with a sensitivity of 96.1% and specificity of 56.0%. The H3B2A1 model demonstrated moderate accuracy (AUC = 0.645; 95% CI: 0.563–0.727), while H3B2, GBS, and mGBS had lower AUC values (0.624, 0.606, and 0.613, respectively). The complete results are presented in Table 3, with ROC curves illustrated in Figs. 1,2.

4. Discussion

Gastrointestinal bleeding (GIB) is one of the gastroenterology emergencies requiring medical intervention and one of the most common causes of hospitalization [6]. Although the incidence varies according to age, elderly patients are more frequently affected, and the frequency of hospitalization increases with age. The most common cause of UGIB in the elderly population is gastric and duodenal ulcers or esophagitis, which is observed in 80% of cases [7]. In a 2007 study in the UK, 63% of patients diagnosed with UGIB were over 60 years of age [8]. Consistent with these findings, our study showed that the mean age of patients was 70.28 ± 14.96 years, with 67.38% of patients being over 65 years old. The in-hospital mortality rate was 10.7%, and mortality increased with age.

Given the substantial morbidity and mortality associated with acute UGIB, early assessment and risk prediction are critically important for optimizing patient outcomes. The severity of acute GIB ranges from mild to life-threatening. Therefore, various scoring systems are used to evaluate the condition and prognosis of patients [9]. However, in emergency department settings, the practicality and accessibility of parameters are crucial for the applicability of these scores. Although scores like GBS and mGBS are validated, their complexity limits routine use in high-pressure emergency settings [4, 5, 10]. Especially, commonly used risk scores, such as GBS, AIMS65, and Rockall, may be impractical in emergency clinical settings due to their reliance on laboratory and endoscopic data. In response, recent research has emphasized the need for sim-

TABLE 2. Comparison of laboratory parameters between the groups.

	Survivor (Mean ± SD)	Non-survivor (Mean ± SD)	Total (Mean ± SD)	95% CI		*p*
				Lower	Upper	
Hemoglobin (g/dL)	8.99 ± 2.34	8.10 ± 1.98	8.89 ± 2.32	−0.07	1.86	0.068
Hematocrit (%)	27.49 ± 6.90	24.71 ± 6.02	27.19 ± 6.85	−0.06	5.62	0.055
Platelet count (×10^3/µL)	266.09 ± 118.94	273.04 ± 225.58	266.84 ± 133.76	−101.29	87.39	0.881
aPTT (s)	25.97 ± 9.28	26.86 ± 7.92	26.07 ± 9.14	−4.70	2.93	0.649
INR (s)	1.25 ± 0.47	1.26 ± 0.63	1.25 ± 0.49	−0.22	0.19	0.895
AST (U/L)	25.92 ± 32.61	22.56 ± 13.43	25.56 ± 31.12	−9.64	16.36	0.611
ALT (U/L)	19.62 ± 26.37	18.32 ± 10.69	19.48 ± 25.14	−9.21	11.81	0.808
GGT (U/L)	36.89 ± 62.36	72.20 ± 104.26	40.68 ± 68.66	−79.08	8.45	0.015
BUN (mg/dL)	38.88 ± 24.53	41.03 ± 28.66	39.11 ± 24.95	−12.57	8.28	0.686
Creatinine (mg/dL)	1.13 ± 0.76	1.26 ± 0.46	1.15 ± 0.74	−0.44	0.18	0.409
Albumin (g/L)	31.84 ± 5.43	26.84 ± 4.45	31.30 ± 5.54	2.77	7.22	<0.001
BUN/ALB	1.29 ± 0.90	1.54 ± 0.98	1.32 ± 0.91	−0.63	0.13	0.191
BUN/Crea	37.08 ± 18.66	31.40 ± 12.68	36.47 ± 18.17	−1.88	13.24	0.140
CRP (mg/L)	21.95 ± 37.69	16.64 ± 36.16	21.39 ± 37.49	−10.34	20.97	0.504

BUN: Blood Urea Nitrogen; Crea: Creatinine; AST: Aspartate aminotransferase; ALT: Alanine aminotransferase; GGT: Gamma-glutamyl transferase; INR: international normalized ratio; CRP: C-reaktive protein; CI: confidence intervals; ALB: Albumin; SD: standard deviation; aPTT: activated partial thromboplastin time.

