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# The effectiveness of uric acid in determining prognosis in nonvariceal upper gastrointestinal bleeding and its comparison with risk scores

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## Abstract:

**OBJECTIVES:** Studies examining the prognostic significance of uric acid specifically in upper nonvariceal gastrointestinal bleeding (NVUGIB) are limited. We aim to investigate whether uric acid levels have prognostic value in patients diagnosed with NVUGIB.

**METHODS:** This study was retrospective. Patients aged >18 diagnosed with NVUGIB were included in the study. Patients' demographic data, vital signs, comorbid diseases, results of laboratory parameters, endoscopy findings, transfusion requirements, recurrent bleeding, and outcomes (discharge and death) were recorded. Albumin; International normalized ratio; Mental status; Shock; Age - 65 (AIMS65) score, Rockall, and Glasgow-Blatchford scores were calculated for all patients based on information obtained from patient files. Pearson correlation test, independent samples *t*-test, and simple linear regression analysis were utilized to examine the relationship between uric acid levels and various measurements.  $P < 0.05$  was considered statistically significant.

**RESULTS:** One hundred and eighty-nine patients, 30.7% of whom were women, were included in the study, and the mean age was  $61.67 \pm 19.28$  years. While the mean uric acid level of discharged patients was  $5.6 \pm 2.04$  mg/dL, the mean uric acid level of deceased patients was  $6.81 \pm 2.77$  mg/dL. Uric acid level had a significant effect on mortality ( $P = 0.023$ ) according to univariate analysis. There was a positive correlation between uric acid and both the AIMS65 score ( $P = 0.001$ ) and the Rockall score ( $P = 0.001$ ), indicating statistical significance.

**CONCLUSION:** Our study suggests that elevated serum uric acid levels can serve as a valuable factor in preendoscopy risk assessment. Higher uric acid levels are associated with an increased likelihood of mortality.

## Keywords:

Mortality, upper gastrointestinal bleeding, uric acid

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## Introduction

Upper gastrointestinal bleeding (UGIB) is a critical medical condition with mortality rates ranging from 8% to

14%.<sup>[1]</sup> Seventy percent of the UGIB is due to nonvariceal upper gastrointestinal bleeding (NVUGIB). NVUGIB is defined as the bleeding with origin above the ligament of Treitz that is not variceal in origin. The most typical cause of NVUGIB is a bleeding peptic ulcer.<sup>[2-4]</sup>

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**Box-ED section****What is already known on the study topic?**

- Upper gastrointestinal bleeding (UGIB) is a critical medical condition with mortality rates ranging from 8% to 14%. Seventy percent of the UGIB is due to nonvariceal upper gastrointestinal bleeding (NVUGIB).
- Uric acid is associated with various vascular risk factors.

**What is the conflict on the issue? Has it importance for readers?**

- Prognostic significance of uric acid specifically in NVUGIB are limited.
- Uric acid levels could be associated with worse clinical outcomes in NVUGIB.

**How is this study structured?**

- This was a single-center, retrospective cohort study that includes data from approximately 189 patients.

**What does this study tell us?**

- Elevated serum uric acid levels can serve as a valuable factor in pre-endoscopy risk assessment.
- Higher uric acid levels are associated with an increased likelihood of mortality.

Clinical guidelines recommend the use of risk stratification tools to assist in accurately assessing the severity of NVUGIB and making timely decisions regarding treatment interventions, including endoscopy. Various scoring systems, such as the Rockall score, the Glasgow–Blatchford score, and the Albumin; International normalized ratio; Mental status; Shock; Age 65 (AIMS65) score are commonly used to predict outcomes in NVUGIB patients. These tools help predict mortality, recurrent bleeding, transfusion requirements, and the need for interventions to control bleeding.<sup>[5,6]</sup> However, these scoring systems have limitations, including the complexity of Glasgow–Blatchford score and the requirement for endoscopic findings in the Rockall score. The AIMS65 score was developed to predict outcomes in NVUGIB patients and offers the advantage of rapid implementation during emergencies compared to other scoring systems.<sup>[7,8]</sup>

Uric acid (UA) is a highly soluble bioproduct of purine metabolism that is primarily excreted by the kidneys. UA increases the resistance of cells to oxidative damage and degeneration.<sup>[9]</sup> It is associated with various vascular risk factors such as hypertension (HT), diabetes, and metabolic disorders. UA levels were also found to be positively associated with intracranial hemorrhage.<sup>[10,11]</sup> Despite this association, studies examining the prognostic significance of uric acid specifically in NVUGIB are limited.<sup>[12]</sup> Identifying patients at high risk of mortality or recurrent bleeding is crucial for effective management in

patients with NVUGIB. We hypothesize that elevated uric acid levels are associated with worse clinical outcomes in NVUGIB. Therefore, in our study, we aimed to evaluate the relationship of uric acid levels with patient prognosis, such as mortality, transfusion requirements, recurrent bleeding, and length of hospitalization in patients with NVUGIB.

