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Clinical profile and predictors of mortality in upper gastrointestinal bleeding presenting to the emergency department of a tertiary care center – a prospective observational study

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ABSTRACT

Introduction and aim. Upper gastrointestinal bleeding (UGIB) is a common and potentially life-threatening emergency associated with significant morbidity and mortality. Prospective emergency department (ED)-based data from India on factors associated with in-hospital mortality remain limited, and comparative evidence between bleeding-specific scores such as the Glasgow-Blatchford Score (GBS) and triage systems like the Emergency Severity Index (ESI) is scarce. This study aimed to describe the clinical profile of patients presenting with UGIB and to evaluate predictors of in-hospital mortality, with a focus on comparing the prognostic performance of GBS and ESI.

Material and methods. This single-center prospective observational cohort study was conducted in the ED of a tertiary care center in North India from January 2024 to January 2025. Adult patients with clinically

suspected or endoscopically confirmed UGIB were enrolled. Clinical, laboratory, and management data were recorded using a standardized form. GBS and ESI were assigned at presentation by trained clinicians prior to outcome assessment. The primary outcome was in-hospital mortality. Predictive performance was assessed using receiver operating characteristic (ROC) curve analysis.

Results. Eighty-three patients with UGIB were included; 55.4% had a GBS >2. Patients with higher GBS demonstrated greater physiological derangement, increased transfusion requirements, higher incidence of shock, and significantly higher mortality (39.1% vs. 0%, p<0.001). All non-survivors were triaged as high acuity by ESI and had qSOFA ≥2 at presentation. GBS showed good discriminative ability for predicting mortality (AUROC=0.785), outperforming ESI (AUROC=0.723).

Conclusion. GBS showed good performance in predicting in-hospital mortality and may aid early ED risk stratification. However, findings should be interpreted cautiously given the single-center design and small sample size.

Keywords. emergency severity index, endoscopy, esophageal and gastric varices, gastrointestinal hemorrhage, Glasgow-Blatchford score, quick sequential organ failure assessment

Introduction

The annual incidence of upper gastrointestinal bleeding (UGIB) is estimated to range from 80 to 150 cases per 100,000 adults, with an estimated mortality rate ranging from 2% to 10%.[1] UGIB is defined as blood loss originating from the gastrointestinal tract proximal to the ligament of Treitz, including sources in the esophagus, stomach, or duodenum. Gastrointestinal bleeding may present as hematemesis, which can appear as either bright red blood or coffee-ground vomitus, as well as melena or, less commonly, hematochezia. Hematochezia refers to the passage of bright red blood or blood clots per rectum. While it typically indicates lower gastrointestinal bleeding (LGIB), it can also occur in cases of brisk UGIB. Patients typically present with symptoms related to blood loss, including orthostatic hypotension, syncope, fatigue, and generalized weakness.[2,3] Peptic ulcer disease (PUD) is the most common cause of UGIB, accounting for up to 50% of cases. Other frequent causes include esophagitis (24%), gastritis (18–22%), duodenitis (13%), and esophageal or gastric varices (11%). Additional etiologies include Mallory-Weiss tears (5–15%), vascular ectasia (5%), gastrointestinal neoplasms, and portal hypertensive gastropathy.[4,5]

Risk stratification scoring systems are essential for identifying patients who are more likely to require intervention and are at increased risk of re-bleeding and mortality. These tools play a crucial role in guiding resuscitation efforts, determining the optimal timing for endoscopy, and informing decisions about discharge planning. The Glasgow-Blatchford Score (GBS) is specifically designed to predict the need for endoscopic intervention. It incorporates clinical and laboratory parameters, including hemoglobin (Hb) level, systolic blood pressure (SBP), presence of syncope, melena, liver disease, and heart failure. A GBS of 6 or higher is associated with a greater than 50% likelihood of requiring therapeutic intervention.

