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Etiology and Short-Term Outcomes of Upper Gastrointestinal Bleeding in Patients Presenting at the Emergency Department in a Tertiary Hospital in a Low Resource Setting–A Prospective Cohort Study

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ABSTRACT

Background: Upper gastrointestinal bleeding (UGIB) is one of the most common medical emergencies. Currently, there is a paucity of data on the clinical profile and outcome of UGIB in resource-limited settings.

Objective: We aim to describe the etiology and outcomes of the patients who presented to the Emergency Department (ED) of a tertiary hospital in Ghana with UGIB.

Methods: This was a single-center prospective cohort study involving 195 adults who presented with symptoms of UGIB from May 2022 to April 2023. Relevant baseline demographic and clinical characteristics were obtained. The cause of UGIB was determined as per findings at endoscopy. Patients were followed up for 6 weeks from admission, looking out for rebleeding, need for transfusion, length of hospital stay, and mortality.

Results: There were 145 (74.4%) males and 50 (25.6%) females, and the mean age ± SD was 51.4 ± 17.4 years. The main clinical presentations included melena (87.2%), hematemesis (69.7%) and postural dizziness (73.8%). The commonest findings at endoscopy were esophageal and gastric varices (33.3%), erosive gastritis and duodenitis (27.7%) and peptic ulcers (21.5%). The median length of hospital stay (IQR) was 7 days (5 days). 70.8% required whole blood transfusion with a median (IQR) of 2 units (2 units). The 6-week mortality and rebleeding rates were 17.4% and 7.2%, respectively.

Conclusion: Variceal bleeding was the most common cause of UGIB at the emergency. One out of every fourteen patients that recover from acute UGIB may rebleed within the first six weeks one out of every six patients who present with acute UGIB may die within the succeeding six weeks.

1 | Introduction

Upper gastrointestinal bleeding (UGIB) is a potentially life-threatening emergency that remains a common cause of hospitalization. It is defined as bleeding from a gastrointestinal (GI) source proximal to the ligament of Treitz [1]. The annual incidence ranges from 50 to 150 per 100 000 population, and it shows an overall mortality rate of 6%–10%, which can be up to 30% in sub-Saharan Africa (SSA) [2–4]. The annual worldwide incidence of hospitalization for UGIB is approximately one per thousand adults, and this generally increases with age and is more common in men [5, 6]. UGIB is associated with significant morbidity, mortality, and resource utilization [7]. This burden is compounded in poor-resource settings, where patients often

pay out-of-pocket for care, thereby hampering appropriate early diagnosis to determine the location and severity of bleeding [8].

The causes and outcomes of UGIB vary in different geographic regions depending on the local demographics and socioeconomic characteristics [9]. Worldwide, peptic ulcer disease (PUD) is the most common cause of UGIB, accounting for approximately 50% of cases, followed by esophageal varices [10, 11]. However, in parts of SSA, esophageal varices are the most common cause of UGIB [3, 12]. Other causes include esophagitis, Mallory-Weiss syndrome, Dieulafoy's lesion, gastric and duodenal erosions, upper gastrointestinal malignancies, and aorto-enteric fistula. It usually presents as hematemesis and/or melena, hematochezia, postural dizziness, or shock depending on the severity. Clinical history and examination are essential in determining the risk factors and possible complications associated with UGIB. Initial management involves fluid resuscitation, hemodynamic monitoring, blood transfusion if indicated, and timely esophagogastroduodenoscopy (EGD) [13].

Central to the current management of UGIB is timely EGD, which provides both diagnostic and therapeutic opportunities. It is essential for anatomic and pathological diagnosis as well as hemostatic interventions and risk stratification. EGD is recommended within 24 h after initial resuscitation [14]. This recommendation may not be followed in some patients with UGIB, especially in SSA, where there are inadequate health resources and trained medical personnel.

International guidelines do not take into consideration these peculiarities and challenges; hence the need for more data on the etiology, endoscopic profile, and clinical outcome of patients of UGIB from this region.

2 | Methods

2.1 | Study Design

The study was a prospective cohort study involving 206 participants over a 1-year period who presented with symptoms of UGIB at the Emergency Department (ED) between May 2022 and April 2023.

2.2 | Study Setting

This study was conducted at the Emergency Department (ED) of Komfo Anokye Teaching Hospital (KATH). It is a 1200-bed tertiary facility located in Kumasi, the capital of the Ashanti region in Ghana. It is the second largest teaching hospital in Ghana, and due to its central location, it serves as a referral center for 12 out of the 16 administrative regions. The study was approved by the Komfo Anokye Teaching Hospital Institutional Review Board (KATH IRB) with approval number KATH IRB/AP/022/22.

2.3 | Study Participants

All adults, 18 years and above who presented with overt symptoms of UGIB characterized by hematemesis, melena, and/or hematochezia and consented were included in this study. Patients who presented with signs of generalized bleeding, trauma-related UGIB, a history of ingestion of substances causing black discoloration of stool, and those who failed to give consent were excluded from this study.