**Methods**

This was a retrospective cohort study. Ethical approval for this study was obtained from Adana City Training and Research Hospital, University of Health Sciences on the date of 08/09/2022, with approval number of 2127/111. Patients presenting to the emergency department between January 1, 2020, and December 31, 2022, with ICD-10 code K92.2 were identified through the hospital automation and archive systems. The study included those with suspected gastrointestinal bleeding who were confirmed to have NVUGIB by endoscopy and had uric acid levels measured at admission. Endoscopic procedures at our hospital are performed by gastroenterology specialists. Exclusion criteria comprised patients under 18 years of age, those with known gout or metabolic disease, those without endoscopic evaluation or diagnosed with variceal bleeding, individuals with a lack of information in the hospital automation system, patients who refused treatment and discharged themselves from the hospital, and those transferred to another medical facility. The study population was established by retrospectively evaluating all patients who met the predefined eligibility criteria. Flowchart of patient selection is shown in Figure 1.

For each participant, detailed demographic data, mental status, vital signs, comorbid diseases such as HT, diabetes mellitus (DM), cardiac–kidney–hepatic disease, malignancy, complaints during apply, results of biochemical, hematological, and coagulation tests conducted using venous samples obtained during emergency presentation, endoscopy findings and treatment modalities (endoscopic or surgical), need for blood–blood product transfusion and presence of recurrent bleeding during the first 48 h, as well as outcomes from the ED (discharge, admission, and death), and duration and outcome of hospitalization (discharge and death) were meticulously recorded.

AIMS65, Rockall, and Glasgow–Blatchford scores were calculated for all patients based on information obtained from patient files.

The primary outcome of the study was to determine the role of uric acid levels in determining 30-day mortality, transfusion requirements, recurrent bleeding, and length of hospitalization. The secondary outcome was to investigate the impact of uric acid levels on the performance of AIMS-65, Rockall, and Glasgow–Blatchford scores in NVUGIB patients.

The data analysis was conducted utilizing SPSS version 26.0, with a confidence level set at 95%. Given that the sample size exceeded 30 for the variables, we assumed that the data followed a normal distribution, as explained by the central limit theorem. Pearson correlation test, independent samples *t*-test, and simple linear regression analysis were utilized to examine the relationship between uric acid levels and various measurements. Receiver operating characteristic curve (ROC) analysis was used to determine the cutoff value of variables based on uric acid levels. Area under the curve (AUC) was calculated. Logistic regression analysis was performed to investigate the effects of uric acid on significant variables. For all of the tests, statistical significance level was accepted as 0.05.

## Results

The study comprised 189 patients, with females accounting for 30.7%, and the mean age was  $61.67 \pm 19.28$  years. Among the patients, HT was the most prevalent comorbidity ( $n = 78, 41.3\%$ ); predominant presenting complaint was melena ( $n = 142,$

75.1%). All patients underwent endoscopy within 24 h of their admission to the ED. Peptic ulcers, which are most commonly detected in the endoscopy results, were evaluated according to the Forrest classification. Regarding endoscopic findings, Forrest 2A was the most common lesion ( $n = 59, 31.2\%$ ). Patients' AIMS65 score showed a mean of  $1.14 \pm 1.11$ , while the Rockall score mean at  $5.44 \pm 2.1$ . The Glasgow–Blatchford score demonstrated a mean of  $10.02 \pm 3.78$ . In terms of recurrent bleeding, the majority of patients (87.8%,  $n = 166$ ) did not experience it. The mean utilization of erythrocyte suspension was  $2.92 \pm 2.07$ , and fresh frozen plasma was  $1.38 \pm 1.52$ . Platelet product usage mean at  $0.2 \pm 0.96$ . The mean duration of hospitalization for the patients was found to be  $6.05 \pm 6.55$  days. The study revealed that the mean uric acid level was  $5.72 \pm 2.15$  mg/dL. Treatment primarily involved endoscopic intervention alone for 91% ( $n = 172$ ) of patients, while 9% ( $n = 17$ ) underwent both surgical and endoscopic procedures. Mortality rate was 10.1% ( $n = 19$ ). The characteristics of the patients and their statistical relationship with mortality are summarized in Table 1.

