European Review for Medical and Pharmacological Sciences 2022; 26: 7986-7995

Evaluation of the Sheffield score, clinical characteristics, and the therapeutic approach in children with upper gastrointestinal system bleeding

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Abstract. – OBJECTIVE: Unlike adults, there is no valid and reliable scoring system for upper gastrointestinal system bleeding (UGB) in children. The Sheffield scoring system, which is awaiting confirmation, is the single scoring system which can be predictive for children who require high-risk, endoscopic therapeutic intervention. The aim of this study was to evaluate the efficacy of the Sheffield scoring system, the clinical characteristics of patients, and the treatments applied.

PATIENTS AND METHODS: Evaluation was made of a total of 86 children with UGB who underwent esophagogastroduodenoscopy and for whom the Sheffield score was calculated. The decision for therapeutic intervention was made according to the clinical status independently of the score. The demographic data of the patients, clinical symptoms and findings, risk factors, and treatments were examined retrospectively.

RESULTS: The Sheffield score was calculated as ≤8 in 67.4% of the patients and >8 in 32.6%. Endoscopic hemostatic intervention was applied to 15.1% of the patients. The rate of therapeutic endoscopy was significantly high in the high-score group. In 11 patients with Sheffield score >8, the bleeding was brought under control with octreotide treatment administered before endoscopy and no invasive intervention was applied. The sensitivity and specificity of the Sheffield score were determined to be at a good level in the prediction of the requirement for therapeutic endoscopy and octreotide treatment.

CONCLUSIONS: The Sheffield score can reliably predict the need for endoscopic treatment with high sensitivity and specificity. In children with a high score, the need for an invasive intervention can be reduced with the administration of vasoactive treatment before esophagogastroduodenoscopy. The Sheffield score can thus be of guidance in the determination of the need for vasoactive treatment.

Key Words:

Upper gastrointestinal system bleeding, Scoring system, Children, Esophagogastroduodenoscopy, Invasive endoscopic intervention, Octreotide.

Introduction

Although upper gastrointestinal system bleeding (UGB) in childhood is uncommon, it is an important condition that can be life-threatening. Esophagogastroduodenoscopy (EGD) provides the opportunity for both diagnosis and treatment, reduces re-bleeding, the need for surgical intervention, and mortality[1]. The priority aim is to reduce mortality and the need for surgical intervention. However, in a bleed which can be self-limiting, it is important to avoid unnecessary interventions and hospitalisation[2].

There are pre-endoscopic/post-endoscopic scoring systems for adults with UGB (Glasgow-Blatchford, Addenbrooke, Rockall, Forrest), which can be used to determine patients who require emergency endoscopic treatment which is high risk, or those who are low risk and will be able to be discharged. The parameters of these scoring systems are not suitable for use in the paediatric population. Thomson et al[3] recently developed the Sheffield scoring system to determine the severity of bleeding and the need for endoscopic treatment in children with UGB. In this scoring system, which is awaiting confirmation, the total score is 24 and the cutoff value is 8. It has been stated that endoscopic therapeutic intervention is necessary in patients with a score of >8[3]. The aim of this study was to evaluate the Sheffield scoring system in children with UGB, the clinical findings of patients, and the diagnostic and therapeutic approaches.

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Patients and Methods

Study Design

The study included patients aged <18 years who presented at a university hospital with UGB between May 2019 and February 2022, for whom the Sheffield score was calculated on presentation. These patients, regardless of the calculated scores, were applied with hemostatic intervention to active bleeding during EGD or to lesions at high risk of re-bleeding (visible veins, adherent clots, varice bleeding). Patients were excluded from the study if EGD was not applied, if no finding of UGB was determined with EGD in suspicious cases, if EGD was performed after 48 hours, or if the Sheffield score was not calculated on presentation or was not recorded. Demographic data, complaints on presentation, comorbid diseases, the presence of risk factors for UGB, laboratory examination results, octreotide requirement, blood and blood products requirement, EGD findings, the presence of Helicobacter pylori (*H. pylori)*, and therapeutic endoscopic interventions applied were recorded retrospectively. The EGD applications were classified according to whether it was therapeutic or only diagnostic EGD. As the cutoff value of the Sheffield score was 8 for the requirement for therapeutic endoscopy, the patients were grouped according to this value as cases with a score of ≤8 or >8.

The study protocol was approved by the Ethics Committee of Necmettin Erbakan University Medical Faculty (approval no: 2021/3439) and conformed to the principles outlined in the Declaration of Helsinki.

