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Original Article

Diagnostic Accuracy of Harbinger Score by Comparing It with Glasgow Blatchford (GBS) for Prediction of Early Endoscopic Intervention Need in Patients with Upper Gastrointestinal Bleed (UGIB)

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ABSTRACT

Accurate risk assessment techniques are crucial to aid in clinical decision-making on the need for early endoscopic intervention in patients with upper GI bleed. The Glasgow-Blatchford Score and the Harbinger Score are two popular scoring systems; however, it is uncertain how accurate their comparative diagnostic abilities are. **Objective:** To evaluate and compare the diagnostic precision of the Harbinger Score and the Glasgow-Blachford Score in determining the need for early endoscopic intervention among patients experiencing upper gastrointestinal bleeding (UGIB). **Methods:** 278 UGIB patients who came to the Department of Gastroenterology, Liaqat National Hospital, Karachi, between July 2022 and June 2023 were enrolled. Demographic, clinical information and scores for Harbinger and Glasgow-Blatchford rating systems were derived for each patient. Outcome measure was the requirement for early endoscopic intervention. Diagnostic accuracy was determined and contrasted for both scoring systems. **Results:** 192 (69.06%) were male, 86 (30.93%) female. Age ranged from 16 to 80 years, with a mean of 65.5±16.4. 117 patients (42.08%) presented with dyspepsia and heartburn and syncope in 6 (2.15%). Mortality AUC was 0.761 for GBS and 0.532 for Harbinger score, p-value <0.002. Both Harbinger and GBS scored >14 and 1. GBS specificity was 88% and Harbinger 54%, while susceptibility was 80% (90% CI: 35.9-95.8) for both scores. The intensive care AUC was 0.769 for GBS and 0.531 for Harbinger score, with a p-value <0.002. **Conclusions:** According to this study, Harbinger score had better sensitivity than GBS for predicting upper GI bleeding.

INTRODUCTION

Upper gastrointestinal bleeding is a serious medical disorder with high morbidity and mortality (UGIB). To get the best results, patients needing early endoscopic intervention must be identified promptly [1]. Different risk assessment scoring methods have been created to help doctors decide when to conduct endoscopy on UGIB patients [2]. The Glasgow-Blatchford and Harbinger scores are popular scoring systems used for this [3]. Peptic ulcers, esophageal varices, Mallory-Weiss rips, and other underlying gastrointestinal disorders may lead to UGIB, a common medical emergency [4]. Endoscopic timely and suitable intervention may locate the bleeding source, promote hemostasis, and lower the risk of rebleeding and related consequences [5]. Age, vital signs, comorbidities, and laboratory results are among the clinical and laboratory factors the Harbinger Score integrates to classify patients into risk groups. The Glasgow-Blatchford Score, on the other hand, evaluates the necessity for endoscopy by combining clinical and endoscopic data, including hemoglobin levels, melena, and active bleeding. Despite the widespread usage of these scoring systems, study is still being done to determine their comparative diagnostic efficacy and capacity to foretell the need for early endoscopic intervention [6, 7]. We compared the

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sensitivity, specificity, and AUC-ROC of the Harbinger and Glasgow-Blatchford scores to get clinical insights. These results help clinical practice guidelines and healthcare practitioners make more accurate and timely UGIB treatment choices.

METHODS

This descriptive validation study was carried out at the department of Gastroenterology, Liaqat National Hospital, Karachi during the period between July 2022 and June 2023. This study consisted of 278 male and female patients in age range 16 to 80 years with UGIB. UGIB was defined as patient complaining of hematemesis or melena accompanied by drop in hemoglobin concentration by more than 2gm/dl from the baseline. Patients with history of proton pump inhibitors (PPIs) intake in the last 2 weeks, patients with history of corrosive intake, patients complaining of UGIB after any medical procedures, patients with history of gastric malignancy and patients taking antiplatelets or anticoagulants were excluded. Participants were recruited using non-probability consecutive sampling technique. The sample size was determined using WHO sample size calculator using 5% margin of error at 95% confidence interval. Detailed history was taken from all patients followed by medical examination. Patient age, gender, vital signs at the time of admission (blood pressure, heart rate, respiration rate), laboratory results (hemoglobin levels, platelet count, international normalized ratio), comorbidities, clinical presentation (melena, hematemesis), and endoscopic findings were all recorded. Patients had upper gastrointestinal endoscopy as part of their diagnostic workup, had full data available for both the Harbinger and Glasgow-Blatchford scoring systems, and presented with signs and symptoms indicating UGIB. The main outcome measure was the requirement for early endoscopic intervention, defined as an upper gastrointestinal endoscopy carried out within 24 hours after admission. The patient features were summarized using descriptive statistics. The calculation of the Glasgow-Blachford Score (GBS) included the allocation of points to several criteria, including hemoglobin levels, melena, and active bleeding, in accordance with established rules. The cumulative score for the Harbinger Score was determined in a similar manner, taking into account factors including age, vital signs, laboratory results, and comorbidities. The statistical analysis was conducted using SPSS 26.0. The patient features were summarized via descriptive statistics. The sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and the area under the receiver operating characteristic curve (AUC-ROC) were used to evaluate the diagnostic accuracy of both scores. A comparative study was performed on the two scoring systems using suitable statistical techniques. The statistical significance of discrepancies in diagnostic accuracy was assessed using paired t-tests or their non-parametric counterparts. This study followed ethical guidelines and obtained under reference number CPSP/REU/GAS-2019-192-1032, dated February 25, 2022. The confidentiality of patient data was maintained in compliance with data protection legislation.