**Table 1: Baseline characteristics of the study population and their statistical relationship with mortality**

	All patients	Mortality (-)	Mortality (+)	P
Gender**, n (%)				
Female	58 (30.7)	49 (28.8)	9 (47.4)	0.162
Male	131 (69.3)	121 (71.2)	10 (52.6)	
Comorbid diseases**, n (%)				
DM	50 (26.5)	40 (23.5)	10 (52.6)	0.014
HT	78 (41.3)	70 (41.2)	8 (42.1)	1.000
Coronary artery disease	56 (29.6)	47 (27.6)	9 (47.4)	0.128
CKD	17 (9)	11 (6.5)	6 (31.6)	0.003
Cerebrovascular event	7 (3.7)	6 (3.5)	1 (5.3)	0.530
Endoscopy result**, n (%)				
Forrest 1A	15 (7.9)	10 (5.9)	5 (26.3)	0.009
Forrest 1B	35 (18.5)	29 (17.1)	6 (31.6)	0.128
Forrest 2A	59 (31.2)	55 (32.4)	4 (21.1)	0.455
Forrest 2B	23 (12.2)	20 (11.8)	3 (15.8)	0.709
Forrest 2C	22 (11.6)	22 (12.9)	0	0.135
Forrest 3	35 (18.5)	34 (20)	1 (5.3)	0.208
Dieulafoy lesion	3 (1.6)	3 (1.8)	0	1.000
Mallory–Weiss Syndrome	3 (1.6)	3 (1.8)	0	1.000
Recurrent bleeding**, n (%)				
No	166 (87.8)	150 (88.2)	16 (84.2)	0.709
Yes	23 (12.2)	20 (11.8)	3 (15.8)	
Age* (mean±SD)	61.67±19.28	60.3±19.1	73.95±16.69	0.003
UA (mg/dL)*, (mean±SD)	5.72±2.15	5.6±2.04	6.81±2.77	0.020
AIMS65* (mean±SD)	1.14±1.11	0.99±1.02	2.42±1.07	0.000
Rockall score* (mean±SD)	5.44±2.1	5.19±2.02	7.74±1.33	0.000
Glasgow–Blatchford score* (mean±SD)	10.02±3.78	9.75±3.81	12.42±2.57	0.000
Erythrocyte suspension* (mean±SD)	2.92±2.07	2.69±1.89	4.95±2.53	0.000
Fresh frozen plasma* (mean±SD)	1.38±1.52	1.2±1.26	2.95±2.5	0.007
Platelet product* (mean±SD)	0.2±0.96	0.11±0.75	1±1.91	0.060
Length of stay (days)*, (mean±SD)	6.05±6.55	5.36±5.19	12.21±12.27	0.027

\*Independent samples *t*-test, \*\*Chi-square test. AIMS65: Albumin; International normalized ratio; Mental status; Shock; Age 65, SD: Standard deviation, CKD: Chronic kidney disease, DM: Diabetes mellitus, HT: Hypertension, UA: Uric acid