2.4 | Study Procedure

Based on the inclusion criteria, informed consent was obtained from all participants. Data on demographics, medical history including presenting symptoms, drug history including the use of antiplatelets, non-steroidal anti-inflammatory drugs (NSAIDs), anticoagulants like warfarin and direct-acting oral anticoagulants, and comorbidities were obtained from participants or legal proxies in case they were unconscious using a structured questionnaire. Admission vital signs from the ED (blood pressure, pulse rate, respiratory rate and oxygen saturation) were recorded, and a physical examination was performed, looking out for signs like stigmata of chronic liver diseases that is, finger clubbing, gynecomastia, ascites, spider naevi, and jaundice that may point to the cause of UGIB and signs of severity like pallor and shock.

Laboratory investigations obtained included complete blood count, blood grouping and crossmatching, prothrombin time, international normalized ratio (INR), liver biochemical tests (serum transaminases, serum total bilirubin, serum protein, serum albumin), blood urea, electrolytes, and creatinine.

Initial resuscitation included insertion of two wide bore cannulae, Intravenous (IV) fluids; IV antibiotics and octreotide or IV proton pump inhibitor (PPI) based on clinical suspicion of variceal or non-variceal bleeding respectively and when required; whole blood transfusion. Antibiotic prophylaxis was only given in cases of variceal bleeding. The indications for whole blood transfusion were hemoglobin levels less than 7 g/dL, hemoglobin levels less than 8 g/dL if the participant had an underlying cardiac condition or persistent hypotension even with adequate IV fluid resuscitation. Shock was defined as systolic BP below 90 mmHg.

Clinical severity was assessed using the pre-endoscopic Rockall score and Glasgow Blatchford score. EGD was performed for participants when they were stable. Based on the findings at EGD, the full Rockall Score was calculated.

All participants were followed up daily while on admission, then biweekly after discharge for up to 6 weeks post-admission to assess their clinical outcomes including rebleeding, requirement of transfusion, length of admission, and mortality.

2.5 | Statistical Analysis

Data was collated, checked, and analyzed using the Statistical Package for Social Sciences (*SPSS version* 26.0; Chicago, IL, USA). Results were enumerated in means and proportions at a 95% confidence interval (CI) and presented in tables, charts, or graphs. Simple descriptive statistics were used. Depending on the distribution of the data after assessing normality by

the Shapiro–Wilk test, continuous variables were presented as mean (standard deviation, SD) or median (Interquartile range, IQR). Proportions and frequency tables were used to summarize categorical variables. Categorical variables and outcomes were analyzed using the Pearson χ^2 test and Fisher's exact test. The differences in median values between continuous variables and outcome groups were analyzed using the Mann–Whitney *U* test.

In the multivariate analysis, Cox regression analysis was computed on variables to determine the independent risk of 6-week mortality. A confidence interval of 95% was used, and $p < 0.05$ was considered statistically significant.

3 | Results

3.1 | Demographic and Clinical Characteristics of Participants

During the study, there were 23,231 admissions at the ED, of which 215 (0.9%) presented with UGIB. Out of the 215, 206 (95.8%) met the inclusion criteria. The participants/legal proxies failed to give consent for the study in 9 (4.2%) patients; hence, they did not meet the inclusion criteria. Endoscopy could not be performed in 11 (5.3%) of the cases because participants died during the resuscitation process and were excluded because the cause of UGIB could not be determined objectively.

Based on the endoscopy findings of 195 participants, 68 (34.9%) participants had variceal bleeding and 127 (65.1%) had non-variceal bleeding. Males, 145 (74.4%) were predominant with a male-to-female ratio of 2.9:1. There was a statistically significant difference in the gender distribution between the two groups of variceal and non-variceal bleeding ($p = 0.038$). The mean age (±SD) was 51.4 years (±17.4) and showed a statistically significant difference between the variceal bleeding group and the non-variceal bleeding group 9 ($p < 0.001$).

Patients with variceal bleeding were more likely to present with malena 64/68 (94.1%) and hematochezia 106/127 (83.5%) compared to patients with non-variceal bleeding ($p = 0.042$ and 0.044 respectively). There were no statistically significant differences among the distribution of symptoms of collapse 20 (10.3%), hematemesis 136 (69.7%) and postural dizziness 144 (73.8%) among the groups with variceal and non-variceal bleeding ($p = 0.330$, 1.000 and 0.610 respectively).

Patients with variceal bleeding were more likely to have a past medical history of chronic liver disease 59/68 (86.8%) than patients with non-variceal bleeding 11/127 (8.7%) with a significant $p < 0.001$. History of Jaundice was more common in patients with variceal bleeding 52/68 (76.5%) than patients with non-variceal bleeding 12/127 (9.4%) with a significant $p < 0.001$. Peptic ulcer disease was significantly ($p < 0.001$) found in patients with non-variceal bleeding 62/127 (48.8%) than in variceal bleeding 9/68 (13.2).

Aspirin/antiplatelets/NSAID use was 69 (35.4%) and their distribution among participants with variceal and non-variceal bleeding showed statistically significant differences ($p \leq 0.001$).