RESULTS

In this study, a total of 278 patients were included. Among these patients, 192 (69.06%) were male, while 86 (30.93%) of the study population were female. The age distribution of the patients ranged from 16 to 80 years, with a general mean age of 65.5±16.4. When we examined the mean ages separately by gender, the average age for male patients was 55.6±18.9, whereas the female patients had an average age of 64.2±15.7 (Table 1).

Table 1: Demographic Parameters

Parameter	Frequency (%)/ Mean ± SD (n=278)
Gender	
Male	192 (69.06)
Female	86 (30.94)
Age (Range: 16-80 years)	
Overall	65.5 ± 16.4 years
Male	55.6 ± 18.9 years
Female	64.2 ± 15.7 years

Dyspepsia and heartburn were the most common symptoms in 117 (42.08%). Sixty-seven patients (24.10%) reported stomach pain, 55 (9.78%) nausea/vomiting, 8 (2.87%) dizziness, and 6 (2.15% syncope). 135 (48.56%) were diabetic, 139 (50%) were hypertensive, 13 (4.67%) were asthmatic, and 37 (13.30%) were suffering from ischemic heart disease. Melena was the most prevalent bleeding in 164 (58.99%) cases and hematemesis in 192 (69.06%). Hematemesis occurred in ten patients (3.59%). The study additionally examined the patients' bleeding history. One hundred eighty-five patients (66.54%) had none. Eighty-one patients did not take any medication (29.13%). Some patients used particular medicines, such as antiplatelet agents 9 (3.23%), anticoagulants 15 (5.39%), new generation anticoagulants 11 (3.95%), non-steroidal anti-inflammatory drugs 8 (2.87%), and 38 (13.66%). These findings provide information on the patient group (Table 2).

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Table 2: Patient complaints, bleeding types and Medication parameters

Parameter	Number of Patients (%) n=278
Patient Complaints at Admission	
Dyspepsia and Heartburn	117 (42.08)
Abdominal Pain	67 (24.10)
Nausea/Vomiting	55 (19.78)
Dizziness	8 (2.87)
Syncope	6 (2.15)
Diabetes	135 (48.56)
Hypertension	139 (50)
Asthma	13 (4.67)
IHD	37 (13.30)
Bleeding Types	
Melena	164 (58.99)
Hematemesis	192 (69.06)
Hematemesis and Active Bleeding	10 (3.59)
History of Bleeding	
No History	185 (66.54)
Medication Use	
No Medication	81 (29.13)
Antiplatelet Agents	9 (3.23)
Anticoagulants	15 (5.39)
New Generation Anticoagulants	11 (3.95)
Non-Steroidal Anti-Inflammatory Drugs	8 (2.87)
Other Drugs	38 (13.66)

GBS and Harbinger patients were assessed using numerous critical factors. First, systolic blood pressure (BP) was divided into three ranges: 1 for 100–160 mmHg, 2 for 80–99, and 3 for below 80. The shock index, which assesses heart rate and systolic blood pressure, scored 1 for values between 0.5 and 1.32. Urea levels, which indicate renal function, were classified into four groups. Patients with urea levels between 6.5 and 10 mmol/L scored 2, whereas those with 10–20 scored 3. Urea levels between 20 and 25 mmol/L were rated 4, while those beyond 25 were awarded 6. The kidney function marker urea/creatinine ratio scored 1 for levels above 130. Anemia was determined by hemoglobin concentration, which was divided into three categories. Scores were 1 for hemoglobin levels between 14 and 14.7 gr/dL, 3 for 12–13.9 gr/dL, and 6 for below 12 gr/dL. Proton pump inhibitor (PPI) usage was also recorded, with scores of 1 and 2 indicating 1-2 uses per week. If the heart rate was 90 beats per minute or above, it was scored 1. The risky symptom syncope scored 6. Hepatic illness and melena (black tarry stool) scored 1 and 2. Final score: 4 for cardiac failure. These parameter-point connections in the GBS and Harbinger scoring systems help doctors evaluate patient gastrointestinal bleeding severity and risk, guiding medical actions and management options (Table 3).