TABLE 3. The receiver operating characteristic (ROC) analysis for the different scoring systems in predicting in-hospital mortality and ICU admission

Score	AUC (95% CI)	Cut-off value	Youden's J index	Sensitivity (%)	Specificity (%)	*p*-value
Mortality						
AIMS65	0.754 (0.655–0.852)	1.5	0.366	88	48.6	<0.001
GBS	0.706 (0.614–0.797)	11.5	0.265	64	62.5	<0.001
mGBS	0.731 (0.640–0.822)	10.5	0.374	84	53.4	<0.001
H3B2	0.725 (0.620–0.830)	3.5	0.454	80	65.4	<0.001
H3B2A1	0.750 (0.653–0.846)	3.5	0.414	88	53.4	<0.001
ICU admission						
AIMS65	0.844 (0.790–0.899)	1.5	0.521	96.1	56.0	<0.001
GBS	0.606 (0.519–0.692)	10.5	0.170	68.6	48.4	0.021
mGBS	0.613 (0.525–0.701)	9.5	0.080	56.9	51.1	0.014
H3B2	0.624 (0.535–0.713)	2.5	0.137	82.4	31.3	0.007
H3B2A1	0.645 (0.563–0.727)	3.5	0.175	64.7	52.7	0.002

AUC: Area Under the ROC Curve; CI: Confidence Interval; GBS: Glasgow-Blatchford Score; mGBS: modified Glasgow-Blatchford Score; ICU: intensive care unit.

pler and more rapidly calculable indices [10]. Kocaoğlu and Çetinkaya (2021) reported the Age Shock Index, a metric based on vital signs and age, which showed moderate predictive ability and outperformed both the Shock Index (SI) and Modified Shock Index (MSI) in patients with GIB. Similarly, our study suggests that incorporating accessible parameters, such as serum albumin, may enhance early risk stratification and support prompt, bedside clinical decision-making.

In our study, the AIMS65 (AUC: 0.754) and the H3B2A1 (AUC: 0.750) scores were particularly effective in predicting in-hospital mortality. mGBS (AUC: 0.731), H3B2 (AUC: 0.725), and GBS (AUC: 0.706) also showed fair performance. These findings align with those of Sasaki *et al.* [3], who reported comparable predictive power for AIMS65 (AUC: 0.707) and H3B2 (AUC: 0.685) in UGIB, outperforming more complex scores, such as GBS (AUC: 0.587) and mGBS (AUC: 0.594). Similarly, Cazacu *et al.* [4] found that all scores had predictive value for mortality even in patients who did not undergo endoscopy, with AIMS65 and INBS performing particularly well.

