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Identification of Risk Factors for Adverse Outcomes and Comparison of Clinical Scoring Systems in Acute Lower GI Bleeding

R Santhosh[1], K Muthu Kumaran[2], Ratnakar Kini[3], Shubha Immineni[4], A. Chezhian[5]

[1]Final Year Resident Madras Medical College, Chennai, Tamil Ndau, India

[2]Assistant Professor Madras Medical College, Chennai, Tamil Ndau, India

[3]Associate Professor Madras Medical College, Chennai, Tamil Ndau, India

[4]Assistant Professor Madras Medical College, Chennai, Tamil Ndau, India

[5]Assistant Professor Madras Medical College, Chennai, Tamil Ndau, India

Abstract: ***Aims*: To identify risk factors for adverse outcomes in acute lower GI bleeding and compare the efficacy of existing validated clinical scores in predicting severe disease. *Methods*: A single center prospective observational study of 160 patients admitted with LGIB who underwent colonoscopy between November 2022 and October 2023. The risk of severe LGIB was determined via univariable and multivariable logistic regression. Area under receiver operating characteristic curve analysis was used to compare the scores. Seven clinical scores were calculated at admission (Oakland, SALGIB, Birmingham, NOBLADS, AIM65, Blatchford and Charlson Comorbidity Index). *Results*: We had included 160 patients with acute LGIB requiring colonoscopy. Fifty four percent (n= 86) fit the criteria for severe bleeding. Patients with severe bleeding were more likely to have chronic renal failure (32% vs 18%; p =.05), lower admission hemoglobin levels (8.4 g/dl vs 10.9g/dl; P=.0001), and lower albumin values (3.2 g/dl vs 3.85g/dl; P<.0001. Those with severe bleeding were more likely to require blood transfusion (87% vs 34%; P<.0001), receive more units of packed red blood cells (3 vs 1; P<.0001), require ICU stays (51% vs 16%; P<.0001). Best predictor of severe bleeding was the Oakland score (AUC,.74 P<.0001). Blatchford was most discriminative for in - hospital recurrent bleeding. The discriminative score for in hospital death was SALGIB (AUC,.74; P<.0001). *Conclusion*: No singular clinical risk tool had the best predictive ability across all outcomes. Admission albumin and hemoglobin levels were the strongest predictors of severe bleeding. Oakland score performed better for predicting ability of severe bleeding.***

Keywords: LGIB, Oakland, Severe bleeding, SALGIB, Albumin, Clinical Score

1. Introduction

LGIB represents approximately thirty - six hospitalizations per 100, 000 admissions annually and has an estimated mortality rate between 5% and 15%[1]

It is associated with high resource utilization given that patients often experience recurrent bleeding, require blood transfusions, and may receive endoscopic, radiologic, or surgical interventions[2].

Despite this, there are limited data on accurately predicting the risk of adverse outcomes for hospitalized patients with LGIB[3], especially in comparison with patients with upper GI bleeding (UGIB) where tools such as the Glasgow - Blatchford Score have been validated to accurately predict important clinical outcomes[4].

Many clinical prediction tools have been derived to appropriately identify and treat high - risk patients with LGIB with an aim on predicting severe bleeding to target those who require hospital - based intervention[5].

Unlike with UGIB, there is no widely accepted risk prediction tool for LGIB[3, 1]. Although several LGIB prediction tools have been studied, heterogeneity in the primary and secondary outcomes of these studies limits' comparison of the tools.

Data are urgently needed for clinicians on how to accurately identify high - risk patients, given the heterogeneity of LGIB and the variability of management strategies according to bleeding severity[6].

The aim is to identify risk factors for adverse outcomes in acute lower GI bleeding and compare the efficacy of existing validated clinical scores in predicting severe disease.

2. Methods

Settings and Participants

This was a prospective observational study of admitted patients with acute LGIB to the Rajiv Gandhi General Government Hospital between May 2022 to April 2023. Rajiv Gandhi General Government Hospital is a large tertiary care center and teaching hospital. The study protocol received approval from hospitals ethical committee on16 March 2022

Inclusion criteria: All patients above the age of 18 years presenting with all forms of acute Lower GI Bleed with bright, dark red blood or blood clots per rectum, maroon

colored stool, blood mixed in with blood or Melena without hematemesis.

Exclusion criteria: Patients with Upper GI Bleeding, pregnancy or lactating women and congestive heart failure (NYHA III or IV).

Upper gastrointestinal bleeding was considered in patients with liver disease presenting with hematemesis, defined as either one or more than one episode of vomiting either fresh blood or a coffee ground - like material, or reported or observed melena, with a drop in hemoglobin, and blood in the nasogastric tube with other varicella and non - variceal causes of UGI bleed.