Table 3: The attributes of scoring systems

GBS		HARBINGER	
Parameters	**Point**	**Parameters**	**Point**
Systolic BP mmHg	1 (100-160) 2 (80-99) 3 (<80)	Shock index	1 (.5-1.32)
Urea mmol/L	2 (6.5-10) 3 (10-20) 4 (20-25) 6 (>25)	Urea/creatinine	1 (≥130)
Hemoglobin gr/dL	1 (14-14.7) 3 (12-13.9) 6 (<12)	PPI use (in a week)	1-2
Heart rate	1 (≥90)	-	-
Syncope	6	-	-
Hepatic disease	1	-	-
Melena	2	-	-
Cardiac failure	4	-	-

The mean ± SD and median (IQR20-85) values for systolic blood pressure were 120.5±15.7 mmHg and 110 (120-130) mmHg, respectively. For diastolic blood pressure, 42.02±14.3 mmHg and 50 (54-75) mmHg, respectively. Respiratory rates were 11.3±8.5 /min and 16 (0-20) /min. For heart rate, the values were 95.8±20.4 bpm and 90 (85-139) bpm. Values for hospitalization were 105.3±138.6 hours and 75 (25-78) hours. Blood transfusions were 1.6±1.4 and 1 (0-2) units, respectively. Values for GBS were 8.7±4.6 and 6 (5-12), respectively. For the Harbinger score, the mean ± SD and median values were 1.6±0.8 and 1 (1-2), respectively (Table 4).

Table 4: The measurement of vital signs and the calculation of score averages

Variables	units	Mean ± SD	median (IQR20-85)
Systolic Blood Pressure	mmHg	120.5±15.7	110 (120-130)
Diastolic Blood Pressure	mmHg	42.02±14.3	50 (54-75)
Respiratory rate	/min	11.3±8.5	16 (0-20)
Heart rate	Bpm	95.8±20.4	90 (85-139)
Hospitalization	Hours	105.3±138.6	75 (25-78)
Blood Transfusion	number	1.6±1.4	1 (0-2)
GBS	Score	8.7±4.6	6 (5-12)
HARBINGER	Score	1.6±0.8	1 (1-2)

GBS and Harbinger scores were evaluated for mortality, critical care, rebleeding, and transfusion. Mortality AUC was 0.761 for GBS and 0.532 for Harbinger score, p-value <0.002. Both Harbinger and GBS scored >14 and 1. GBS specificity was 88% and Harbinger 54%, while susceptibility was 80% (90% CI: 35.9-95.8) for both scores. The intensive care AUC was 0.769 for GBS and 0.531 for Harbinger score, with a p-value <0.002. The cut-off values for GBS and Harbinger scores were >12 and <2, respectively. Harbinger score sensitivity was 96.3% and GBS 64.5% (90% CI: 44-86.5). GBS specificity was 84.6% (95% CI: 74.1-85.2) and Harbinger score 14.01%. Rebleeding had a p-value of

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0.011, GBS AUC of 0.695, and Harbinger score of 0.490. The cut-off values for GBS and Harbinger scores were >11 and <1, respectively. Harbinger score sensitivity was 1% and GBS 64.4% (90% CI: 34.2-81.6). Harbinger score was 96.6%, and GBS specificity was 67.8% (95% CI: 62.4-78.4). GBS AUC was 0.767, Harbinger score 0.510, p-value 0.281 for transfusion. Both Harbinger and GBS scored >6 and >2. Harbinger score sensitivity was 57.2% [45.6-65.2], whereas GBS was 75.6% (90% CI: 65.8-83.2). GBS specificity was 84.55% (95% CI: 73.7-85.4), and Harbinger scored 58.2% (Table 5).

