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The Validation of Rockall Scoring System in Predicting Outcomes from Variceal Bleeding in Sudanese Patients: A Cross-sectional Study

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Abstract

Objective: This study aims to evaluate the validation of the Rockall scoring system in predicting the outcomes of variceal bleeding among Sudanese patients.

Materials and methods: A cross-sectional hospital-based study involved 150 adult Sudanese patients presenting with Upper Gastrointestinal Bleeding (UGIB) of variceal origin. Patients with UGIB resulting from causes other than varices were excluded. Data were collected through a structured questionnaire complemented by upper gastrointestinal tract endoscopy findings, and patients were followed up until discharge.

Results: The study encompassed 150 patients, predominantly male (117, 78%), aged between 18 and 60 years (n=119, 79%), residing mainly in central regions (134, 89%). The leading presenting complaints included hematemesis (70, 46.7%) and melena (22, 14.6%). Notably, peri-portal fibrosis (101, 67.3%) and cirrhosis (24, 16%) were the primary etiological factors, with a significant prevalence of alcohol consumption (87, 58%). Concerning the grade of esophageal varices, grades III and IV were most prevalent (67, 44.7% and 47, 31.3%, respectively), and fundal varices were identified in 13 patients (8.7%). The mean Rockall score was 3.83±1.99, indicating moderate severity. Additionally, the Rockall score showed significant associations with the number of sessions, complications, bleeding recurrence, duration of hospital stay, and mortality ($p<0.05$).

Conclusion: Understanding the significance of the Rockall scoring system and its applicability to Sudanese patients with variceal bleeding has the potential to guide more effective strategies in the management of upper gastrointestinal tract bleeding, ultimately improving patient outcomes and reducing morbidity and mortality.

Keywords: Rockall score • Upper GI bleeding • Variceal bleeding • Sudan

Introduction

Upper Gastrointestinal Bleeding (UGIB) is a prevalent issue, occurring at a rate of approximately 80 to 150 cases per 100,000 individuals annually. Its associated mortality rates are estimated to range from 2% to 15%. UGIB is defined as any form of blood loss originating from the gastrointestinal tract above the ligament of Treitz. Clinical manifestations may include hematemesis (vomiting bright red blood or coffee-ground-like material), hematochezia, or melena. Patients may also exhibit symptoms resulting from blood loss, such as fainting episodes, fatigue, and general weakness. UGIB can present as acute, occult, or obscure bleeding [1].

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Among the potential causes of Upper Gastrointestinal Bleeding (UGIB), Peptic Ulcer Disease (PUD) is responsible for 40% to 50% of the cases. Other significant contributors include erosive esophagitis (11%), duodenitis (10%), varices (ranging from 5% to 30% depending on whether the population studied has a chronic liver disease), Mallory-Weiss tear (5% to 15%), and vascular malformations (5%) [2].

ariceal bleeding arises from enlarged veins (varices) situated at the intersection of the portal and systemic venous systems, typically occurring in the lower part of the esophagus or the upper part of the stomach. Individuals experiencing variceal hemorrhage commonly exhibit evident Upper Gastrointestinal Bleeding (UGIB), marked by symptoms such as hematemesis and/or melena. The prognosis for patients suffering from variceal bleeding is closely tied to the intensity of the bleeding incident, liver function, and portal venous pressure [3]. Mortality from variceal bleeding has been found to be as high as 11 per 100 people [4]. In the emergency department, acute variceal hemorrhage is a major cause of mortality and can be challenging to treat. The mortality in a bleeding episode depends on the severity of the underlying liver disease, with rates being less than 10% in well-compensated cirrhotic patients and over 70% in those with advanced cirrhosis. The risk of re-bleeding is also significant, reaching up to 80% within a year [5]. The mortality rate following the first bleeding episode was found to be between 17% and 57% [6], and inadequate management can lead to a high risk of re-bleeding [7].