Single center prospective cohort study involving patients meeting the inclusion criteria will be selected.

Patients with suspected LGIB were identified presenting as Outpatient admitted during the study time that presented with hematochezia and underwent colonoscopy during admission. Patients with concurrent melena and hematochezia at presentation were included only if a compatible LGIB source was identified on colonoscopy and an upper GI source was excluded via endoscopic evaluation.

Medical record review was performed to obtain baseline demographic information, clinical data (comorbidities, vital signs, laboratory studies, admission medications), details of hospital management (endoscopic and radiologic procedures and interventions, transfusions, ICU services), and adverse outcomes (severe bleeding, in - hospital recurrent bleeding, death)

Endoscopy reports and gastroenterology consultation notes were reviewed to identify sources of bleeding.

Both definite and presumptive sources of bleeding were included.

Operational definitions:
Definite sources of bleeding included lesions with documented visualization of active bleeding, a visible vessel, or adherent clot. Presumptive diagnoses were made in cases of diverticula, hemorrhoids, or angiodysplasia without stigmata of recent bleeding.

Outcome criteria
The main outcome of interest was severe bleeding, which has previously been defined as (1) continued bleeding in the first 24 hours of admission (transfusion 2 units of packed red blood cells and/or a decrease in hematocrit 20%) and/or (2) recurrent bleeding after 24 hours of clinical stability (rectal bleeding accompanied by a further decrease in hematocrit 20% and/or additional blood transfusions and/or readmission for LGIB within 1 week of discharge) [7]

Secondary outcomes included in - hospital recurrent bleeding, blood transfusion requirements, intervention (endoscopy, interventional radiology, surgery), length of stay, ICU admission, and the comparative predictive ability of seven clinical risk stratification tools[8].

In - hospital recurrent bleeding was defined as (1) clinically significant recurrent bleeding requiring repeat endoscopic or radiographic procedures (after initial colonoscopy) or (2) additional blood transfusion requirements or (3) a further decrease in hematocrit of 20% or more after a 24 - hour period of stability after initial presentation[8]

Seven previously described clinical prediction tools were used to calculate risk scores for each patient. Four of the seven tools were validated LGIB predictive models (NOBLADS[9], Oakland[10], Birmingham Score[11], SALGIB Score[13]]), whereas two were validated UGIB models (AIMS65[14] and the Glasgow - Blatchford Bleeding Score[15]).

Although AIMS65 and Blatchford were designed for UGIB, they were included in our study because evidence suggests they have predictive value in LGIB as well.

The final model examined was the widely used Charlson Comorbidity Index.

Statistical analysis
Data will be collected in MS Excel sheet and statistical analysis will be performed.

Correlation between numerical variables will be evaluated using spearman's coefficient.[5]

Continuous variables will be compared using students t - test and categorical variables will be evaluated with the chi - square or Fishers exact test.

Cox regression analysis will be used to evaluate the association between variables of interest.

3. Results

In total 160 patients underwent colonoscopy for LGIB in this study. Median age was 68 years (interquartile range: 58 - 77), fifty - six% were men. Out of 160; 86 (54%) patients had severe bleeding during their admission and 4 (2%) patients had in - hospital deaths. There was no significant difference in age, sex, or alcohol or tobacco use between those with severe bleeding and non - severe bleeding. Oral antiplatelet or non - steroidal anti - inflammatory drug use was common, reported in 38% of cases. The median time from admission to colonoscopy was 70.3 hours (interquartile range, 30.3 - 74.7 hours). Chronic renal failure and Cardiovascular disease were the most common comorbidities; patients with severe bleeding were more likely to have chronic renal failure (32% vs 18%; p =.05), lower admission hemoglobin levels (8.4 g/dl vs 10.9g/dl; P=.0001), and lower albumin values (3.2 g/dl vs 3.85g/dl; P<.0001). In those with severe bleeding higher admission creatinine levels (1.5mg/dl vs 1mg/dl; P=.04) and lower systolic blood pressure (106 mm Hg vs 128 mm Hg; P=.01)

The etiology of LGIB was determined in 114 (71%) of patients with the most common source being hemorrhoids (39%) whereas presumed and definitive diverticular bleeding was second most common source (15%). There were 58 (36.2%) and 21 (13.1%) cases of left sided and right sided colonic bleeding, respectively. Localization of

bleeding was unable in eighty - one cases due to pan colonic nature of bleeding or lack of clearly identified source of bleeding. Eight percent of patients (n=12) received endoscopic interventions (Argon plasma coagulation, clips, epinephrine), 40% received blood transfusions (n=64) and 35% required ICU stay (n=56). Post polypectomy was least likely to cause severe bleeding (0% v 3.8%; P=.01), even though only 3 patients had post polypectomy bleeding. There was no significant difference in the site of bleeding between those with severe and non severe bleeding. Those with severe bleeding were more likely to require blood transfusion (87% vs 34%; P<.0001), receive more units of packed red blood cells (3 vs 1; P<.0001), require ICU stays (51% vs 16%; P<.0001), and have a longer overall length of hospital stay (7 days vs 4 days; P =.0009).