Conversely, patients with a low GBS of 0 or 1 are considered low risk and may be safely discharged from the emergency department (ED) with outpatient follow-up.[6] In an international, multicenter, prospective study comparing multiple risk stratification tools, the GBS demonstrated superior accuracy in predicting the need for intervention or risk of death. As a result, both the American College of Gastroenterology and the European Society of Gastrointestinal Endoscopy recommend the GBS as the preferred tool for initial risk assessment in patients with UGIB.[7-9] The American Association for the Study of Liver Diseases (AASLD) recommends that esophagogastroduodenoscopy (EGD) be performed within 12 hours of presentation in patients with suspected acute variceal hemorrhage.[10] This guidance is supported by studies demonstrating that delayed endoscopy in patients with cirrhosis and variceal bleeding is associated with higher rates of re-bleeding and increased mortality.[11,12]

Upper endoscopy remains the gold standard for diagnosing and managing UGIB. However, computed tomography angiography (CTA) serves as a valuable alternative when endoscopy fails to identify an active source of bleeding, when a gastroenterologist is unavailable, when the patient is unfit for endoscopy, or when anatomical factors limit endoscopic access.[13] Increased mortality, risk of re-bleeding, and the need for endoscopic or surgical intervention are associated with several risk factors, including age over 60 years, presence of comorbidities, active bleeding at presentation, hypotension, and the requirement for blood transfusion.[14] Endoscopic therapy successfully achieves sustained haemostasis in approximately 80% to 90% of patients with UGIB; however, re-bleeding occurs in 10% to 20% of cases. In PUD, the majority of deaths, around 80% are attributed not to the bleeding itself but to underlying medical comorbidities.[15] Despite significant therapeutic advancements, acute variceal hemorrhage continues to carry a six-week mortality rate of approximately 15%.[16] Prospective emergency department-based data from India evaluating predictors of in-hospital mortality in upper gastrointestinal bleeding are limited. In particular, evidence comparing bleeding-specific risk stratification tools such as the GBS with ED triage systems like the Emergency Severity Index (ESI) for mortality prediction is scarce. This study addresses this gap by prospectively evaluating clinical factors associated with in-hospital mortality, and the performance of GBS and ESI in an Indian tertiary care ED.

Aim

The aim of this study was to prospectively evaluate the clinical profile and predictors of in-hospital mortality among patients presenting with UGIB. The study also aimed to assess and compare the prognostic performance of the GBS and ESI for early risk stratification and prediction of mortality in UGIB. This study addresses the limited prospective ED based data from India on mortality predictors and the comparative utility of bleeding-specific and triage-based risk assessment tools.

Material and methods

Study design and setting

This single-center prospective observational cohort study was conducted over a one-year period from January 2024 to January 2025 in the Department of Emergency Medicine at Sanjay Gandhi Postgraduate Institute of Medical Sciences (SGPGIMS), Lucknow, a tertiary care teaching hospital in North India. During the study period, 110 consecutive adult patients presenting with gastrointestinal bleeding were screened. Of these, 83 patients diagnosed with UGIB were included in the final analysis, while patients with lower LGIB were excluded, as the present study focused exclusively on UGIB.

Inclusion and exclusion criteria

Patients aged ≥18 years, of either sex, presenting with features suggestive of UGIB, such as hematemesis and/or melena, were enrolled in the study. UGIB was established by endoscopic demonstration of a bleeding source proximal to the ligament of Treitz. Patients with isolated LGIB, no objective evidence of gastrointestinal bleeding, pregnancy, incomplete medical records, or those who were discharged or left against medical advice before completion of evaluation were excluded.

Ethical considerations

The study was conducted in accordance with the ethical standards of the Institutional Ethics Committee of SGPGIMS. Ethical approval was obtained (IEC Code: 2019-161-IP-EXP-11, PGI/BE/623/2019; 11th Institutional Ethics Committee meeting). The committee waived the requirement for individual informed consent, given the non-interventional, observational nature of the study, which posed minimal risk to the participants, and without altering the standard patient management.

It is important to note that the original approval was granted before the commencement of the study. Due to delays caused by the COVID-19 pandemic, the study timeline was extended. This extension was granted in accordance with institutional guidelines, post COVID-19 extension, ensuring ongoing compliance with ethical standards. Patient confidentiality was protected by keeping all data anonymized and coded, with restricted access in password-protected systems, ensuring strict confidentiality and adherence to data protection standards.

Data collection

Data were prospectively collected using a pre-designed and pre-approved standardized case reporting form by trained emergency medicine residents under the supervision of attending consultants. At admission, each patient was evaluated, and information was recorded on demographic characteristics, age, and gender. Clinical parameters recorded at presentation: heart rate (HR), blood pressure (BP), respiratory rate (RR), oxygen saturation (SpO_2), and presence of shock. Clinical presentation: type of bleeding and presenting

symptoms (gastrointestinal, respiratory, neurological). Comorbid conditions: diabetes mellitus (DM), hypertension (HTN), chronic liver disease (CLD), chronic kidney disease (CKD), and hematological disorders. Laboratory parameters included hemoglobin level, blood urea, serum creatinine, and coagulation profile. The following variables were predefined candidate predictors of in-hospital mortality based on clinical relevance and prior evidence: demographic factors, vital signs at presentation, comorbidities, laboratory parameters, etiology of bleeding, and treatment-related variables including transfusion requirements and need for endoscopic intervention. Management strategies included intravenous fluids, transfusion of packed red blood cells (PRBC), fresh frozen plasma (FFP), and single donor platelets (SDP), vasoactive support, and endoscopic intervention where required. Data collection followed standardized institutional protocols to ensure uniformity. Missing data were minimal due to prospective collection; cases with incomplete key variables or outcome data were excluded, and no imputation was performed.