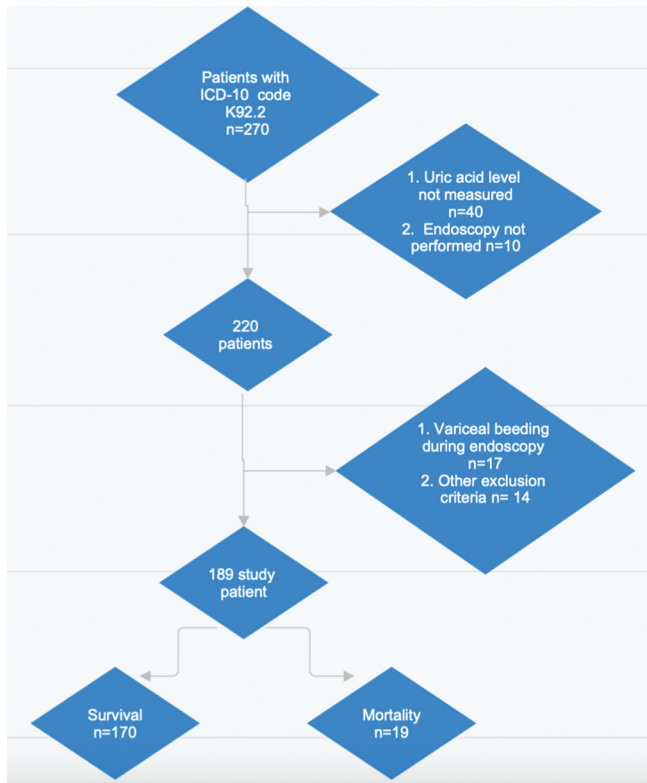


Figure 1: Flowchart of patient selection and study outcome

Univariate and multivariate logistic regression analyses of factors affecting mortality were performed. In univariate analysis, the presence of DM, chronic kidney disease (CKD), uric acid levels, patients' AIMS65, Rockall score and Glasgow–Blatchford score, the use of packed red blood cells, frozen plasma, and platelets significantly increased the risk of mortality ( $P = 0.009$ ,  $P = 0.001$ ,  $P = 0.023$ ,  $P = 0.000$ ,  $P = 0.000$ ,  $P = 0.005$ ,  $P = 0.000$ ,  $P = 0.000$ , and  $P = 0.013$ ). However, DM, CKD, uric acid levels, Glasgow–Blatchford score, the use of packed red blood cells, frozen plasma, and platelets effect did not reach statistical significance in multivariate analysis ( $P = 0.107$ ,  $P = 0.22$ ,  $P = 0.33$ ,  $P = 0.116$ ,  $P = 0.257$ ,  $P = 0.874$ , and  $P = 0.127$ ). AIMS65 and Rockall scores were found to be strongly associated with mortality in multivariate analysis ( $P = 0.027$  and  $P = 0.027$ ). In univariate analysis, each day of length of stay was associated with a 10% increase in mortality risk ( $P = 0.000$ ). However, this effect was not significant in multivariate analysis ( $P = 0.658$ ) [Table 2].

The AUC of the ROC analysis of uric acid levels in predicting mortality was 0.631. This value showed that the prognostic power of uric acid was not significant ( $P = 0.061$ ) (95% confidence interval, 0.485–0.770) [Figure 2].

The analysis revealed several correlations between uric acid levels and various parameters [Table 3]. There

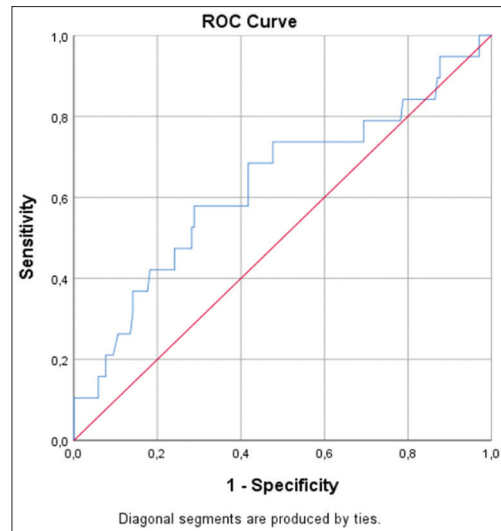


Figure 2: Receiver operating characteristic curve analysis of uric acid levels in predicting mortality

was a weak positive correlation observed between uric acid levels and the utilization of erythrocyte suspension, fresh frozen plasma, and the duration of hospitalization ( $P = 0.001$ ,  $P = 0.023$ , and  $P = 0.024$ , respectively). However, no significant relationship was identified between uric acid levels and the use of fresh thrombocyte products ( $P > 0.05$ ). Additionally, there was a weak positive correlation between uric acid and both the AIMS65 score and the Rockall score, indicating statistical significance ( $P = 0.001$ ). Similarly, an intermediate positive correlation was found between uric acid levels and the Glasgow–Blatchford score ( $P = 0.000$ ). The simple linear regression analysis results indicated that uric acid had a significant effect on the use of erythrocyte suspension, use of fresh frozen plasma, hospitalization duration, AIMS65, Rockall, and the Glasgow–Blatchford score ( $P = 0.001$ ,  $P = 0.023$ ,  $P = 0.024$ ,  $P = 0.001$ ,  $P = 0.01$ , and  $P < 0.001$ , respectively) [Table 4].

ROC analysis was performed between uric acid levels and these parameters; the results were summarized in Table 5 and Figure 3.

There was no statistically significant difference in mean uric acid levels between patients with and without recurrent bleeding ( $P > 0.05$ ).