At examination, 124 (63.6%) had tachycardia, 32 (16.4%) came in with hypotension, 177 (90.8%) had conjunctival pallor, 123 (63.1%) had epigastric tenderness, and 60 (30.8%) had scleral jaundice. Almost half, 79 (40.5%), had ascites; 43 (22.1%) had splenomegaly; 24 (12.3%) had flapping tremors; and 69 (35.56%) tested positive for the rapid urease test for *Helicobacter pylori* infection. Scleral jaundice, the presence of ascites, splenomegaly, flapping tremors, and *Helicobacter pylori* infection showed significant differences between the groups with variceal and non-variceal bleeding (all $p < 0.001$) (Table 1).

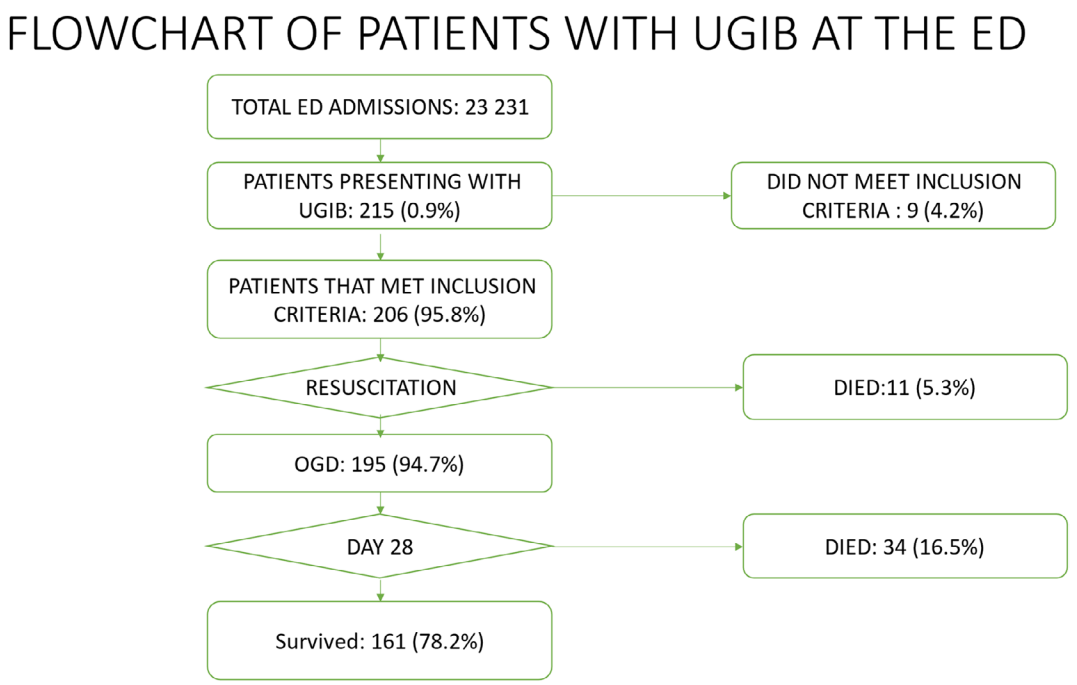

TABLE 1 | Clinico-demographic characteristics of study participants.

Variable	Variceal $N=68$	Non-variceal $N=127$	Overall $N=195$	p
Age (years), mean ± SD	44.5 (11.1)	55.2 (19.0)	51.4 (17.4)	**< 0.001**
Gender				
Male	57 (83.8)	88 (69.3)	145 (74.4)	**0.038**
Female	11 (16.2)	39 (30.7)	50 (25.6)	
Marital status				
Single	20 (29.4)	22 (17.3)	42 (21.5)	
Married	41 (60.3)	87 (68.5)	128 (65.6)	0.217
Divorced	3 (4.4)	5 (3.9)	8 (4.1)	
Widow/Widower	4 (5.3)	13 (10.2)	17 (8.7)	
Hospital referral	60 (91.2)	106 (83.5)	168 (86.2)	0.191
National health insurance	58 (85.3)	115 (90.6)	173 (88.7)	0.342
Symptoms				
Collapse	9 (13.2)	11 (8.7)	20 (10.3)	0.330
Hematemesis	47 (69.1)	89 (70.1)	136 (69.7)	1.000
Melena	64 (94.1)	106 (83.5)	170 (87.2)	**0.042**
Hematochezia	17 (25.0)	16 (12.6)	33 (16.9)	**0.044**
Postural dizziness	52 (76.5)	92 (72.4)	144 (73.8)	0.610
Past medical history				
Peptic ulcer disease	9 (13.2)	62 (48.8)	71 (36.4)	**< 0.001**
Jaundice	52 (76.5)	12 (9.4)	64 (32.8)	**< 0.001**
Chronic liver disease	59 (86.8)	11 (8.7)	70 (35.9)	**< 0.001**
Renal failure	5 (7.4)	12 (9.4)	17 (8.7)	0.792
Cardiac disease	4 (5.9)	19 (15.0)	23 (11.8)	0.066
Malignancy	5 (7.4)	5 (3.9)	10 (5.1)	0.322
Stroke	0 (0.0)	6 (4.7)	6 (3.1)	
Schistosoma infection	3 (4.4)	0 (0.0)	3 (1.5)	
Drug history				
Aspirin/Antiplatelet/NSAID use	5 (7.4)	64 (50.4)	69 (35.4)	< 0.001
Anticoagulants	0 (0.0)	4 (3.1)	4 (2.1)	0.300
Steroid Use	0 (0.0)	5 (3.9)	5 (2.6)	0.165
Herbal preparation use	21 (30.9)	33 (26.0)	54 (27.7)	0.504
Social history				
Cigarette smoking	2 (2.9)	9 (7.1)	11 (5.6)	0.335
Alcohol use	27 (39.7)	40 (31.5)	67 (34.4)	0.271
Physical examination				
Tachycardia	46 (67.6)	78 (61.4)	124 (63.6)	0.437
Hypotension (blood pressure < 90 mmHg)	15 (22.1)	17 (13.4)	32 (16.4)	0.155
Conjunctiva pallor	66 (97.1)	111 (87.4)	177 (90.8)	**0.035**