Severity scoring systems

Glasgow Blatchford score (GBS)

GBS was calculated at initial presentation using standard clinical and laboratory parameters blood urea nitrogen (BUN), Hb, SBP, PR, presentation with melena or syncope, and history of hepatic or cardiac disease) prior to endoscopic evaluation. Patients were stratified into low-risk (GBS ≤2) and high-risk (GBS >2) groups. A threshold of ≤2 was selected to identify patients at very low risk of requiring hospital-based intervention, as validated in previous studies demonstrating high negative predictive value for adverse outcomes.[26,27]

qSOFA score

The quick Sequential Organ Failure Assessment (qSOFA) score was calculated at presentation in the ED using three clinical parameters: RR ≥22/min, SBP ≤100 mmHg, and altered mentation (Glasgow Coma Scale <15). Each variable was assigned one point, yielding a total score of 0 to 3. A qSOFA score ≥2 was considered high risk. The score was recorded before endoscopic intervention and evaluated for its ability to predict in-hospital mortality.

Emergency severity index (ESI)

The five-level ESI triage score was assigned at presentation in the emergency department by a trained triage physician according to standard criteria. Patients were categorized based on acuity level and anticipated resource needs, with ESI levels 1–2 defined as high acuity.

All scoring systems (GBS, qSOFA, and ESI) were recorded at initial presentation prior to endoscopic evaluation and before outcome occurrence. Although formal blinding was not feasible due to the observational design, score assignment preceded outcome assessment, thereby minimizing bias.

Endoscopic evaluation and intervention

All patients with suspected UGIB underwent upper gastrointestinal endoscopy within 24 hours of admission or earlier in hemodynamically unstable patients after initial resuscitation for diagnostic evaluation and therapeutic management according to institutional protocol. Endoscopy was performed to identify the source of bleeding and to classify lesions as variceal or non-variceal in origin. Variceal sources included esophageal varices, gastric varices, and portal hypertensive gastropathy, whereas non-variceal causes included PUD (gastric or duodenal ulcers with stigmata of recent hemorrhage such as active bleeding, visible vessels, or adherent clots), erosive gastritis, duodenitis, esophagitis, and Mallory-Weiss tears.

Hemostasis was achieved using a multimodal approach, including injection therapy with diluted adrenaline (1:10,000) with or without sclerosants, thermal coagulation (heater probe, bipolar electrocoagulation, argon plasma coagulation), and mechanical methods such as hemoclips and endoscopic variceal ligation. High-risk ulcers received intravenous proton pump inhibitor infusion for 72 hours. The interventions were performed by consultants with more than five years of experience in emergency endoscopy.

Definitions of key clinical variables

Shock: Characterized by inadequate tissue perfusion, defined by criteria such as systolic blood pressure <90 mmHg, a mean arterial pressure (MAP) less than 65 mmHg, or requiring vasopressor support.

Hematological cause: Bleeding due to blood disorders such as thrombocytopenia, coagulation factor deficiencies, or hematological malignancies.

Drug history: Recent or ongoing use of medications known to affect coagulation or increase bleeding risk, including anticoagulants, antiplatelet, non-steroidal anti-inflammatory drugs, or corticosteroids.

Central nervous system (CNS) Symptoms: Neurological symptoms such as altered consciousness, dizziness, confusion, or loss of consciousness.

Respiratory symptoms: Symptoms indicating respiratory compromise, such as dyspnea, tachypnea, hypoxia, or cough.

Renal symptoms: Symptoms such as dysuria, hematuria, flank pain, and decreased urine output.

Gastrointestinal (GI) symptoms: Symptoms related to gastrointestinal bleeding or irritation, including hematemesis, melena, hematochezia, abdominal pain, distension, vomiting, or dyspepsia.

Categories of bleeding severity:

Minor: Bleeding that does not require blood transfusion or major intervention; often self-limited.