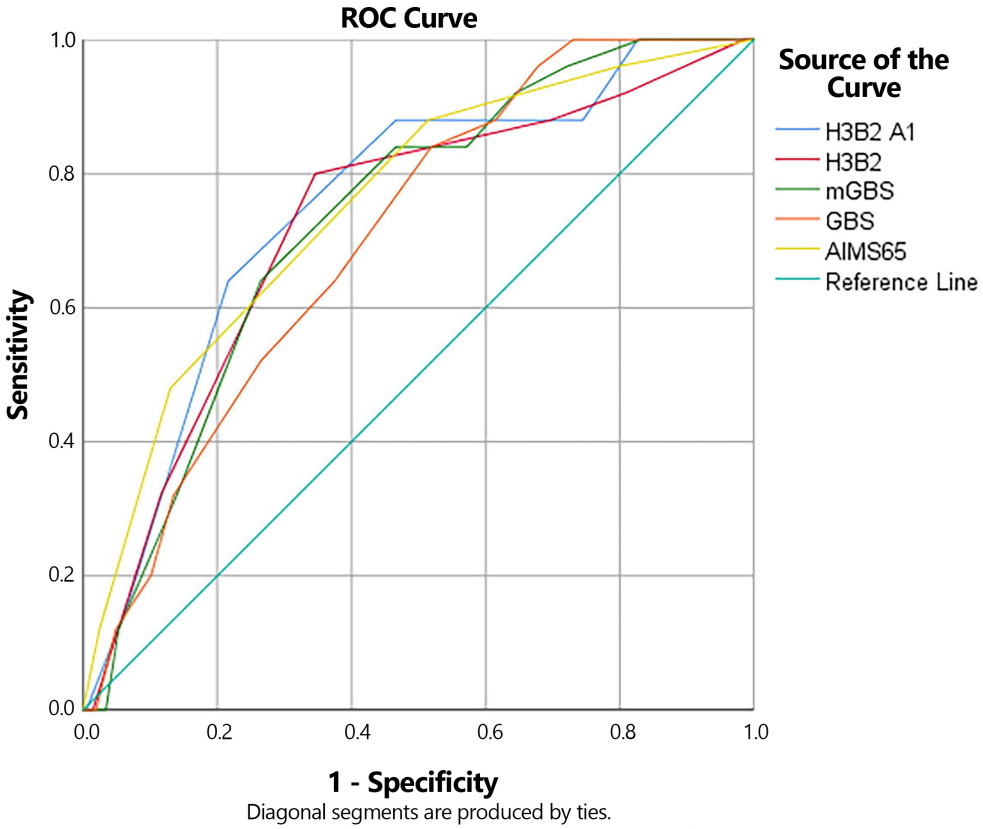

FIGURE 1. ROC curve comparison of five scoring systems in predicting in-hospital mortality. ROC: Receiver operating characteristic; GBS: Glasgow-Blatchford Score; mGBS: modified Glasgow-Blatchford Score.