(Continues)

TABLE 1 | (Continued)

Variable	Variceal $N=68$	Non-variceal $N=127$	Overall $N=195$	p
Sclera jaundice	47 (69.1)	13 (10.2)	60 (30.8)	**<0.001**
Epigastric tenderness	39 (57.4)	84 (66.1)	123 (63.1)	0.276
Ascites	62 (91.2)	17 (13.4)	79 (40.5)	**<0.001**
Splenomegaly	37 (54.4)	6 (4.7)	43 (22.1)	**<0.001**
Flapping Tremor	21 (30.9)	3 (2.4)	24 (12.3)	**<0.001**
Helicobacter pylori infection	12 (17.9)	57 (44.9)	69 (35.6)	**<0.001**

Note: Bold values indicate statistically significant *p*-values.
Abbreviation: NSAID = non-steroidal anti-inflammatory drugs.

TABLE 2 | Biochemical, hematological, and risk profile of participants.

Biochemical test/risk score	Variceal	Non-variceal	Overall	p
Hemoglobin (g/dL), median (IQR)	6.1 (3.6)	7.0 (3.5)	6.8 (3.7)	**0.016**
Platelet ($\times 10^9$/L), median (IQR)	102.5 (105.0)	210.0 (122.0)	178 (147)	**<0.001**
WBC ($\times 10^9$/L), median (IQR)	7.7 (6.8)	8.0 (5.4)	7.8 (5.8)	0.080
INR, median (IQR)	1.4 (0.7)	0.9 (0.3)	1.0 (0.4)	**<0.001**
Serum urea (mmol/L), median (IQR)	7.9 (3.9)	7.4 (5.8)	7.5 (4.9)	0.696
Serum creatinine (μmol/L), median (IQR)	93.5 (55.3)	94.0 (39.0)	94.0 (45.0)	0.659
Alanine aminotransferase (U/L), median (IQR)	63.3 (69.5)	24.3 (23.7)	44.5 (39.5)	**<0.001**
Aspartate aminotransferase (U/L), median (IQR)	94.2 (272.6)	32.8 (33.4)	42.4 (69.5)	**<0.001**
Serum bilirubin (μmol/L), median (IQR)	28.7 (43.3)	12.1 (13.0)	16.0 (24.2)	**<0.001**
Serum albumin (g/L), median (IQR)	22.1 (7.3)	29.4 (10.5)	27.2 (11.1)	**<0.001**
Full rockall score, median (IQR)	7.0 (2.0)	4.0 (2.0)	5.0 (4.0)	**<0.001**
Glasgow blatchford score, median (IQR)	12.5 (4.0)	10.0 (4.0)	11.0 (4.0)	**<0.001**

Note: Bold values indicate statistically significant *p*-values.
Abbreviations: INR = international normalized ratio, IQR = interquartile range, PCV = packed cell volume, WBC = white blood cells.

3.2 | Biochemical, Hematological and Risk Profile of Participants

The median hemoglobin level (IQR) was 6.8 g/dL (3.7 g/dL), platelet count ($\times 10^9$/L) (IQR) of 178 (147), INR(IQR) of 1.0 (0.4), alanine aminotransferase (IQR) of 44.5 U/L (39.5 U/L), aspartate aminotransferase (IQR) of 42.4 U/L (69.5 U/L), serum bilirubin (IQR) of 16.0 mmol/L (24.2 mmol/L), serum albumin (IQR) of 27.2 g/L (11.1 g/L), Glasgow Blatchford score (IQR) of 11 (4) and full Rockall score (IQR) of 5 (4). They all showed significant differences between the groups with variceal and non-variceal bleeding, with *p*-values of 0.016, <0.001, <0.001, <0.001, <0.001, <0.001, <0.001, <0.001, and <0.001 respectively (Table 2).

3.3 | Endoscopic Findings

Out of 206 participants, 195 (94.7%) underwent upper gastrointestinal endoscopy. The remaining 11 (5.3%) did not undergo upper gastrointestinal endoscopy because they were not stable and subsequently died before the procedure could be done. Most of the participants had their endoscopy from 24 to 48 h into the admission 73 (35.4%) (Figure 1).