Moderate: Bleeding requiring blood transfusion or medical intervention but not life-threatening.

Massive: Severe bleeding leading to hemodynamic instability, shock, or requiring urgent major intervention, such as massive transfusion.

Outcome measures

The primary outcome was in-hospital mortality among patients presenting with UGIB. Secondary outcomes included risk stratification according to the GBS, requirement for blood transfusion, need for endoscopic intervention, and the predictive performance of the GBS and ESI for in-hospital mortality.

Statistical analysis

Data was entered into Microsoft Excel and analyzed using IBM SPSS Statistics version 26 (IBM Corp., Armonk, NY, USA). Continuous variables were assessed for normality using the Shapiro-Wilk test and are presented as mean±standard deviation. Comparisons between groups were performed using independent samples t-test or Mann-Whitney U test, as appropriate. Categorical variables are expressed as frequencies and percentages and were compared using the Chi-square test or Fisher's exact test. Given the relatively small sample size and number of outcome events, only univariable analyses were performed to explore associations between clinical variables and in-hospital mortality. Receiver operating characteristic (ROC) curve analysis was performed to evaluate the discriminative ability of GBS and ESI. The areas under the ROC curves (AUROC) were compared using appropriate statistical methods. The GBS cut-off of ≤2 was selected based on prior validation studies demonstrating high sensitivity and clinical utility for identifying low-risk patients. A p-value <0.05 was considered statistically significant.

Results

Clinical characteristics and severity stratification according to GBS

A total of 83 patients presenting with UGIB were included in the study. Based on the GBS, patients were categorized into two groups: GBS ≤2 (n=37; 44.6%) and GBS >2 (n=46; 55.4%), as shown in Table 1. The mean age of the study population was 48.77±14.07 years, with no significant difference between the two groups (p=0.846). Males constituted 72.3% of the cohort, and gender distribution was similar across the two groups (p=0.175).

Patients in the GBS >2 group had significantly worse physiological parameters at presentation. This group demonstrated higher HR (126.28±13.88 vs. 91.49±13.93 beats/min; p<0.001) and RR (27.07±6.44 vs. 20.70±3.76 breaths/min; p<0.001), along with lower SBP (101.87±18.25 vs. 119.81±23.09 mmHg; p<0.001) and SpO_2 (94.11±3.65% vs. 98.03±1.96%; p<0.001). Diastolic BP did not differ significantly between the groups (p=0.961).

Comorbid illnesses were more frequent in the GBS >2 group (91.3% vs. 75.7%), although the difference did not reach statistical significance (p=0.052). There were no significant differences between the groups with respect to DM, HTN, CKD, or CLD.

Hematological causes of bleeding were significantly more common in the GBS >2 group (36.96% vs. 2.7%; p<0.001), as was a positive drug history (80.4% vs. 56.8%; p=0.019). Central nervous system symptoms

were observed more frequently in patients with GBS >2 (65.2% vs. 2.7%; p<0.001). All patients in the GBS >2 group presented with features of shock, whereas none in the GBS ≤2 group did (p<0.001).

Patients with GBS >2 required more intensive management. All patients in this group received PRBC, RDP, FFP, and central venous access (p<0.001 for all). SDP transfusion was required in 50% of patients in the GBS >2 group, while none in the GBS ≤2 group required this intervention (p<0.001). CT imaging was performed more frequently in the GBS >2 group (71.7% vs. 2.7%; p<0.001). In contrast, therapeutic interventions were more commonly performed in patients with GBS ≤2 (70.3% vs. 41.3%; p=0.008).

Regarding outcomes, patients with GBS ≤2 were more frequently transferred to the ward (43.2% vs. 4.3%; p<0.001). Mortality was significantly higher in the GBS >2 group (39.1% vs. 0%; p<0.001). All patients in the GBS >2 group had a qSOFA score ≥2 at presentation, reflecting greater severity of illness (p<0.001).

Patients with a GBS >2 exhibited more severe clinical presentations, greater need for transfusions and invasive monitoring, higher incidence of shock and central nervous system involvement, and significantly higher mortality compared with patients with lower GBS scores.