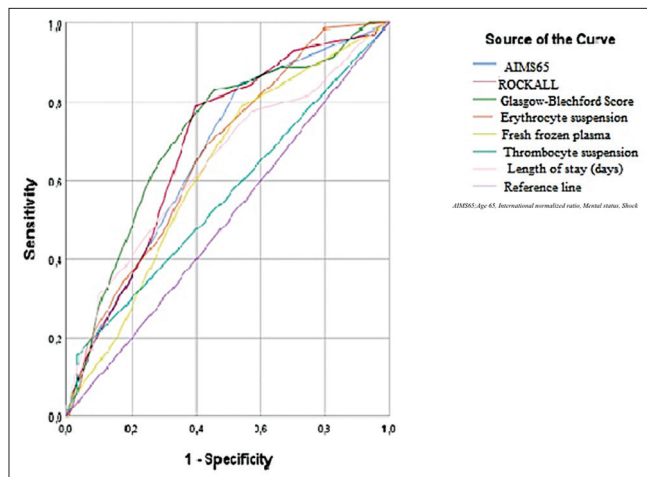
## Discussion

Upper gastrointestinal bleeding is a prevalent and severe condition, posing a threat to life with mortality rates reaching up to 15%. NVUGIB can present in diverse clinical forms, spanning from mild and self-resolving bleeding episodes to severe and life-threatening hemorrhage.<sup>[13,14]</sup> In this study,

**Table 2: Results of univariate and multivariate logistic regression analysis of factors affecting mortality**

	Univariate					Multivariate				
	$\beta$	P	OR	95% CI for EXP(B)		$\beta$	P	OR	95% CI for EXP(B)	
				Lower	Upper				Lower	Upper
DM (+)	1.284	0.009	3.611	1.372	9.505	1.128	0.107	3.088	0.784	12.170
HT (+)	0.038	0.938	1.039	0.398	2.715					
Coronary artery disease (+)	0.857	0.081	2.355	0.901	6.159					
CKD (+)	1.898	0.001	6.671	2.125	20.947	1.062	0.222	2.891	0.526	15.892
Cerebrovascular event (+)	0.418	0.706	1.519	0.173	13.329					
Uric acid	0.233	0.023	1.263	1.032	1.545	0.130	0.330	1.139	0.876	1.481
AIMS65	1.058	0.000	2.880	1.818	4.560	0.783	0.027	2.188	1.093	4.381
Rockall	0.871	0.000	2.388	1.630	3.500	0.739	0.027	2.093	1.086	4.036
Glasgow–Blatchford score	0.230	0.005	1.258	1.072	1.477	-0.198	0.116	0.821	0.642	1.050
Erythrocyte suspension (unit)	0.504	0.000	1.656	1.289	2.126	0.347	0.257	1.414	0.777	2.575
Fresh frozen plasma (unit)	0.612	0.000	1.845	1.337	2.546	0.053	0.874	1.054	0.549	2.024
Platelet product (unit)	0.502	0.013	1.652	1.114	2.450	0.349	0.127	1.417	0.906	2.217
Length of stay (days)	0.098	0.000	1.102	1.046	1.162	0.018	0.658	1.018	0.941	1.101
Recurrent bleeding (+)	0.341	0.612	1.406	0.376	5.256					

AIMS65: Albumin, International normalized ratio; Mental status; Shock; Age 65, CKD: Chronic kidney disease, DM: Diabetes mellitus, HT: Hypertension, OR: Odds ratio, CI: Confidence interval



**Figure 3:** Receiver operating characteristic curve analysis of uric acid levels in predicting erythrocyte suspension, platelet product fresh frozen plasma, hospital stay, Age 65; International normalized ratio; Mental status; Shock score (AIMS65), Rockall, Glasgow–Blatchford scores

our objective was to explore whether hyperuricemia independently contributes to transfusion requirements, recurrent bleeding incidents, length of hospitalization, and mortality rates in NVUGIB cases, as well as to assess its impact on the performance of risk scoring systems.

In our study, uric acid was found to be effective with mortality in univariate analysis, but it lost its independent effect in multivariate analysis. Our analysis showed that the AUC for uric acid in predicting mortality was 0.631, indicating only modest discriminative ability. However, this result did not reach statistical significance ( $P = 0.061$ ), suggesting that uric acid may not serve as an independent prognostic marker for mortality in patients with NVUGIB.

Although uric acid sensitivity varied between 60% and 80% in different parameters, these thresholds were not found to be clinically significant. Therefore, a reliable prognostic cutoff value for uric acid levels could not be determined.