Table 5: All risk score ROC values for clinical outcome prediction and diagnostic accuracy

Variables		GBS	HARBINGER	*p-value*
	AUC	0.761	0.532	<0.002
	Cut-off	>14	>1	
	Sensitivity (90% CI)	80 35.9-95.8	80 35.9-95.8	
Mortality	Specificity (95% CI)	88 84.7-94	54 45.6-60.8	
Intensive care	AUC	0.769	0.531	<0.002
	Cut-off	>12	>2	
	Sensitivity (90% CI)	64.5 44-86.5	96.3 77.3-98.6	
	Sensitivity (95% CI)	84.6 74.1-85.2	14.01 6.5-17.2	
Rebleeding	AUC	0.695	0.490	0.011
	Cut-off	>11	>1	
	Sensitivity (90% CI)	64.4 34.2-81.6	1 1-22.6	
	Sensitivity (95% CI)	67.8 62.4-78.4	96.6 92.4-96.4	
Need for transfusion	AUC	0.767	0.510	0.281
	Cut-off	>6	>2	
	Sensitivity (90% CI)	75.6 65.8-83.2	57.2 45.6-65.2	
	Sensitivity (95% CI)	84.55 73.7-85.4	58.2 44.6-67.4	

DISCUSSION

This study showed that the Harbinger score outperformed other measures in predicting the requirement for intensive care in upper GI hemorrhage. The primary purpose of using UGIB risk scores is to identify persons who are at a low risk for UGIB. The development of tools that can effectively categorize high-risk patients is essential due to the crucial nature of the clinical screening process [8]. In previous studies, the primary stage in the provision of healthcare to patients was evaluating the extent of haemorrhaging [9]. Systemic arterial hypotension often arises as a prevalent consequence in cases of severe bleeding, especially when a substantial loss of 20-25% of the intravascular volume occurs, leading the patient to experience hypovolemic shock [10]. Gastrointestinal bleeding is well recognized as a primary etiological factor contributing to the development of hypovolemic shock [11]. The shock index, which is calculated by dividing the heart rate by the systolic blood pressure, serves as a reliable measure of blood loss sensitivity. Consequently, it may be used as a prognostic tool for predicting the outcomes of patients with hypovolemia [12]. Moreover, it is the most crucial aspect of the Harbinger score. Based on several studies, it has been shown that the shock index lacks clinical use in prognosticating outcomes in cases of upper gastrointestinal haemorrhage, since its predictive capacity is limited to short-term adverse consequences [13, 14]. According to the findings of the study, the Harbinger score shown efficacy in low-risk people. However, the shock index did not exhibit utility in predicting unfavorable outcomes after hospitalization for patients with upper gastrointestinal haemorrhage, as per the research [15]. According to this study, the GBS was determined to be the best predictor of the requirement for intensive care (AUC=0.531) (p0.002). The observed phenomenon may be attributed to the demographic characteristic of upper gastrointestinal bleeding patients, who often consist of older individuals afflicted with chronic ailments. The mean age in our group of participants was 65.5 ± 16.4 years, a finding consistent with previous research [16]. A significant proportion of the patient, used medicine to manage their chronic illnesses effectively. In previous research endeavors, hypertension emerged as the prevailing chronic ailment, but in our investigation, it manifested in 50% of the patient cohort [17, 18]. Antihypertensive medications have the potential to mask or alter pulse and blood pressure readings, hence influencing shock index values and subsequent clinical results. It is noteworthy to mention that both the GBS and Harbinger scores include heart rate and blood pressure measurements. While age does not directly contribute to the scoring system, several studies have provided evidence indicating that advanced age has an impact on both the duration of intensive care unit (ICU) stays and fatality rates [19]. GBS >14, AUC 0.761, and statistically significant difference (p=0.002) were found in our investigation. No research has determined the GBS score cut-off for intensive care. Greater area under the curve (AUC) values, even when using lower cut-off values, signify the superior predictive capability of the GBS score in relation to the Harbinger score for intensive care prognosis. Albumin is a GBS score factor. GI blood loss is a major cause of hypoalbuminemia [20]. The GBS score predicted upper GI bleeding mortality without statistical significance. The GBS score had a superior area under the curve (AUC) value of 0.761 compared to the Harbinger score, which showed no predictive capability for death. The GBS score

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demonstrated a suboptimal predictive ability for re-bleeding, as shown by its position below the curve. Furthermore, there was no statistically significant disparity seen. The GBS predicted blood transfusions better and had a larger AUC (0.767) area (p=0.281). For in-hospital adverse events, the Harbinger score solely predicted blood transfusion (AUC =0.510).

CONCLUSIONS

The technique used in this study enabled an in-depth evaluation of the Harbinger Score and the Glasgow-Blatchford Score in their ability to predict the need for early endoscopic intervention in patients with upper gastrointestinal bleeding (UGIB). Harbinger score showed better sensitivity than GBS for predicting the need for early endoscopic intervention.

Authors Contribution

Conceptualization: MMUH
Methodology: BR, MMUH, RKW
Formal analysis: BR
Writing-review and editing: BR, RKW

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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