Statistical Analysis

Data obtained in the study were analyzed statistically using SPSS vn. 20.0 software (IBM Inc., Armonk, NY, USA). Descriptive measurements were stated as mean±standard deviation (SD) or median (Q1-Q3) values for numerical variables and as number (n) and percentage (%) for categorical variables. Conformity of numerical variables to normal distribution was assessed with the Kolmogorov-Smirnov test, and it was seen that the majority of the variables did not have normal distribution. The Kruskal-Wallis test was applied to comparisons of multiple independent groups, and Chi-square analysis was used to determine relationships between categorical data. The diagnostic rates of the need for therapeutic gastroscopy and octreotide according to the Sheffield score were calculated. For type 1 error of 5%, a value of p <0.05 was accepted as statistically significant. Power analysis of the study was performed using G-Power software. Exact was selected as the test family, and the single random sampling test was selected as the test type. The sample size was calculated as n=79 taking the power value of 90%, error margin of 5%, and effect size of 0.10 for a one-way binomial test.

Results

Evaluation was made of a total of 86 paediatric patients, comprising 55.8% males and 44.2% females, with a median age of 82 months; 59.3% of the patients were aged >5 years. The patients presented with hematemesis in 56 (65.1%) cases, melena in 15 (17.4%), hematemesis and melena in 14 (16.3%), and hematemesis and hematochezia in one. In the majority of patients (74.4%), there was no comorbid disease which could lay the ground for bleeding. In the other 25.6% of patients, the most common comorbidities were cerebral palsy, vasculitis, and leukemia/lymphoma. There was no risk factor which could cause UGB in 20.9% of the patients. The most common risk factor (54.8%) was determined to be a history of nonsteroidal anti-inflammatory drugs (NSAID) use within one month before the bleeding. Among patients with NSAID use, 4 had used concomitant corticosteroids, 1 had used concomitant salicylates, and in 4 patients there was accompanying *H. pylori* positivity. The *H. pylori* positivity was determined in 14% of the patients (Table I).

The causes of bleeding determined with EGD were gastric ulcer (32.5%), duodenal ulcer (26.7%), oesophageal ulcer (10.5%), Mallory-Weiss syndrome (8.1%), hemorrhagic erosive gastritis (5.8%), and oesophageal varices (5.8%). Different reasons for bleeding were observed at low rates. The other less common causes were the combination of gastric and duodenal ulcer (2.3%), Dieulafoy lesion (2.3%), gastrojejunostomy anastomosis ulcer (1.2%), portal hypertensive gastropathy (1.2%), gastric vascular malformation (1.2%), oesophageal foreign body (1.2%), and erosive oesophagitis (1.2%). The swallowing of a foreign body was the risk factor at the highest rate in oesophageal ulcer bleeding and the rates of NSAID or NSAID and corticosteroid together (NSAID+corticosteroid) use were higher in gastric ulcer bleeding (p=0.010). No statistical significance was seen in the distribution of risk factors according to other causes of bleeding.

Table I. Demographic and clinical characteristics of the patients.

Characteristics	Categories	N (%)
Age	< 5 years	35 (40.07)
	≥ 5 years	51 (59.03)
Gender	Male	48 (55.8)
	Female	38 (44.2)
Clinical Presentation	Hematemesis	56 (65.1)
	Melena	15 (17.4)
	Hematemesis and Melena	14 (16.3)
	Hematemesis and Hematochezia	1 (1.2)
Comorbid diseases	None	64 (74.4)
	Bleeding diathesis	1 (1.2)
	Vasculitis	5 (5.8)
	Chronic liver disease	2 (2.3)
	Cerebral Palsy	7 (8.1)
	Budd-Chiari	1 (1.2)
	Portal Vein Thrombosis	2 (2.3)
	Congenital Hepatic Fibrosis	1 (1.2)
	Leukemia/Lymphoma	3 (3.5)
Risk factors	None	18 (20.9)
	Only NSAID	38 (44.2)
	Multiple NSAID	1 (1.20)
	Corticosteroid	2 (2.3)
	NSAID+Corticosteroid	4 (4.7)
	NSAID+*H. pylori*	4 (4.7)
	H. pylori infection	8 (9.3)
	Portal hypertension	6 (7.0)
	Critical disease (sepsis, ICU admission, operation, burns, trauma)	3 (3.5)
	Swallowing of foreign body	1 (1.2)
	Gastrointestinal surgery	1 (1.2)
Hemoglobin fall in 24 hours	None	60 (69.7)
	> 2 g/dl fall	26 (30.2)
Octreotide requirement	Present	20 (23.3)
	Absent	66 (76.7)
Blood transfusion requirement	Present	33 (38.4)
	Absent	53 (61.6)
Other blood products transfer requirement	Present	7 (8.1)
	Absent	79 (91.9)
Bolus fluid requirement	Present	6 (7)
	Absent	80 (93)

NSAID: Nonsteroidal anti-inflammatory drugs, NSAID+Corticosteroid: Concomitant of NSAID and corticosteroid use, NSAID+*H. pylori*: Concomitant of NSAID use and *H. pylori* positivity, ICU: Intensive Care Unit.