Various theories have been proposed to explain how hyperuricemia contributes to mortality across all causes. Experimental studies suggest that the oxidation of xanthine and hypoxanthine, mediated by xanthine oxidase, generates oxygen radicals that can inflict damage on endothelial cells.<sup>[15]</sup> Another study proposes that elevated serum uric acid, directly absorbed by vascular endothelial cells, triggers inflammation, ultimately resulting in endothelial dysfunction.<sup>[16,17]</sup> Our analysis indicated a positive correlation between elevated uric acid levels and the requirement for erythrocyte suspension and fresh frozen plasma. Consequently, the observed positive association between heightened serum uric acid levels and increased blood product transfusions in our study implies the severity of bleeding. However, no correlation was discerned between platelet suspension usage and uric acid levels. Platelet suspension was uniformly administered to all bleeding patients manifesting hemodynamic instability, regardless of platelet count, along with other blood products.

According to our study, the mean hospitalization duration for patients was  $6.05 \pm 6.55$  days, with a positive correlation detected between serum uric acid levels and hospital stay length. This correlation suggests that elevated serum uric acid levels may contribute to prolonged hospitalization, possibly due to the severity of bleeding, particularly in patients with hemodynamic instability requiring blood transfusions. The mean uric

acid level for discharged patients was  $5.6 \pm 2.04$  mg/dL, whereas for deceased patients (exitus), it was notably higher at  $6.81 \pm 2.77$  mg/dL.

About two-thirds of uric acid elimination transpires in the kidneys.<sup>[18]</sup> The presence of comorbidities associated

with hyperuricemia, such as HT, diabetes, and renal insufficiency, may further elucidate this relationship.<sup>[19]</sup> In our study, the simultaneous presence of other risk factors such as DM and chronic kidney disease alongside hyperuricemia was associated with increased mortality in univariate analysis, but this association was not confirmed in multivariate analysis.

**Table 3: Several correlations between uric acid levels and various parameters**

Variables	UA level
Erythrocyte suspension replacement (unit)	
<i>r</i>	0.232
<i>P</i>	0.001
Fresh frozen plasma replacement (unit)	
<i>r</i>	0.165
<i>P</i>	0.023
Platelet product replacement (unit)	
<i>r</i>	0.078
<i>P</i>	0.286
Length of stay (days)	
<i>r</i>	0.164
<i>P</i>	0.024
AIMS65 score	
<i>r</i>	0.241
<i>P</i>	0.001
Fresh frozen plasma replacement (unit)	
<i>r</i>	0.240
<i>P</i>	0.001
Glasgow–Blatchford score	
<i>r</i>	0.310
<i>P</i>	<0.001

Pearson correlation test was used.  $P < 0.05$  was considered statistically significant. AIMS65: Albumin, International normalized ratio; Mental status; Shock; Age 65, UA: Uric acid

Regarding recurrent bleeding, 87.8% of patients did not experience recurrence, while 12.2% did. However, our study did not identify a significant association between uric acid levels and the risk of recurrent bleeding.

In our investigation, we observed a statistically significant weak positive relationship between elevated serum uric acid levels and the AIMS65 score, a similar weak positive relationship with the Rockall score, and a moderate positive relationship with the Glasgow–Blatchford score. In univariate analyses, DM, CKD, AIMS65, Rockall, and Glasgow–Blatchford scores, blood product use, and length of stay were significantly associated with mortality. However, in multivariate analyses, the only significant variables were AIMS65 and Rockall scores. Bleeding severity and the presence of comorbidities emerged as common parameters among all risk scoring parameters. Our findings suggest that the positive correlation between elevated serum uric acid levels and increased blood product transfusion indicates greater severity of bleeding. In addition, a statistically significant association was noted between elevated serum uric acid levels and the presence of

**Table 4: Simple linear regression analysis between uric acid levels and requirement erythrocyte suspension, fresh frozen plasma, hospital stay, AIMS65, Rockall, and Glasgow–Blatchford scores**

Independent variables	Dependent variables	$\beta$	<i>t</i>	<i>P</i>	<i>R</i> <sup>2</sup>	Lower limit	Upper limit
UA	Erythrocyte suspension (unit)	0.232	3.255	0.001	0.054	0.088	0.359
	Fresh frozen plasma (unit)	0.165	2.290	0.023	0.027	0.016	0.218
	Length of stay (days)	0.164	2.278	0.024	0.027	0.067	0.935
	AIMS65 score	0.241	3.401	0.001	0.058	0.052	0.197
	Rockall score	0.240	3.381	0.001	0.058	0.098	0.372
	Glasgow–Blatchford score	0.310	4.464	<0.001	0.096	0.305	0.789