Table 1. Distribution of demographic and clinical variables between Glasgow-Blatchford Bleeding score (GBS) categories (n=83)

Variables	GBS		Total (n=83)	p
	≤2 (n=37)	>2 (n=46)		
Age	49.11±16.12	48.5±12.37	48.77±14.07	0.846
Gender				
Male	24 (64.86)	36 (78.26)	60 (72.29)	0.175
Female	13 (35.14)	10 (21.74)	23 (27.71)	
HR (beats/min)	91.49±13.93	126.28±13.88	110.77±22.22	<0.001
SBP (mmHg)	119.81±23.09	101.87±18.25	109.87±22.3	<0.001
DBP (mmHg)	61.89±22.15	62.07±8.36	61.99±15.93	0.961
RR (breaths/min)	20.7±3.76	27.07±6.44	24.23±6.25	<0.001
SPO_2 (%)	98.03±1.96	94.11±3.65	95.86±3.59	<0.001
Comorbid illness				
Yes	28 (75.68)	42 (91.3)	70 (84.34)	0.052
No	9 (24.32)	4 (8.7)	13 (15.66)	
DM				
Yes	14 (37.84)	15 (32.61)	29 (34.94)	0.619
No	23 (62.16)	31 (67.39)	54 (65.06)	
HTN				

Yes	11 (29.73)	14 (30.43)	25 (30.12)	0.945
No	26 (70.27)	32 (69.57)	58 (69.88)	
CKD				
Yes	6 (16.22)	9 (20)	15 (18.29)	0.659
No	31 (83.78)	36 (80)	67 (81.71)	
CLD				
Yes	25 (67.57)	39 (84.78)	64 (77.11)	0.064
No	12 (32.43)	7 (15.22)	19 (22.89)	
Hematological cause				
Yes	1 (2.7)	17 (36.96)	18 (21.69)	<0.001
No	36 (97.3)	29 (63.04)	65 (78.31)	
Drug history				
Yes	21 (56.76)	37 (80.43)	58 (69.88)	0.019
No	16 (43.24)	9 (19.57)	25 (30.12)	
CNS symptoms present				
Yes	1 (2.7)	30 (65.22)	31 (37.35)	<0.001
No	36 (97.3)	16 (34.78)	52 (62.65)	
Shock present				
Yes	0 (0)	46 (100)	46 (55.42)	<0.001
No	37 (100)	0 (0)	37 (44.58)	
Intervention performed				
Yes	26 (70.27)	19 (41.3)	45 (54.22)	0.008
No	11 (29.73)	27 (58.7)	38 (45.78)	
PRBC				
Yes	0 (0)	46 (100)	46 (55.42)	<0.001
No	37 (100)	0 (0)	37 (44.58)	
RDP				
Yes	0 (0)	46 (100)	46 (55.42)	<0.001
No	37 (100)	0 (0)	37 (44.58)	
SDP				
Yes	0 (0)	23 (50)	23 (27.71)	<0.001
No	37 (100)	23 (50)	60 (72.29)	
FFP				
Yes	13 (35.14)	46 (100)	59 (71.08)	<0.001

No	24 (64.86)	0 (0)	24 (28.92)	
PIVC				
Yes	37 (100)	45 (97.83)	82 (98.8)	0.367
No	0 (0)	1 (2.17)	1 (1.2)	
CIVC				
Yes	0 (0)	46 (100)	46 (55.42)	<0.001
No	37 (100)	0 (0)	37 (44.58)	
RT lavage				
Yes	0 (0)	46 (100)	46 (55.42)	<0.001
No	37 (100)	0 (0)	37 (44.58)	
CT scan performed				
Yes	1 (2.7)	33 (71.74)	34 (40.96)	<0.001
No	36 (97.3)	13 (28.26)	49 (59.04)	
Transfer to ward				
Yes	16 (43.24)	2 (4.35)	18 (21.69)	<0.001
No	21 (56.76)	44 (95.65)	65 (78.31)	
Outcome of patients/mortality				
Yes	0 (0)	18 (39.13)	18 (21.69)	<0.001
No	37 (100)	28 (60.87)	65 (78.31)	
qSOFA score at presentation				
≥2	0 (0)	46 (100)	46 (55.42)	<0.001
<2	37 (100)	0 (0)	37 (44.58)	

* continuous variables are presented as mean±standard deviation (SD), and categorical variables as number (percentage), comparisons were performed using independent samples t-test for continuous variables and Chi-square test or Fisher's exact test for categorical variables, a $p<0.05$ was considered statistically significant, HR – heart rate, SBP – systolic blood pressure, DBP – diastolic blood pressure, RR – respiratory rate, SpO_2 – peripheral oxygen saturation, GI – gastrointestinal, PRBC – packed red blood cells, RDP – random donor platelets, SDP – single donor platelets, FFP – fresh frozen plasma, PIVC – peripheral intravenous cannula, CIVC – central intravenous cannula, RT – Ryle's tube, CT – computed tomography, CNS – central nervous system, CLD – chronic liver disease, CKD – chronic kidney disease, qSOFA – quick Sequential Organ Failure Assessment

Outcome and mortality analysis

Of the 83 patients with UGIB, 18 (21.7%) died during hospitalization (Table 2). There was no significant difference in age between non-survivors and survivors (45.8±11.2 vs. 49.6±14.7 years; p=0.445). Non-

survivors had significantly higher HR at presentation (129.3±7.9 vs. 105.6±22.2 beats/min; p<0.001), while RR were comparable (p=0.853).