These findings at endoscopy were esophageal and gastric varices 65 (33.3%), gastritis 51 (26.2%), gastric ulcers 27 (13.8%), duodenal ulcers 15 (7.7%), gastric neoplasm 12 (6.2%), esophagitis seven (3.6%). Others were 3 (1.5%) each for esophageal neoplasm and duodenitis/erosions, portal hypertensive gastropathy 2 (1.0%), Mallory-Weiss tear and duodenal neoplasm 1 (0.5%) each. 8 (4.1%) of the participants had normal findings (Table 3).

3.4 | Outcomes

The overall median length of hospital stay (IQR) was 7 days (5 days). This was shorter than the group with variceal bleeding, 9 days (4 days). Most of the participants, 138 (70.8%) received whole blood transfusion with a median (IQR) of 2 units (2 units). In the group with variceal bleeding, 55 (80.9%) received whole blood transfusion compared to 83 (64.5%) in the group with

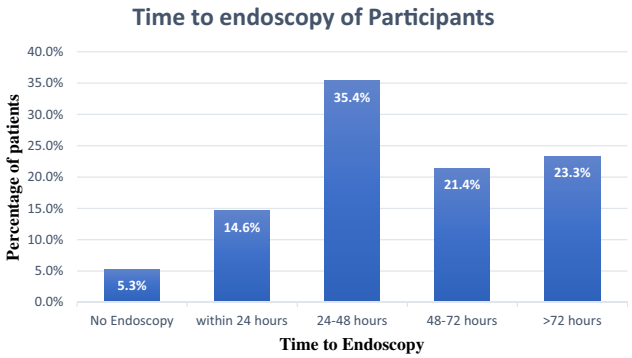

FIGURE 1 | Time to endoscopy of participants.

TABLE 3 | Endoscopic findings of participants.

Endoscopic findings of participants	Frequency $N=195$ (percent)
Esophageal and gastric varices	65 (33.3)
Gastric ulcers	27 (13.8)
Duodenal ulcers	15 (7.7)
Gastritis	51 (26.2)
Duodenitis	3 (1.5)
Gastric neoplasm	12 (6.2)
Duodenal neoplasm	1 (0.5)
Esophagitis	7 (3.6)
Mallory Weiss tear	1 (0.5)
Normal findings	8 (4.1)
Esophageal neoplasm	3 (1.5)
Portal Hypertensive gastropathy	2 (1.0)

non-variceal bleeding (p-value 0.031). A few participants, 14 (7.2%) had rebleeds, with the majority occurring in the group with variceal bleeding 10 (14.7%) compared to 4 (3.1%) in the group with non-variceal bleeding ($p=0.004$). The overall 6-week mortality rate was 34 (17.4%); the 6-week mortality rate was 25 (36.8%) in the group with variceal bleeding compared with the group with non-variceal bleeding, 4 (3.1%) ($p<0.001$) Table 4.

3.5 | Association Between Clinical Parameters and 6-Week Mortality

Factors that had a significant relationship with mortality in the univariate analysis were presenting symptom of collapse ($p=0.033$), history of PUD ($p<0.001$), jaundice($p<0.001$), liver failure ($p<0.001$) and malignancy ($p<0.001$); the presence of scleral jaundice ($p<0.001$), ascites ($p<0.001$) and splenomegaly ($p=0.007$); raised WBC ($p=0.001$), INR ($p<0.001$), serum creatinine ($p=0.039$), alanine aminotransferase ($p<0.001$), aspartate aminotransferase ($p<0.001$), total serum bilirubin ($p<0.001$), low serum albumin levels ($p<0.001$), *Helicobacter pylori* infection, ($p=0.026$), variceal bleeding ($p<0.001$), high Glasgow Blatchford ($p<0.001$) and Rockall scores ($p<0.001$) (Tables 5 and 6).

TABLE 4 | Outcomes.

Outcome	Variceal $N=68$	Non-variceal $N=127$	Overall $N=195$	p
6-week mortality	25 (36.8)	9 (7.1)	34 (17.4)	**<0.001**
Blood transfusion	55 (80.9)	83 (65.4)	138 (70.8)	**0.031**
Rebleeding	10 (14.7)	4 (3.1%)	14 (7.2)	**0.004**
Duration of hospital stay, median (IQR)	9 (4.0)	7 (5.0)	7 (5)	**0.121**

Note: Bold values indicate statistically significant p-values.

In multivariate regression analysis, history of disseminated cancer cos hazard ratio of 7.7 (CI 2.2–26.6, $p=0.001$), presence of sclera jaundice cos hazard ratio of 4.8 (CI 1.2–18.3, $p=0.022$), flapping tremor cos hazard ratio of 3.3 (CI 1.2–8.7, $p=0.017$), increasing white blood cell count cos hazard ratio of 1.1 (CI 1.1–1.2, $p=0.002$), and Rockall Score cos hazard ratio of 1.5 (CI 1.1–1.9, $p=0.007$) were independent predictors of mortality (Tables 6 and 7).