The Rockall system has demonstrated its efficacy and reliability in predicting the likelihood of re-bleeding and mortality. The Rockall scores incorporate various factors, including the patient's age, the presence of shock as evaluated through systolic blood pressure readings and pulse rate, the existence and severity of coexisting medical conditions, as well as the presence of visible signs of haemorrhage [8]. Previous investigations and validations of the scoring system have revealed that individuals with a score of ≤2 are linked with a notably low incidence of bleeding, recurrence, and mortality, thus enabling their potential management as outpatients. Patients with a Rockall score of ≥3 have a high risk of re-bleeding and mortality, and require hospitalization and intensive care. This offers clinicians an opportunity for a more targeted approach to patient care, tailored to their assessed risk of complications subsequent to the initial Upper Gastrointestinal Bleeding (UGIB) [9].

The Rockall scoring system is particularly useful in predicting the outcomes of variceal bleeding, which is a major cause of UGIB in Sudan [10]. In Sudan, the majority of cases of variceal bleeding are due to schistosomial peri-portal fibrosis [10]. Which is caused by the development of T cell-dependent granuloma around schistosome mansoni eggs, leading to hepatic peri-portal fibrosis [11]?

This study aims to evaluate the validation of the Rockall scoring system in predicting the outcomes of variceal bleeding among Sudanese patients presenting to the Mohammed Salih Idris Bleeding Center (MSIBC) which is the national tertiary referral bleeding center. The results of this study could help to improve the management of patients with variceal bleeding in Sudan, and reduce the risk of re-bleeding and mortality.

The work has been reported in line with the STROCSS criteria [12].

Methods

This cross-sectional, observational study was conducted at the Mohammed Salih Idris Bleeding Center (MSIBC) in Khartoum, Sudan. A total of 150 patients were enrolled in the study. The study comprised patients aged 18 years and older, presenting with upper Gastrointestinal (GI) bleeding of variceal origin, who visited the outpatient and referral clinic at the center and reported primary complaints of upper GI bleeding (UGIB), including hematemesis and/or melena. Patients with upper GI bleeding resulting from causes other than varices, as well as those who declined to participate in the study, were excluded

Variables

The data were collected through interviews conducted by trained medical doctors using structured questionnaire forms, and it was categorized into three sections. The first part included demographic data such as age, gender, occupation, and residence. The second part encompassed the patient's medical history, comprising a history of Schistosomal infection, Hepatitis B and Hepatitis C infections, the cause of portal hypertension, past instances of variceal bleeding, history of alcohol consumption, presenting complaints, history of past endoscopic interventions, and the number of sessions conducted.

The findings from the upper GI endoscopy were collected and included the grade of esophageal varices, endoscopic diagnosis, and evidence of bleeding. The third part encompassed the international Rockall score (Table 1) [13], which included factors such as age, evidence of shock, other co-morbid conditions, the cause of bleeding, and evidence of recent bleeding. Other significant variables collected during the study included the interventions conducted, complications that developed thereafter, occurrences of bleeding recurrence, duration of hospital stay, and instances of mortality.

The upper GI endoscopy was performed within 24 hours of presentation by an experienced gastrointestinal physician or gastrointestinal surgeon. The location and grade of varices were recorded, along with evidence of recent bleeding and details of the intervention method. Following the administration of appropriate pharmacological and endoscopic therapy, patients were monitored for evidence of early re-bleeding or mortality until their discharge from the hospital.

Data analysis

The data were characterized by their range, mean along with standard deviation (±SD), median, frequencies denoting the number of cases, and relative frequencies presented as percentages where appropriate. A paired t-test was utilized to compare quantitative variables for parametric data, while the Chi-square ($\chi 2$) test was employed for comparing categorical data. In cases where the expected frequency was below 5, the exact test was used. A probability value (p-value) below 0.05 was considered to be statistically significant. All statistical computations were conducted using Statistical Package for the Social Sciences (SPSS) version 26.0 for Microsoft Windows (IBM SPSS Statistics, Armonk, NY, USA).