All non-survivors were categorized as high acuity according to the ESI, compared with 55.4% of survivors (p<0.001). Likewise, a qSOFA score ≥2 on day 1 was observed in 100% of non-survivors but in only 43.1% of survivors (p<0.001), reflecting significantly greater physiological severity at presentation among patients who died.

Comorbid illness was present in all non-survivors compared with 80.0% of survivors (p=0.061). CLD was significantly more frequent among non-survivors (100% vs. 70.8%; p=0.009), whereas DM and HTN were less common (p=0.004 and p=0.009, respectively). Hematological causes of bleeding (94.4% vs. 1.5%; p<0.001) and positive drug history (100% vs. 61.5%; p<0.001) were strongly associated with mortality.

Non-survivors more frequently presented with central nervous system (94.4% vs. 21.5%), respiratory (100% vs. 38.5%), and gastrointestinal symptoms (100% vs. 56.9%) (all p<0.001), as well as shock at presentation (100% vs. 43.1%; p<0.001). Moderate to severe bleeding predominated among non-survivors, whereas minor bleeding was observed exclusively in survivors (p<0.001). Transfer to the ward was significantly less frequent among non-survivors (p=0.009). All non-survivors had a GBS >2 at presentation, whereas survivors more frequently had a GBS ≤2 (p<0.001).

Table 2. Comparison of clinical characteristics, clinical presentation, severity scores, management, and outcomes between survivors and non-survivors among patients with UGIB*

Variables	**Outcome of patient/mortality**		
	Yes (n=18)	**No (n=65)**	**p**
Age			
Mean±SD	45.833±11.242	49.585±14.736	0.445
HR (beats/min)			
Mean±SD	129.333±7.881	105.631±22.186	<0.001
RR (breaths/min)			
Mean±SD	22.444±1.886	24.723±6.929	0.853
ESI scoring			
Yes	18 (100%)	36 (55.4%)	<0.001
No	0 (0%)	29 (44.6%)	
qSOFA score at presentation			
≥2	18 (100%)	28 (43.1%)	<0.001
<2	0 (0%)	37 (56.9%)	
Comorbid illness			

Yes	18 (100%)	52 (80%)	0.061
No	0 (0%)	13 (20%)	
DM			
Yes	1 (5.6%)	28 (43.1%)	0.004
No	17 (94.4%)	37 (56.9%)	
HTN			
Yes	1 (5.6%)	24 (36.9%)	0.009
No	17 (94.4%)	41 (63.1%)	
CKD			
Yes	2 (11.1%)	14 (21.5%)	0.502
No	16 (88.9%)	51 (78.5%)	
CAD			
Yes	0 (0%)	0 (0%)	
No	18 (100%)	65 (100%)	
CVA			
Yes	0 (0%)	0 (0%)	
No	18 (100%)	65 (100%)	
CLD			
Yes	18 (100%)	46 (70.8%)	0.009
No	0 (0%)	19 (29.2%)	
Haematological cause			
Yes	17 (94.4%)	1 (1.5%)	<0.001
No	1 (5.6%)	64 (98.5%)	
Drug history			
Yes	18 (100%)	40 (61.5%)	<0.001
No	0 (0%)	25 (38.5%)	
CNS symptoms present			
Yes	17 (94.4%)	14 (21.5%)	<0.001
No	1 (5.6%)	51 (78.5%)	
Respiratory symptoms			
Yes	18 (100%)	25 (38.5%)	<0.001
No	0 (0%)	40 (61.5%)	
GI symptoms			
Yes	18 (100%)	37 (56.9%)	<0.001