4 | Discussion

In this study, we found an overall 6-week rebleeding rate of 7.2% and a mortality rate of 17.4%. Rebleeding was more common in patients with variceal bleeding compared to those with non-variceal bleeding. The 6-week mortality rate was also more common in patients with variceal bleeding compared with the group with non-variceal bleeding. The mean age of presentation was 51.4 ± 17.4 years. UGIB was more common in males than females, with a male-to-female ratio of 3:1. The most common clinical presentations were melena, hematemesis, and postural dizziness. The median hemoglobin concentration was 6.8 g/dL with a median platelet count of 178 ($\times 10^9$/L). We found esophageal and gastric varices and erosive gastritis as the commonest causes of UGIB.

The risk of UGIB has been shown to increase with increasing age in most developed countries. Van Leerdam et al. showed that as many as 70% of acute upper GI bleed episodes occur in patients older than 60 years [15]. In France, Thiebaud et al. found that the median age at presentation was 66 years [16]. However, most studies in West Africa have found the median age to be below 60 years. In Ghana, Nkansah et al. found the median age at presentation to be 54 years [17]. Other studies in Nigeria by Ajayi et al., Rukewe et al., Alatise et al., Manko et al., and Fatusi et al. had ages at presentation below 60 years [8, 12, 18–20]. The difference in predominant age groups among developed and

TABLE 5 | Association between clinical characteristics and mortality (categorical data).

Variable	Response	Survived (%) $N=161$	Died (%) $N=34$	p
Gender	Male	119 (73.9)	26 (76.5)	0.832
	Female	42 (26.1)	8 (23.5)	
Collapse	Yes	14 (8.7)	9 (39.1)	**0.033**
	No	147 (80.3)	36 (19.7)	
Hematemesis	Yes	114 (79.2)	30 (20.8)	0.592
	No	47 (75.8)	15 (24.2)	
Melena	Yes	138 (76.7)	42 (23.3)	0.174
	No	23 (88.5)	3 (11.5)	
Hematochezia	Yes	26 (76.5)	8 (23.5)	0.795
	No	135 (78.5)	37 (21.5)	
History of peptic ulcer disease	Yes	68 (94.4)	4 (5.6)	
	No	93 (69.4)	41 (30.6)	**<0.001**
History of Jaundice	Yes	42 (56.8)	32 (43.2)	**<0.001**
	No	119 (90.2)	13 (9.8)	
History of liver failure	Yes	45 (56.3)	35 (43.8)	**<0.001**
	No	116 (92.1)	10 (7.9)	
History of kidney failure	Yes	11 (61.1)	7 (38.9)	0.067
	No	150 (79.8)	38 (20.2)	
History of heart disease	Yes	20 (83.3)	4 (16.7)	0.414
	No	141 (77.5)	41 (22.5)	
History of malignancy	Yes	2 (18.2)	9 (81.8)	**<0.001**
	No	159 (81.5)	36 (18.5)	
Sclera jaundice	Present	37 (53.6)	13 (9.5)	**<0.001**
	Absent	124 (90.5)	32 (46.4)	
Ascites	Present	53 (59.6)	36 (40.4)	**<0.001**
	Absent	108 (92.3)	9 (7.7)	
Splenomegaly	Present	30 (63.8)	17 (36.2)	**0.007**
	Absent	131 (82.4)	28 (17.6)	
Endoscopy within 24 h	Yes	24 (14.9)	6 (17.6)	0.793
	No	137 (85.1)	28 (82.4)	
Helicobacter pylori infection	Yes	63 (39.1)	6 (18.2)	**0.027**
	No	98 (60.9)	27 (81.8)	
Etiology of bleeding	Variceal	43 (26.7)	25 (73.5)	**<0.001**
	Nonvariceal	118 (73.3)	9 (26.5)	

Note: Bold values indicate statistically significant p-values.

developing nations may be due to the different risk factors associated with UGIB. Whereas risk factors of UGIB in developed countries are associated with increased NSAID and antiplatelet use among the aged population, chronic liver disease from hepatitis B, which mainly occurs at a younger age as a result of vertical and horizontal transmission, may be the driving force in developing countries.

Gender and its related risk behaviors may influence the incidence of UGIB. Most studies have shown male sex is a risk factor

TABLE 6 | Association between clinical and laboratory characteristics and mortality (Continuous data).