Ethics

All participants provided written, informed consent. Strict confidentiality protocols were implemented to safeguard the privacy and anonymity of the participants. The study received approval from the Mohammed Salih Idris Bleeding Center ethical committee, Khartoum, Sudan.

Results

Seventy-nine percent (n=119) of the patients were aged between 18 and 60 years old, with a male predominance (117, 78%) reported. Additionally, the majority of the patients resided in central states (134, 89%) (Table 2).

Concerning presenting complaints, 70 patients (46.7%) reported hematemesis, 22 patients (14.6%) reported melena, and 58 patients (38.7%) reported experiencing both symptoms. Peri-portal fibrosis was identified as the most common cause (101, 67.3%), followed by cirrhosis (24, 16%), with both causes coexisting in 23 patients (15.3%). Two patients (1.3%) had other causes. A positive history of schistosomiasis was noted in 90 patients (60%), while sixteen patients (10.7%) had a positive hepatitis B screening, and none tested positive for hepatitis C. Fifty-eight percent (n=87) of the patients reported alcohol consumption.

In terms of the grade of esophageal varices, 4 patients (2.7%) had grade I esophageal varices, 19 patients (12.7%) had grade II, 67 patients (44.7%) had grade III, 47 patients (31.3%) had grade IV, and 13 patients (8.7%) were diagnosed with fundal varices.

Fifty-four percent (n=81) of the patients experienced upper gastrointestinal (UGI) bleeding for the first time without a history of prior UGI bleeding.

Table 1. Scoring algorithms for the Rockall scores.

The Rockall Score		
Factor		**Score**
Age (in years)	<60	0
	60–79	1
	>80	2
Shock	No shock	0
	Pulse >100bpm, SBP >100mmHg	1
Co-morbidity	No major	0
	CCF,IHD, or major co-morbidity	2
	Renal failure, liver failure, metastatic cancer	3
Diagnosis	Mallory-Weiss tear or no lesion and no stigmata	0
	All other diagnosis	1
	GI malignancy	2
Evidence of bleeding	No stigmata or dark spot on ulcer	0
	Blood in upper gastrointestinal tract, clot, visible or spurting vessel	2
Maximum Score		11

Table 2. Characteristics of the patients, past history and the intervention were done.

Variable		N=150	%
Age (in years)	18–60	119	79.30%
	60-80	30	20%
	>80 years	1	0.70%
Gender	Male	117	78%
	Female	33	22%
Occupation	Farmer	57	38%
	Professional	5	3.30%
	Students	3	2%
	Unemployed	1	0.70%
	Others	66	44%
Presenting complains	Hematemesis	70	46.70%
	Melena	22	14.60%
	Both	58	38.70%
Cause of UGIB	Peri-portal fibrosis	101	67.40%
	Cirrhosis	24	16%
	Both	23	15.30%
	Other causes	2	1.30%
Past history	Schistosomiases	90	60%
	Hepatitis B	16	10.70%
	Hepatitis C	0	0.00%
	Alcohol consumption	81	58%
Intervention	Sclero-therapy	53	35.30%
	Band ligation	3	2%
	No intervention	94	62.70%

Concerning the past history of endoscopic interventions, 94 patients (62.7%) had not undergone any intervention, 53 patients (35.3%) had received sclerotherapy, and only three patients (2%) had undergone band ligation (Table 2).

The mean Rockall score was calculated to be 3.83±1.99. Regarding the individual element scores, 66 patients (44%) exhibited a pulse rate exceeding 100, while 33 patients (22%) had a systolic blood pressure below 100. Co-morbid conditions were identified in 10 patients (6.7%) with coexistent liver failure, 3 patients (2%) with renal failure, and 2 patients (1.3%) with both conditions. Additionally, three patients tested positive for metastatic cancer, and one patient had ischemic heart disease (IHD). The majority of the patients (129, 86%) had no co-morbidities.

Out of the patients observed, 42 (28%) exhibited no evidence of bleeding, while 91 patients (60.7%) had visible blood, 15 patients (10%) had an adherent clot, and spurting vessels were found in one patient. As for complications, two patients (1.3%) experienced encephalopathy, one patient (1.3%) had renal failure, and the remaining patients (97.3%) did not develop any complications.