No	0 (0%)	28 (43.1%)	
Renal involvement			
Yes	2 (11.1%)	14 (21.5%)	0.502
No	16 (88.9%)	51 (78.5%)	
Bleeding			
Minor	0 (0%)	30 (46.2%)	<0.001
Moderate	17 (94.4%)	9 (13.8%)	
Massive	1 (5.6%)	26 (40%)	
Shock			
Yes	18 (100%)	28 (43.1%)	<0.001
No	0 (0%)	37 (56.9%)	
Intervention performed			
Yes	0 (0%)	45 (69.2%)	<0.001
No	18 (100%)	20 (30.8%)	
Transfer to ward			
Yes	0 (0%)	18 (27.7%)	0.009
No	18 (100%)	47 (72.3%)	
GBS			
≤2	0 (0%)	37 (56.9%)	<0.001
>2	18 (100%)	28 (43.1%)	

* values are expressed as mean±standard deviation or number (percentage), $p<0.05$ was considered statistically significant, ESI – emergency severity index

Predictive performance of GBS and ESI for in-hospital mortality

ROC curve analysis demonstrated that both scoring systems were significant predictors of in-hospital mortality (Fig. 1). The GBS showed good discriminative ability, with an AUROC of 0.785 (95% CI: 0.724–0.845; $p<0.001$). The ESI demonstrated a lower but statistically significant discriminative performance, with an AUROC of 0.723 (95% CI: 0.662–0.784; $p<0.001$). Overall, GBS exhibited superior discrimination for predicting mortality compared with ESI.

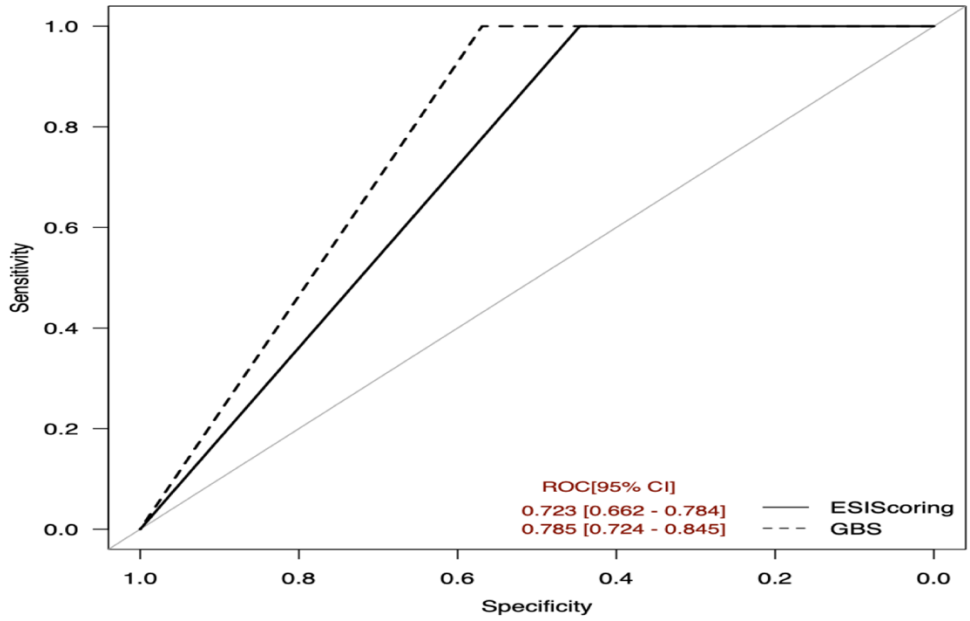

Fig 1. Comparison of the ESI score and GBS in predictive of outcome (in hospital mortality) in UGIB

Discussion

Gastrointestinal bleeding remains a potentially life-threatening emergency, with UGIB broadly categorized into variceal and non-variceal etiologies. PUD, particularly gastric ulcers, continues to be the most common cause, followed by variceal bleeding in patients with underlying liver disease.

In the present study, we explored the association between GBS and clinical outcomes in patients presenting with UGIB. Patients with higher GBS values demonstrated significantly greater transfusion requirements, with rates exceeding those reported in previous literature. This observation may be attributed to our institution being a tertiary referral center, which routinely manages critically ill patients with multiple comorbidities. Comparable transfusion rates approaching 75% have also been reported in studies from other regions, including Turkey.[7,17]

Male predominance was evident in our cohort, consistent with prior findings. Surendran et al. and Shenoy et al. reported a similar sex distribution, with males accounting for 77.5% of cases compared with 22.5% in females.[18] Such trends highlight the higher susceptibility of men to UGIB.