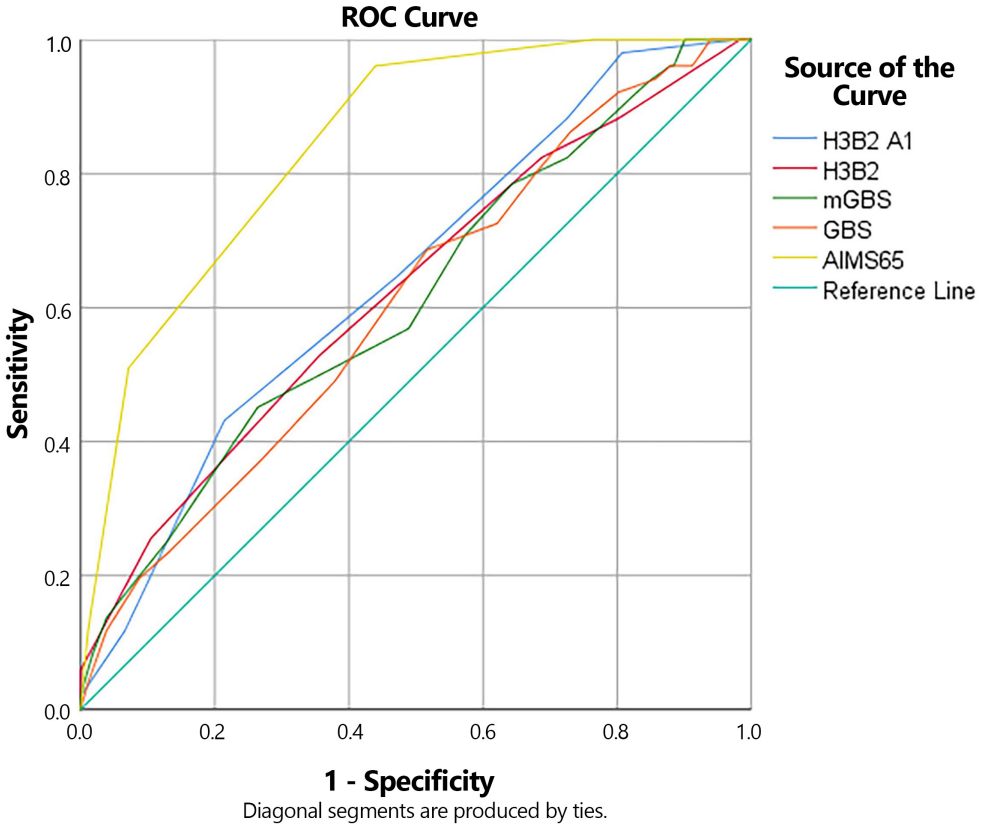

FIGURE 2. ROC curve comparison of five scoring systems in predicting ICU admission. ROC: Receiver operating characteristic; GBS: Glasgow-Blatchford Score; mGBS: modified Glasgow-Blatchford Score.

As highlighted by Sasaki *et al.* [3], the H3B2 score is a more practical alternative for predicting mortality in UGIB patients. While the AIMS65 score includes easily obtainable parameters, such as age and mental status, the Glasgow-Blatchford Score (GBS) requires the evaluation of multiple variables, including the presence of hepatic and cardiac diseases, which may not always be readily accessible in emergency settings. Furthermore, in patients presenting with altered mental status, it is essential to consider other potential causes before applying scoring criteria. Taken collectively, these considerations emphasize the importance of promptly identifying high-risk UGIB patients, planning timely endoscopies, and accurately predicting in-hospital mortality to guide effective clinical management [11].

The literature shows that early risk classification indices are inadequate in the clinical decision-making process before endoscopy in high-risk patients, particularly when determining ICU admission or hospitalization in the relevant service. Generally, risk stratification indices have been developed against the possibility of mortality and rebleeding [12, 13]. Kherad *et al.* [12] (2023) evaluated ICU admission rates with the AIMS65, GBS, ABC, and Rockall scores (RS). They reported that ICU admission rates increased significantly for all high-risk patient scores predicted for all scores except the Rockall score, but AUC curves showed poor discriminatory ability for all scores (ABC: AUC: 0.55 (51%–60%); AIMS65: AUC: 0.61 (56%–66%); GBS: AUC: 0.61 (55%–66%), RS: 0.51 (53%–64%)). In our study, in patients admitted to the ICU, in addition to AIMS65 (AUC: 0.844 (95% CI: 0.790–0.899)), other scoring systems (GBS: AUC: 0.606 (0.519–0.69); mGBS: AUC: 0.613 (0.525–0.701); H3B2: AUC: 0.624 (0.535–0.713); H3B2A1: AUC: 0.645 (0.563–0.727)) showed similar characteristics in predicting ICU admission ($p < 0.001$). This is especially important because recent studies have questioned the clinical effectiveness of urgent endoscopy in all UGIB patients, particularly those without variceal bleeding.

Jeon *et al.* [14] (2024) reported that delayed endoscopy might be clinically acceptable in low-risk non-variceal upper gastrointestinal bleeding (NVUGIB) patients, whereas early intervention could decrease in-hospital complications in high-risk individuals. Consistent with these findings, our study highlights the importance of early risk stratification to support personalized patient management and enable timely clinical decisions. Additionally, recent studies have underscored the prognostic value of serum albumin in UGIB. Li *et al.* [15] (2023) identified hypoalbuminemia (<3.0 g/dL) as an independent predictor of in-hospital mortality, while Vara-Luiz *et al.* [16] (2025) associated it with increased hemodynamic instability and ICU admissions in elderly patients with non-cirrhotic UGIB. These findings strengthen the classification of UGIB as a geriatric syndrome, suggesting that including albumin in risk-stratification models may improve early prognostication and guide personalized management in high-risk populations.