There was no statistically significant association between Rockall score and neither the grade of esophageal varices (p value is 0.7) nor with past medical history of endoscopic intervention (p value is 0.538) nor with the current intervention (p value 0.951) (Table 3). In contrast, there was statistically significant association between Rockall score and each of the following: number of cessions (p<0.014), complications (p<0.0001), bleeding recurrence (p<0.001), duration of hospital stay (p<0.002), death (p<0.0001) (Table 3).

Discussion

The majority of individuals within the study population were below the age of 60, a critical demographic representing an important socioeconomic and productive age group. A prior Sudanese study yielded similar findings regarding age [14]. The male gender predominated in the study sample, attributed to the prevalence of males in the agricultural sector in Sudan, which poses a risk of contracting Schistosomal infection. More than half of the study population had a history of Schistosomal infection, with two-thirds developing peri-portal fibrosis as a consequence of this past exposure. Consequently, the major cause of portal hypertension in Sudan is Schistosomal peri-portal fibrosis.

The mean Rockall score was calculated to be 3.83±1.99, which is lower than the result described in another study where the mean Rockall score ranged between 4 and 5 [15]. The incidence of bleeding, as evidenced by endoscopy, was notably higher compared to a previous study conducted in Canada [16], suggesting the severity of variceal bleeding in Sudan.

Regarding the pre-endoscopic Rockall score, our study indicated a 0% mortality rate in individuals with a pre-endoscopic Rockall score of 0 or 1. There was also a statistically significant association between mortality and scores of 2 and above. These results align with a prospective study conducted

Table 3. Illustrate the relationship between the Rockall score and different variables.

Variable	Sub Group	Rockall Score									Total	P-value
		1	2	3	4	5	6	7	8	9	10	
Grade of esophageal varices	I	1	1	1	0	1	0	0	0	0	0	4	0.07
	II	3	3	5	3	2	1	2	0	0	0	19	
	III	10	1	17	12	14	5	1	5	1	1	67	
	IV	4	8	11	12	5	1	3	2	1	0	47	
	Fundal varices	4	2	1	4	2	0	0	0	0	0	13	
Total		22	15	35	31	24	7	6	7	2	1	150	
Complications	Encephalopathy	0	0	0	0	0	0	1	0	1	0	2	0.0001
	Renal failure	0	0	1	0	1	0	0	0	0	0	2	
	None	22	15	34	31	23	7	5	7	1	1	146	
Total		22	15	35	31	24	7	6	7	2	1	150	
Bleeding Recurrence	Yes	0	0	5	0	7	3	1	3	0	0	19	0.001
	No	22	15	30	31	17	4	6	4	2	1	131	
Total		22	15	35	31	24	7	8	7	2	1	150	
Duration of hospital stay	1 day	17	13	23	22	13	4	2	2	1	0	97	0.002
	2 days	5	2	8	9	9	1	4	3	0	0	41	
	3 days	0	0	3	0	2	1	0	2	1	1	10	
	4 days	0	0	1	0	0	1	0	0	0	0	2	
Total		22	15	35	31	24	7	8	7	2	1	150	
Mortality	Yes	0	0	0	0	3	2	0	1	0	1	7	0.0001
	No	22	15	35	31	21	5	6	6	2	0	143	
Total		22	15	35	31	24	7	8	7	2	1	150	

Table 4. Illustrate the association between the pre-endoscopic Rockall score and bleeding recurrence and mortality.