Variable	Survived $N=161$ median (IQR)	Died $N=34$ median (IQR)	p
Age (years)	52 (24.5)	48.0 (23.0)	0.246
PCV (%)	19.4 (9.9)	19.1 (10.0)	0.345
Hemoglobin (g/dL)	6.8 (3.5)	6.4 (3.6)	0.545
Platelet ($\times 10^9$/L)	184 (145.5)	148.0 (224.0)	0.756
WBC ($\times 10^9$/L)	7.4 (5.7)	10.6 (8.5)	**0.001**
INR	1.0 (0.3)	1.7 (1.0)	**<0.001**
Serum urea (mmol/L)	7.4 (3.6)	9.0 (13.9)	0.249
Serum creatinine (μmol/L)	94.0 (36.0)	102.0 (128.0)	0.153
Alanine aminotransferase (U/L)	28.0 (29.7)	76.3 (152.4)	**<0.001**
Aspartate aminotransferase (U/L)	38.3 (54.8)	193.0 (362.2)	**<0.001**
Total bilirubin (μmol/L)	15.0 (15.1)	51.0 (78.1)	**<0.001**
Serum albumin (g/L)	28.5 (12.2)	22.4 (7.5)	**<0.001**
Glasgow Blatchford Score, median (IQR)	11.0 (5.0)	13.5 (6.0)	**<0.001**
Full Rockall Score, median (IQR)	4.0 (3.0)	7 (2.0)	**<0.001**

Note: Bold values indicate statistically significant p-values.
Abbreviations: INR = international normalized ratio, IQR = interquartile range, PCV = packed cell volume, WBC = white blood cells.

for upper GI bleeding [21–23]. Nkansah et al., in their study at a district hospital, Ghana, had 60.8% of respondents being male [17]. In Zaria, Nigeria, Manko et al. also mirrored similar male preponderance with 72.9% in a previous study at Ahmadu Bello University Teaching Hospital [12]. In this study also, there was a male preponderance, with a male to female ratio of 3:1. Plausible explanation for this observed finding could be due to increased risky behaviors such as alcohol misuse, smoking, and intravenous drug use and its associated transmission of hepatitis B and C viruses among males. Also, these risk behaviors may put males at high cardiovascular risk and the need for antiplatelet therapy.

UGIB commonly presents as hematemesis (either red or coffee-ground vomiting) and/or melena stools (black, tarry stool) signifying that the bleeding is proximal to the ligament of Treitz. Laine et al. have demonstrated that the severity of bleeding and mortality rates are similar whether the patient presents with bloody emesis or coffee-ground emesis [24]. Melena may be seen with variable degrees of blood loss, being observed with as low as 50 mL of blood, and the color change is due to the long transit time observed [25]. Some patients may present with hematochezia from massive upper GI bleeding [26]. Acute blood loss may lead to hemodynamic instability and consequent orthostatic hypotension. Thus, anemia is a common clinical finding that may require a blood transfusion. The median hemoglobin concentration observed in our study was 6.8 g/dL, with 70.8% of the participants requiring blood transfusion. In Nigeria, Aletise et al. showed that 83.6% of patients presenting with UGIB required blood transfusion in the course of their hospital admission [19]. In Tanzania, Rajan et al., in their cohort study, found that 48.8% of the participants with UGIB had blood transfusion [4]. In considering hemotransfusion following acute upper GI bleeding, two strategies are employed: the liberal (transfusion when hemoglobin concentration fell below 10.0 g/dL) and the restrictive (transfusion when hemoglobin concentration fell below 8.0 g/dL) transfusion strategy [27]. However, various clinical trials have shown a better outcome with the restrictive strategy [27, 28].

EGD remains the most effective modality in localizing and treating the etiology of UGIB, especially when it is done within 24 h. Of the 206 participants, 5.3% did not have endoscopy, 14.6% had endoscopy done within 24 h, 35.4% from 24 to 48 h, 21.4% from 48 to 72 h, and 23.3% after 72 h. This is lower than the study by Jaka et al. in Tanzania, which had 53.3% of endoscopies being done within 24 h, and Hearnshaw et al. in the United Kingdom found 50.0% of endoscopies being done within 24 h [29, 30]. The source of bleeding could not be identified in 4.1% of OGD done, which is relatively higher than in the study by Jaka et al. in Tanzania (3.1%) but significantly lower than Ajayi et al. (10.4%) and Mustapha et al. (11.9%) in Nigeria [18, 29, 31]. With erosive mucosal lesions healing very fast, the yield of OGD is reduced significantly if it is not done within 24 h of presentation, and this may explain why the cause of UGIB could not be identified in some cases.

The commonest finding at EGD was esophageal and gastric varices, followed by erosive gastritis, gastric ulcers, and duodenal ulcers. Archampong et al. in their retrospective study at Korle Bu Teaching Hospital in Ghana also found esophageal and gastric varices as the commonest findings at EGD [32]. However, Nkansah et al. in a study at a district hospital in Ghana showed that PUD is the commonest cause of UGIB [17]. A possible explanation for this difference could be that this study, together with the one by Archampong et al., was carried out in tertiary centers that have facilities to manage the most severe forms of

TABLE 7 | Multivariate regression of predictors of mortality.