Simple linear regression analysis was used.  $P < 0.05$  was considered statistically significant. AIMS65: Albumin, International normalized ratio, Mental status; Shock; Age 65, UA: Uric acid

**Table 5: Cutoff value for uric acid level in predicting erythrocyte suspension, platelet product, fresh frozen plasma, hospital stay, Albumin score, Rockall score, and Glasgow–Blatchford scores**

Test result variable (s)	Area under curve	SE	<i>P</i>	Asymptotic 95% CI		Sensitivity	Specificity	Cutting value
				Lower	Upper			
Erythrocyte suspension (unit)	0.667	0.039	<0.001	0.590	0.744	0.68	0.58	2.5
Fresh frozen plasma (unit)	0.626	0.041	0.004	0.545	0.707	0.79	0.46	0.5
Length of stay (days)	0.642	0.042	0.001	0.559	0.725	0.45	0.76	5.5
AIMS65 score	0.670	0.040	<0.001	0.593	0.748	0.85	0.47	0.5
Rockall score	0.693	0.039	<0.001	0.617	0.769	0.79	0.60	5.5
Glasgow–Blatchford score	0.718	0.039	<0.001	0.642	0.794	0.75	0.63	10.5

$P < 0.05$  was considered statistically significant. AIMS65: Albumin, International normalized ratio; Mental status; Shock; Age 65. CI: Confidence interval, SE: Standard error

comorbidities. This interaction between serum uric acid levels and the common parameters of bleeding severity and comorbidity presence elucidates the observed positive correlation between serum uric acid levels and risk scoring tools. In our study, the mean serum uric acid levels were calculated to be  $5.72 \pm 2.15$  mg/dL, slightly elevated within or slightly above the normal range. This observation explains the weak positive correlation between serum uric acid levels and the AIMS65 and Rockall scoring tools. However, a study by Konta *et al.* demonstrated that for every 1 mg/dL increase in serum uric acid levels, there was a significant rise in all-cause mortality rates.<sup>[20]</sup> Hence, despite the statistically weak positive relationship between uric acid and risk scores, we believe that this association warrants consideration.

Analysis of patient gender distribution revealed that 30.7% were female ( $n = 58$ ) and 69.3% were male ( $n = 131$ ). This distribution aligns with existing literature findings, such as those reported by Öcal *et al.*,<sup>[19]</sup> where 73.6% of cases were male, and by Ko *et al.*,<sup>[21]</sup> where 63.6% were male.

### Limitations

It was a retrospective design and based on a single-center experience. The number of patients included in the study decreased due to patients whose data we could not access. Another limitation of our study was the inability to obtain definitive information on medication use or comorbidities that may affect uric acid metabolism due to the study design.

### Conclusion

Our study suggests that elevated serum uric acid levels can serve as a valuable factor in pre-endoscopy risk assessment, and it was associated with an increased likelihood of mortality. The AIMS65 and Rockall scores are strong predictors of mortality, and a statistically significant correlation was observed between these scores and uric acid level. Given its cost-effectiveness and ready availability, uric acid can offer significant advantages for emergency medicine clinicians.

### Author contributions statement

- Conceptualization: MYG, AA, YS, AS, SDT, EA, ABU, and SY
- Data curation: MYG, AA, YS, AS, SDT, EA, ABU, and SY
- Investigation: MYG, AA, YS, EA, ABU, and SY
- Resources: MYG, AA, YS, AS, SDT, EA, ABU, and SY
- Methodology: MYG, AA, YS, AS, SDT, EA, ABU, and SY
- Formal analysis: MYG, AA, EA, ABU, and SY
- Writing – original draft: MYG, AA, YS, AS, SDT, EA, ABU, and SY
- Writing – review and editing: MYG, AA, YS, and SY.

### Conflicts of interest

None Declared.

### Ethics approval

Ethical approval for this study was obtained from Adana City Training and Research Hospital Ethics Committee in Adana/Türkiye on the date of 08/09/2022, with approval number of 2127/111.