Pre-endoscopic Rockall score	Bleeding recurrence		Mortality	
	Yes (n=19)	No (n=131)	Yes (n=7)	No (n=143)
0	5 (26.2%)	46 (35.1%)	0 (0.0%)	51 (35.7%)
1	1 (5.3%)	43 (32.8%)	0 (0.0%)	44 (30.8%)
2	6 (31.6%)	24 (18.3%)	3 (42.9%)	27 (18.9%)
3	3 (15.8%)	6 (4.6%)	2 (28.6%)	7 (4.5%)
4	1 (5.3%)	6 (4.6%)	0 (0.0%)	7 (4.5%)
5	3 (15.8%)	4 (3.1%)	1 (14.3%)	6 (4.2%)
6	0 (0.0)	2 (1.5%)	1 (14.3%)	1 (0.7%)

by Phang TSM, et al., which reported a mortality rate of 3.2% in the low-risk group [17]. The risk of bleeding recurrence was observed in all patients with scores ranging from 0 to 6, with an overall estimated risk higher compared to a previous study conducted by Sarwar S, et al. [18].

Seven patients, representing 4.7% of the study population succumbed to mortality (Table 4). The mortality rate in our study was lower than that reported in a study conducted in Lahore, where the mortality rate was 6.7% [19]. This difference is likely related to the underlying cause of portal hypertension, as cirrhotic patients commonly decompensate following variceal bleeding, contrasting with the outcomes observed in patients with peri-portal fibrosis [20].

Regarding the pre-endoscopic Rockall score, this study demonstrated a 0% mortality rate in patients with a score of 0 or 1. A statistically significant association between mortality and scores of 2 and above was also observed ($p<0.001$). These findings are in line with a prospective study conducted by Phang TSM, et al., which validated the pre-endoscopic Rockall score and reported a mortality rate of less than 1% in patients with a score of 0 or 1 [17]. The study further revealed a correlation between increasing initial Rockall scores and mortality, suggesting the potential for patient triage into different care models based on their scores.

Another prospective study, involving 358 patients, evaluated the effectiveness of the initial Rockall risk scoring system in predicting re-bleeding and mortality among patients with esophageal varices or peptic ulcers [20]. The study highlighted zero mortality in patients presenting with acute Upper Gastrointestinal Bleeding (UGIB) due to peptic ulcers or varices, and with an initial pre-endoscopic score of 0 to 1. It also confirmed a significant correlation between hospital mortality and scores of 2 and above, which aligns with the findings of our study.

This study, however, encountered some limitations, such as a relatively small sample size, and the lack of post-discharge follow-up to monitor delayed complications or mortality should be noted. Nonetheless, efforts were made to minimize recall bias by utilizing a widely used, valid, and reliable instrument that provided a concise and thorough assessment of upper gastrointestinal bleeding. To overcome this limitation and promote a more universal applicability of research findings, future investigations could benefit from adopting larger sample sizes.

The study represents a pioneering effort in the Sudanese context, addressing a significant research gap. Before this investigation, there was a notable absence of studies validating the Rockall scoring system specifically in the context of variceal bleeding in Sudan. This lack of localized validation studies impeded the establishment of a reliable foundation for clinical decision-making in managing variceal bleeding cases. Recognizing this gap, our study took the initiative to lay the groundwork for future research endeavors in the region. It stands as a significant contribution, providing a vital cornerstone for subsequent research in Sudanese populations, thereby enhancing the understanding and management of variceal bleeding in Sudan.

Conclusion

The findings underscore the importance of this scoring system in predicting outcomes and guiding clinical decision-making for Sudanese patients presenting with variceal bleeding. The study's identification of peri-portal fibrosis as a predominant cause of portal hypertension in Sudan contributes essential knowledge to the local landscape. The observed association between Rockall scores and various clinical outcomes, including mortality and bleeding recurrence, provides a valuable basis for risk stratification and tailored patient management. Importantly, the study addresses a critical research gap by being the first of its kind in Sudan, thereby laying a foundation for future investigations and serving as a cornerstone for enhancing the understanding and management of variceal bleeding in this specific population.

Acknowledgement

Patient consent

Written informed consent was obtained from the patient for publication and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Ethical approval

The study received approval from the Mohammed Salih Idris Bleeding Center ethical committee, Khartoum, Sudan on 2 January 2012.

Conflict of Interest

None.

Assistance with the Study

None.

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None.

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