In conclusion, all scoring systems are designed to predict the need for early endoscopic treatment, mortality, and transfusion [13]. However, the primary goal of risk stratification in emergency departments is to identify patients suitable for discharge [17]. Our results support using simplified models, such as H3B2A1, alongside validated scores like AIMS65, especially in elderly patients who might present with atypical symptoms or multiple comorbidities. More research is needed to externally validate these tools and evaluate their influence on clinical decisions and outcomes in various UGIB populations.

This study has several limitations. First, it was carried out at a single tertiary care center using a retrospective design, which may limit the generalizability of the findings. Second, the sample size was relatively small, especially in the non-survivor group, which could affect the statistical power of the analyses. Finally, external validation of the H3B2A1 score in various clinical settings and patient populations was not performed. Therefore, future prospective multicenter studies are needed to confirm and build upon these findings.

5. Conclusions

In this study, we evaluated the clinical utility of the H3B2A1 score—a modified version of the H3B2 model that incorporates serum albumin—for predicting in-hospital mortality and ICU admission in patients with upper gastrointestinal bleeding (UGIB). Although H3B2A1 is not yet a widely recognized score in the literature, our findings show that its predictive performance is similar to that of the AIMS65 score. The inclusion of serum albumin, a biomarker often linked to poor prognosis in various clinical settings, may improve the score's effectiveness, especially in elderly or frail populations. Because of its simplicity and use of objective, routinely available clinical parameters, H3B2A1 could be a practical tool for early risk stratification in emergency departments. Nevertheless, further prospective, multicenter studies are warranted to validate its performance and clinical applicability across varied UGIB populations.

AVAILABILITY OF DATA AND MATERIALS

The data supporting this study's findings are available from the corresponding author upon reasonable request.

AUTHOR CONTRIBUTIONS

MF, MÇ and RK—designed the research; software; writing, review, and editing; supervision. MF, MÇ, ABÖ, MB, SG and RK—conceptualization. MB, MÇ, ABÖ and SG—methodology, data curation. MF and RK—validation; formal analysis; investigation. MF, MÇ and MB—resources; visualization; writing–original draft preparation, project administration. All authors have read and agreed to the published version of the manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study was approved by the Clinical Research Ethics Committee of Balikesir University (Approval No: 2023/66). All procedures were conducted according to the ethical rules and principles of the Declaration of Helsinki. Consent for participation was obtained from all subjects.

ACKNOWLEDGMENT

Not applicable.

FUNDING

This research received no external funding.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

REFERENCES

[1] Bae SJ, Kim K, Yun SJ, Lee SH. Predictive performance of blood urea nitrogen to serum albumin ratio in elderly patients with gastrointestinal bleeding. The American Journal of Emergency Medicine. 2021; 41: 152–157.

[2] Lee YJ, Min BR, Kim ES, Park KS, Cho KB, Jang BK, *et al*. Predictive mortality factors within 30 days in patients with nonvariceal upper gastrointestinal bleeding. The Korean Journal of Internal Medicine. 2016; 31: 54–64.

[3] Sasaki Y, Abe T, Kawamura N, Keitoku T, Shibata I, Ohno S, *et al*. Prediction of emergency endoscopic treatment for upper gastrointestinal bleeding and a new score model: a retrospective study. BMC Gastroenterology. 2022; 22: 337.

[4] Cazacu SM, Alexandru DO, Statie RC, Iordache S, Ungureanu BS, Iovănescu VF, *et al*. The accuracy of pre-endoscopic scores for mortality prediction in patients with upper GI bleeding and no endoscopy performed. Diagnostics. 2023; 13: 1188.

[5] Palmer JO, Stanley AJ. A review of risk scores within upper gastrointestinal bleeding. Journal of Clinical Medicine. 2023; 12: 3678.