Variable	*p*	HR	95.0% CI for HR	
			Lower	Upper
Collapse	0.405	0.6	0.2	1.9
History of PUD	0.361	0.5	0.1	2.1
History of jaundice	0.230	0.5	0.2	1.6
History of liver failure	0.486	1.7	0.4	7.3
Disseminated cancer	**0.001**	7.7	2.2	26.6
Sclera jaundice	**0.022**	4.8	1.2	18.3
Ascites	0.662	0.6	0.1	6.3
Splenomegaly	0.039	0.4	0.1	1.0
Flapping tremor	**0.017**	3.3	1.2	8.7
White blood Cell	**0.002**	1.1	1.1	1.2
INR	0.289	1.5	0.7	2.9
Serum creatinine	0.207	1.0	0.9	1.0
Alanine aminotransferase	0.244	1.0	1.0	1.0
Aspartate aminotransferase	0.037	1.0	1.0	1.0
Total bilirubin	0.493	1.0	0.9	1.0
Serum albumin	0.026	0.9	0.9	1.0
Etiology of UGIB	0.833	1.2	0.2	8.4
Helicobacter pylori infection	0.568	1.4	0.4	4.2
Rockall Score	**0.007**	1.5	1.1	1.9
Glasgow Blatchford Score	0.101	1.2	1.0	1.4

Note: Bold values indicate statistically significant *p*-values.
Abbreviations: HR = Hazard ratio, INR = international normalized ratio, PUD = peptic ulcer disease, UGIB = upper gastrointestinal bleed.

CLD and as such received referrals from all over the country, compared to the one by Nkansah et al. The results were also consistent with most studies in sub–Saharan Africa, India, and Nepal [3, 12, 29, 31, 33–38].

Majority of the studies in the developed world had PUD as the commonest cause of UGIB [39–41]. These differences may probably be due to differences in predominant risk factors. While NSAIDS and aspirin use are prevalent in Western countries due to the aging population and are the main risk factors of UGIB in developed countries, CLD from hepatitis B and schistosomiasis with their complications of portal hypertension are prevalent in developing countries and are the main drivers of UGIB.

The study also found a lower prevalence of malignancy as the cause of UGIB: gastric malignancies, 12 (6.2%); esophageal malignancy, three (1.5%) and duodenal malignancy, one (0.5%). This may be explained by the lower prevalence of risk factors like smoking (5.3%) in the study population.

The primary clinical outcomes in this study were the need for blood transfusion, duration of admission, 6-week rebleeding, and mortality rates. The clinical outcomes varied from one study to another, and factors responsible for this variation may include the age of the patient, the severity of underlying conditions like CLD, malignancies, and other comorbidities, the volume of blood loss necessitating the need for multiple blood transfusions, and availability of expertise and facilities for the management of UGIB.

The median length of admission was 7 days and ranged from one to 30 days. This was longer than Alatise et al. (4.5 days) in Nigeria but similar to Jaka et al. (8 days) in Tanzania. Factors like the severity of underlying medical conditions like CLD, availability of expertise and facilities for the management of UGIB, and the need for transfusion of blood products, which may not be readily available, can explain these variations among the different studies. The 6-week rebleeding rate in this study was 7.2%, similar to Moledina et al. (7.1%) in Tanzania [34]. Lee et al. also found the similar rebleeding rate (7.3%) in South Korea [40]. Full Rockall score ≥ 5 was an independent predictor of rebleeding ($p = 0.033$) and was 2.4 times more likely to lead to rebleeding.

The 6-week mortality rate was 17.4%. Most of the studies in sub-Saharan Africa had mortality rates ranging between 4.0% and 33.5% [3, 8, 18, 19, 29, 31, 34, 42]. The studies in developed nations had mortality rates below 4% [40, 43]. The high mortality rate in this study and in other sub-Saharan African countries could be explained by delayed or more severe presentation to a referral facility, compounded by inadequate urgent endoscopic intervention and other interventional measures like blood transfusion. About a quarter of the mortalities in this study happened within the first 24 h of presentation, suggesting how critical early intervention is in managing UGIB.

4.1 | Study Strengths and Limitations

This study was a prospective one where many variables that could potentially predict adverse outcomes were assessed. All the participants were followed up in this study.

The main drawback of this study is that it was conducted in a single tertiary facility, making it difficult to generalize its findings. The patient population may be different in smaller, lower-capacity facilities. Interventions were limited by the absence of cyanoacrylate glue, hemostatic powders or gels, over-the-thescope clips, and argon plasma coagulation in the hospital.

5 | Conclusion

Esophageal varices, gastric varices, and erosive gastritis are the commonest causes of acute UGIB in Ghana. One out of every fourteen patients that recover from acute UGIB may rebleed within the first 6 weeks. Approximately one out of every six patients who present with acute UGIB may die within the succeeding 6 weeks; therefore, there is a need to increase public and physician awareness of associated outcomes and risk factors of common causes of UGIB to help with prevention and early presentation. Patients with background CLD should be screened

for varices endoscopically, and prophylactic treatment should be offered for high-risk varices. There should be a protocol for the management of UGIB with clear guidelines to improve outcomes and make the best use of scarce medical resources peculiar to this region. Efforts should be made to improve and make diagnostic and therapeutic endoscopy services accessible and affordable by training more endoscopists and other team members and providing appropriate and sufficient materials to work with.

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Ethics Statement

The study was approved by the Komfo Anokye Teaching Hospital Institutional Review Board (KATH IRB) with approval number KATH IRB/AP/022/22.

Consent

Written informed consent was obtained from the patients.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

Data is available upon reasonable request to the corresponding author.

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