Alok Raj et al. demonstrated that mortality in GIB is strongly associated with derangements in clinical and hemodynamic parameters, including tachycardia, hypotension, tachypnoea, hypoxemia, and low GCS score, in addition to hematological and biochemical abnormalities such as anemia, thrombocytopenia, leukocytosis, hyperlactatemia, and impaired renal function.[19] These results closely parallel our observations, reinforcing the prognostic significance of readily available clinical and laboratory markers.

Comorbidity profiles in our study were dominated by CLD, followed by diabetes and hypertension, aligning with the findings of Alok Raj et al.[19] Similarly, Bhattarai et al. reported CLD in 45.5% of UGIB cases, a

figure comparable to our cohort.[20] Mahajan et al. further demonstrated that comorbidities such as DM and coronary artery disease significantly increased mortality risk.[21] Prior work has also shown that CLD is more frequently linked to variceal bleeding, whereas cardiovascular, cerebrovascular, and malignant diseases are predominant among patients with non-variceal bleeding.[22]

Advanced age and comorbid conditions consistently emerge as independent risk factors for adverse outcomes in UGIB. Despite improvements in diagnostic modalities and therapeutic interventions, mortality rates have remained largely unchanged over recent decades. Kaplan et al. reported that advanced age and even asymptomatic comorbidities significantly worsen outcomes in UGIB patients.[23] In a large cohort of 3,508 emergency department presentations, 83% of deaths were attributable to one or more comorbid conditions. [24]

Independent predictors of poor prognosis identified across studies include older age, male sex, pre-existing comorbidities, coagulopathy, need for transfusion, re-bleeding episodes, high-risk endoscopic findings, and prolonged hospitalization.[25] In our study, mortality was significantly associated with higher GBS, transfusion requirements, non-endoscopic interventions, adverse hemodynamic parameters, and multiple comorbidities, underscoring their importance as prognostic markers in UGIB.

Our findings are in alignment with existing evidence supporting a GBS threshold of >2. A GBS ≤2 has been shown to reliably identify low-risk UGIB patients. Recent work by Chatten et al. demonstrated that a low-risk cutoff of ≤2 preserves a high negative predictive value, with minimal rates of re-bleeding and mortality, while a large meta-analysis confirmed excellent discriminative ability and a low requirement for hospital-based intervention.[26,27] Consistent with these observations, our study found that patients with a GBS >2 exhibited greater physiological derangement, higher transfusion requirements, increased incidence of shock, and significantly higher in-hospital mortality.

Both GBS and ESI predicted mortality; however, GBS demonstrated superior discrimination (AUROC 0.785 vs 0.723). ESI is a general triage acuity tool primarily based on resource utilization and initial clinical assessment, whereas GBS is a disease-specific physiological score. Consequently, GBS better reflects bleeding severity than overall acuity alone. Our findings suggest that ESI identifies critically ill patients, while GBS predicts bleeding-related mortality; therefore, the two tools are complementary rather than interchangeable.

Study limitations

This study has certain limitations. First, as a single-center investigation with a relatively small sample size**,** the results may have limited generalizability to broader populations. Second, the setting in a tertiary care referral hospital likely led to inclusion of more severe cases, introducing referral bias and possibly overestimating mortality and transfusion requirements. Third, the analysis was restricted to in-hospital outcomes**,** without evaluation of longer-term endpoints such as re-bleeding or 90-day mortality.

Conclusion

The GBS effectively stratified severity and predicted in-hospital mortality in UGIB, outperforming the ESI. A GBS >2 identifies patients at high risk for adverse outcomes and mortality, supporting its use for early ED risk assessment.

Declarations

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Author contributions

Conceptualization, A.D.J. and A.V.; Methodology, A.D.J. and A.V.; Software, A.D.J. and A.V.; Validation, A.D.J., A.V., O.P.S., A.K., A.G. and R.K.S.; Formal Analysis, A.D.J., A.V. and R.K.S.; Resources, A.D.J. and A.V.; Data Curation, A.D.J. and A.V.; Writing – Original Draft Preparation, A.D.J.; Writing – Review & Editing, A.D.J. and A.V.; Visualization, A.D.J., A.V., O.P.S., A.K., A.G. and R.K.S.; Supervision, A.V. and R.K.S.

Conflicts of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Data availability

Due to privacy and confidentiality concerns, the data are not publicly available. However, they may be made available upon reasonable request to the corresponding author, subject to the completion of a signed data access agreement.

Ethics approval

The protocol was approved by the Institutional ethics committee (IEC Code: 2019-161-IP-EXP-11, PGI/BE/623/2019; 11th Institutional Ethics Committee meeting).

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