Univariable analyses demonstrated that risk factors for severe bleeding included malignancy (odds ratio {OR}, 2.68; 95% confidence interval (CI), 1.06 - 6.80; P=.04), low admission hemoglobin (OR, 3.85 per 1g/dl decrease; 95% CI 1.06 - 3.56; P =.0044), and non - tender abdominal examination at presentation (OR, 2.2; 95% CI, 1.11 - 4.38; P =.02). In a multivariable logistic regression model adjusting for age, sex, moderate to severe renal disease, malignancy, abdominal examination, admission INR and blood pressure, the strongest individual predictors of severe bleeding were low admission hemoglobin (OR1.28 1g/dl decrease; 95% CI, 1.10 - 1.49; P=.0015) and low albumin (OR, 2.56 per 1g/dl decrease; 95% CI, 1.16 - 5.56; P =.02)

Univariable analysis of in - hospital recurrent bleeding demonstrated: 2 predictors: low albumin (OR, 2.3 per 1 - g/dL, decreases; 95% CI, 1.18 - 4.56; P=.01) and non tender abdominal examination (OR, 3.27; 94% CI, 1.24 - 8.35; P=.02). Multiple predictors were found for blood transfusion, including congestive heart failure (OR, 4.47; 94% CI, 1.84 - 10.88; P=.0007), low admission hemoglobin (OR, 1.94% per 1g/dL decrease; 95% CI< 1.53 - 2.34; P<.0001) and high creatinine (OR, 3.23 per 1 mg/dL increase; 95% CI, 1.54 - 5.23; P,.0001).

ICU stay had multiple predictors found in univariable analysis, including severe renal disease (OR, 2.47; 94% CI, 1.45 - 5.74; P=.0002), congestive heart failure (OR, 3.08; 96% CI 1.47 - 6.29; P=.0015) and low albumin (OR, 3.01 per 1g/dL decrease; 94% CI,.17 - .96; P=.05). There were no statistically significant associations between left - sided or right - sided colonic bleeding and endoscopic intervention, blood transfusion, in hospital recurrent bleeding and ICU stay.

Comparison of clinical scoring systems

In this study risk scores were calculated for each patient at admission. Univariable analysis of risk scores demonstrated that best predictor of severe bleeding was the Oakland score (AUC,.74 P<.0001). Oakland score performed better than Birmingham score in identifying severe bleeding. The Oakland score and Birmingham score were comparable for predicting need for transfusion (AUC,.87; P<.0001) but Blatchford score performed the best. Blatchford was most discriminative for in - hospital recurrent bleeding. The discriminative score for in hospital death was SALGIB (AUC,.74; P<.0001).

4. Discussion

Management in LGIB usually varies according to severity of bleeding. It is usually a self - remitting bleed with less life – threatening complications, but it is not the case in severe bleed where the rate of deaths is still constant[3, 5, 7]. UGIB has several prediction tools which have been in use to guide practice and improve outcomes. Several LGIB Prediction tools have been developed to identify patients at substantial risk of severe bleeding; but the performance of these tools varies owing to the demography of population enrolled in the study. Hence it is difficult to understand which tool must be used in clinical practice[6].

In our study we compared several validated risk scoring tools to predict the risk of adverse outcomes in LGIB. We found that no single tool outperformed others across all outcomes; but Oakland score showed a better predictive ability for severe bleeding and blood transfusion.

The etiology of acute LGIB has significant geographical differences.[1] Diverticular bleeding was the most common cause of Acute LGIB in west with prevalence ranging from 19.7% to 41.0. We found that hemorrhoids were the most common source of bleeding in our study which is consistent with other studies from Asian countries[16]. Detected hemorrhoids were considered as cause of acute LGIB if they were actively bleeding or colonoscopy was negative for other lesions (figure1).