[6] Wasserman RD, Abel W, Monkemuller K, Yeaton P, Kesar V, Kesar V. Non-variceal upper gastrointestinal bleeding and its endoscopic management. The Turkish Journal of Gastroenterology. 2024; 35: 599–608.

[7] Menichelli D, Gazzaniga G, Del Sole F, Pani A, Pignatelli P, Pastori D. Acute upper and lower gastrointestinal bleeding management in older people taking or not taking anticoagulants: a literature review. Frontiers in Medicine. 2024; 11: 1399429.

[8] Hearnshaw SA, Logan RFA, Lowe D, Travis SPL, Murphy MF, Palmer KR. Acute upper gastrointestinal bleeding in the UK: patient characteristics, diagnoses and outcomes in the 2007 UK audit. Gut. 2011; 60: 1327–1335.

[9] Lee HA, Jung H, Kim TO, Byeon J, Jeong E, Cho H, *et al*. Clinical outcomes of acute upper gastrointestinal bleeding according to the risk indicated by Glasgow-Blatchford risk score-computed tomography score in the emergency room. The Korean Journal of Internal Medicine. 2022; 37: 1176–1185.

[10] Kocaoğlu S, Çetinkaya HB. Use of age shock index in determining severity of illness in patients presenting to the emergency department with gastrointestinal bleeding. The American Journal of Emergency Medicine. 2021; 47: 274–278.

[11] Rivieri S, Carron PN, Schoepfer A, Ageron FX. External validation and comparison of the Glasgow-Blatchford score, modified Glasgow-Blatchford score, Rockall score and AIMS65 score in patients with upper gastrointestinal bleeding: a cross-sectional observational study in Western Switzerland. European Journal of Emergency Medicine. 2022; 30: 32–39.

[12] Kherad O, Restellini S, Almadi M, Martel M, Barkun AN. Comparative evaluation of the ABC score to other risk stratification scales in managing high-risk patients presenting with acute upper gastrointestinal bleeding. Journal of Clinical Gastroenterology. 2023; 57: 479–485.

[13] Rao VL, Gupta N, Swei E, Wagner T, Aronsohn A, Reddy KG, *et al*. Predictors of mortality and endoscopic intervention in patients with upper gastrointestinal bleeding in the intensive care unit. Gastroenterology Report. 2020; 8: 299–305.

[14] Jeon SW, Kwon JG, Lee JY, Lee SH, Lee HJ; Daegu-Gyeongbuk Gastrointestinal Study Group (DGSG). The time of endoscopy for nonvariceal upper gastrointestinal bleeding: an observational study. The Korean Journal of Helicobacter and Upper Gastrointestinal Research. 2024; 24: 267–275.

[15] Li Y, Lu Q, Song M, Wu K, Ou X. Novel risk score for acute upper gastrointestinal bleeding in elderly patients: a single-centre retrospective study. BMJ Open. 2023; 13: e072602.

[16] Vara-Luiz F, Mendes I, Palma C, Mascarenhas P, Simas D, Gomes P, *et al*. Upper gastrointestinal bleeding differences between older and younger adults: should bleeding in non-cirrhotic patients be considered a geriatric syndrome? Therapeutic Advances in Gastroenterology. 2025; 18: 17562848251343416.

[17] Venkat A, Cattamanchi S, Madali A, Farook AR, Trichur RV. Comparison of the AIMS-65 score with the Glasgow-Blatchford score in upper gastrointestinal bleed in the emergency department. Eurasian Journal of Emergency Medicine. 2017; 16: 70–78.

How to cite this article: Meliha Fındık, Muhammet Çakas, Ahmet Buğra Önler, Murat Başcı, Selman Gümüş, Ramazan Kıyak. A modified risk model for upper gastrointestinal bleeding: comparative evaluation of the H3B2A1 score. Signa Vitae. 2025; 21(12): 48-54. doi: 10.22514/sv.2025.180.