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### References

1. Stanley AJ, Laine L, Dalton HR, Ngu JH, Schultz M, Abazi R, *et al.* Comparison of risk scoring systems for patients presenting with upper gastrointestinal bleeding: International multicentre prospective study. *BMJ* 2017;356:i6432.
2. Kate V, Sureshkumar S, Gurushankari B, Kalayarasan R. Acute upper non-variceal and lower gastrointestinal bleeding. *J Gastrointest Surg* 2022;26:932-49.
3. Lanas A, Dumonceau JM, Hunt RH, Fujishiro M, Scheiman JM, Gralnek IM, *et al.* Non-variceal upper gastrointestinal bleeding. *Nat Rev Dis Primers* 2018;4:18020.
4. Kavitt RT, Gralnek IM. Ideal strategy for nonvariceal upper gastrointestinal bleeding. *Curr Opin Gastroenterol* 2024;40:342-7.
5. Rockall TA, Logan RF, Devlin HB, Northfield TC. Selection of patients for early discharge or outpatient care after acute upper gastrointestinal haemorrhage. National audit of acute upper gastrointestinal haemorrhage. *Lancet* 1996;347:1138-40.
6. Saltzman JR, Tabak YP, Hyett BH, Sun X, Travis AC, Johannes RS. A simple risk score accurately predicts in-hospital mortality, length of stay, and cost in acute upper GI bleeding. *Gastrointest Endosc* 2011;74:1215-24.
7. Blatchford O, Davidson LA, Murray WR, Blatchford M, Pell J. Acute upper gastrointestinal haemorrhage in west of Scotland: Case ascertainment study. *BMJ* 1997;315:510-4.
8. Lai YC, Hung MS, Chen YH, Chen YC. Comparing AIMS65 score with MEWS, qSOFA score, glasgow-blatchford score, and rockall score for predicting clinical outcomes in cirrhotic patients with upper gastrointestinal bleeding. *J Acute Med* 2018;8:154-67.
9. Cutler RG, Camandola S, Feldman NH, Yoon JS, Haran JB, Arguelles S, *et al.* Uric acid enhances longevity and endurance and protects the brain against ischemia. *Neurobiol Aging* 2019;75:159-68.
10. Wu W, Geng Z, Wu A, Chen X, Meng X, Zhang Q, *et al.* Prognostic significance of uric acid levels in intracerebral hemorrhage patients. *Neuropsychiatr Dis Treat* 2024;20:449-58.
11. Yuan K, Zhang X, Chen J, Li S, Yang D, Xie Y, *et al.* Uric acid level and risk of symptomatic intracranial haemorrhage in ischaemic stroke treated with endovascular treatment. *Eur J Neurol* 2020;27:1048-55.
12. Zhao G, Zheng Y, Tian N, Zhan X, Peng F, Wang X, *et al.* The relationship between serum uric acid and gastrointestinal bleeding in peritoneal dialysis patients: A propensity score analysis. *Ren Fail* 2024;46:2407881.
13. Anshul, Singh N, Pahuja H Jr., Kumar V, Popli BP, Kumar S. The clinical and endoscopic profiles of patients with Upper Gastrointestinal Bleeding (UGIB) and the role of the rockall scoring system in predicting adverse outcomes. *Cureus* 2023;15:e40418.
14. Banister T, Spiking J, Ayaru L. Discharge of patients with an acute upper gastrointestinal bleed from the emergency department using an extended glasgow-blatchford score. *BMJ Open Gastroenterol* 2018;5:e000225.
15. McCord JM. Oxygen-derived free radicals in postischemic tissue injury. *N Engl J Med* 1985;312:159-63.
16. Yu MA, Sánchez-Lozada LG, Johnson RJ, Kang DH. Oxidative stress with an activation of the renin-angiotensin system

- in human vascular endothelial cells as a novel mechanism of uric acid-induced endothelial dysfunction. *J Hypertens* 2010;28:1234-42.
17. Kang DH, Park SK, Lee IK, Johnson RJ. Uric acid-induced C-reactive protein expression: Implication on cell proliferation and nitric oxide production of human vascular cells. *J Am Soc Nephrol* 2005;16:3553-62.
  18. George C, Leslie SW, Minter DA. Hyperuricemia. In: StatPearls. Treasure Island (FL): StatPearls Publishing; 2025. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK459218/>. [Last updated on 2023 Oct 14].
  19. Öcal O, Kaya B, Demirhan R, Özüçelik DN. The evaluation of 342 cases with upper gastrointestinal bleeding diagnosis in emergency department. *JAEM* 2011;10:69-72.
  20. Konta T, Ichikawa K, Kawasaki R, Fujimoto S, Iseki K, Moriyama T, et al. Association between serum uric acid levels and mortality: A nationwide community-based cohort study. *Sci Rep* 2020;10:6066.
  21. Ko IG, Kim SE, Chang BS, Kwak MS, Yoon JY, Cha JM, et al. Evaluation of scoring systems without endoscopic findings for predicting outcomes in patients with upper gastrointestinal bleeding. *BMC Gastroenterol* 2017;17:159.