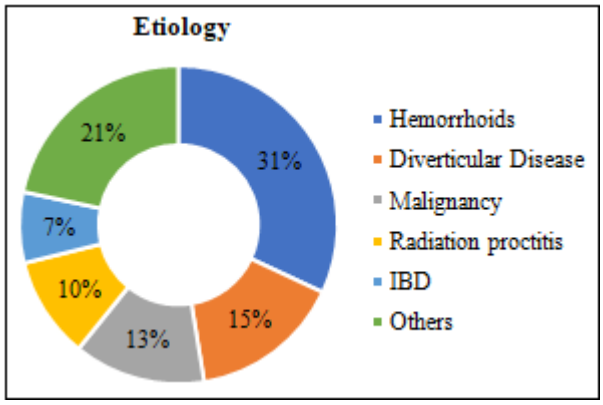

Figure 1: Etiologies of LGIB seen in the study

In this study we have demonstrated that patient with severe bleeding is at higher risk of life - threatening complications such as blood transfusions, ICU stay, longer stay and death which is consistent with medical, literature. We identified independent prognostic for severe bleeding which are low admission hemoglobin and albumin. These findings are consistent with other studies which have included these variables in their risk prediction models[17]. Tapaskar et al also demonstrated the importance of admission of hemoglobin in predicting severe bleeding. Other studies have shown hypoalbuminemia to be an independent predictor of mortality in critically ill patients[11].

Table 1: Univariable association of Risk Scores with major clinical outcomes

Risk Tools	Severe Bleeding (p value)	Recurrent Bleeding (p value)	Blood Transfusion (p value)	ICU Stay (p value)	In Hospital Death (p value)	Endoscopic intervention (p value)
Oakland	<.0001	.23	<.0001	.48	.53	.01
Birmingham	<.0001	.33	.28	.53	.47	.45
SALGIB	<.0001	.47	<.0001	<.0001	<.0001	.03
NOBLADS	.27	.54	.39	.09	.81	.21
AIM 65	.45	.63	.41	.51	.97	.56
GBS	.37	.87	<.0001	.36	.53	.80
Charleson	.46	.02	.53	.78	.29	.64

Oakland et al had compared Blatchford, AIMS 65, BLEED, NOBLADS, Stratesand Rockall with their own score (Table 1) and found the Strate score most predictive of transfusion but did not address severe bleeding.9 Aoki et al[4] also compared several studies to identify scores for predictive ability of severe bleeding and found NOBLADS to be most predictive when compared to BLEED, Strate, Velayos and Newman. Higher NOBLADS were associated with blood transfusion, length of stay and intervention. Quach et al had developed and validated a new scoring system called SALGIB score to predict severe bleeding in a Vietnamese population[12]. The study showed cut off points of SALGIB > 5 was associated with substantial risk of severe bleeding. Smith et al had compared his Birmingham score to Oakland score and found both had comparable predictive ability in identifying severe bleeding[13].

Our study demonstrated that no score outperformed each other; however, Oaklands score was best predictor of severe bleeding whereas Blatchford score was best in predicting in hospital recurrent bleeding but less discriminative of severe bleeding[4]. SALGIB score had the best discriminative ability in predicting hospital deaths but had low predictive ability for severe bleeding. In our study severe bleeding was seen in 54% of patients compared with 29% in NOBLADS study, 10%in SALGIB study, 12% in Birmingham study and only 1% in Oaklandstudy[18]. The high incidence of severe bleeding is likely because of the high comorbidity burden of patients at our tertiary care center. Given the higher incidence of severe bleeding in our study, sample may be more ideal for comparisons of severe bleeding risk scores when compared with other studies.

Both Birmingham and Oakland scores were comparable in predicting transfusion requirements, but Blatchford performed the best (AUC,.87). This was consistent with Tapaskar et al. The rates of endoscopic hemostasis, radiological intervention and surgery in previous studies ranged from 2% to 22%, 0.4% to 2% and 0% to 8% respectively[19]. Our study showed that rates of endoscopic hemostasis, radiological interventions and study were in line with previous studies.2[0]

Major limitations being small sample size in identifying specific variables or scores that predict adverse bleeding or score that predict endoscopic intervention or readmission. A selection criterion of patients undergoing colonoscopy after admission potentially creates a selection bias in view of those patients who were discharged from Triage room without colonoscopy. Also, loss of follow up of patients who did not present to center with rebleeding. Due to lack of expertise in radiological intervention in our center is another limitation which could not identify patients requiring the same[21].

In conclusion, we identified independent predictors of severe bleeding (hemoglobin and albumin) and compared the ability of several risk scores in predicting adverse outcomes in patients with LGIB. We found that none of the validated LGIB tools outperformed each other across five outcomes. We found that UGIB tools had some utility in LGIB. Overall, there is still a big lacuna in LGIB severity tools and more powerful prediction tools are required for better management in LGIB.

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