The median hemoglobin (Hgb) value on presentation of the patients was 9.8 g/dL. When the Hgb values were evaluated according to clinical presentation, there was found to be a significant difference (p <0.001). The Hgb value was determined to be high in patients with isolated hematemesis, lower in those with isolated melena, and extremely low in patients presenting with hematemesis and melena combination (hematemesis+melena) and those with hematemesis and hematochezia combination (hematemesis+hematochezia) (Table II).

Significant differences were determined in the Sheffield score according to the clinical presentation (p <0.001). The median value was 0 in the patients with hematemesis, 7 in the melena group, 13 in the hematemesis+melena group, and as high as 15 in the hematemesis+hematochezia group (Table II).

The Sheffield score was calculated as ≤8 in 58 (67.4%) patients and >8 in 28 (32.6%). In the patient group with a Sheffield score >8, the rates of presentation with melena and hematemesis+melena were significantly higher (p <0.001). Patients

Table II. Sheffield scores and Hgb values on presentation according to the form of clinical presentation.

Presentation	Median; Q1-Q3	
	Sheffield Score	Hgb
Hematemesis	0; 0-1	11.65; 9.17-12.72
Melena	7; 1-10	7.6; 6.8-9.8
Hematemesis and melena	13; 8.5-17	6.65; 5.72-7.5
Hematemesis and hematochezia	15	3.5
p	< 0.001*	< 0.001*

*The level of statistical significance is 0.05, according to the Kruskal-Wallis test.

with a high score were found to have higher rates of the risk factors of portal hypertension, critical disease, and NSAID+*H. pylori* (p =0.033). The rate of octreotide treatment was significantly higher in the high Sheffield score group (p <0.001) (Table III).

In 73 patients (84.9%) there was no requirement for therapeutic endoscopic intervention and only

Table III. Clinical characteristics of the patients according to the Sheffield score groups.

Characteristics	Categories	Sheffield score N (%)		*p*
		≤ 8	> 8	
Presentation	Hematemesis	46 (79.3)	10 (35.7)	< 0.001*
	Melena	9 (15.5)	6 (21.4)	
	Hematemesis and melena	3 (5.2)	11 (39.3)	
	Hematemesis and hematochezia	0 (0.0)	1 (3.6)	
Risk factors	None	17 (29.3)	1 (3.6)	0.033
	Only NSAID	29 (50.0)	9 (32.1)	
	Multiple NSAID	1 (1.7)	0 (0.0)	
	Corticosteroid	1 (1.7)	1 (3.6)	
	NSAID+Corticosteroid	3 (5.2)	1 (3.6)	
	NSAID+*H. pylor*i	1 (1.7)	3 (10.7)	
	H. pylori infection	5 (8.6)	3 (10.7)	
	Portal hypertension	0 (0.0)	6 (21.4)	
	Critical disease	0 (0.0)	3 (10.7)	
	Swallowing of foreign body	1 (1.7)	0 (0.0)	
	Gastrointestinal surgery	0 (0.0)	1 (3.6)	
Cause of bleeding	Erosive oesophagitis	1 (1.7)	0 (0.0)	0.161
	Oesophageal ulcer	7 (12.1)	2 (7.1)	
	Mallory-Weiss syndrome	7 (12.1)	0 (0.0)	
	Oesophageal varices	0 (0.0)	5 (17.9)	
	Oesophageal foreign body	0 (0.0)	1 (3.6)	
	Hemorrhagic erosive gastritis	4 (6.9)	1 (3.6)	
	Gastric ulcer	22 (37.9)	6 (21.4)	
	Portal hypertensive gastropathy	0 (0.0)	1 (3.6)	
	Gastric vascular malformation	1 (1.7)	0 (0.0)	
	Duodenal ulcer	15 (25.9)	8 (28.6)	
	Dieulafoy lesion	0 (0.0)	2 (7.1)	
	Stomach ulcer+duodenal ulcer	1 (1.7)	1 (3.6)	
	Gastrojejunostomy anostomosis ulcer	0 (0.0)	1 (3.6)	
Octreotide requirement	Present	3 (5.2)	17 (60.7)	< 0.001*
	None	55 (94.8)	11 (39.3)	

*p < 0.05 was accepted as statistically significant. NSAID: Nonsteroidal anti-inflammatory drugs, NSAID+Corticosteroid: Concomitant of NSAID and corticosteroid use, NSAID+ *H. pylori*: Concomitant of NSAID use and *H. pylori* positivity, ICU: Intensive Care Unit.

diagnostic EGD was performed. A therapeutic intervention was made in 13 (15.1%) patients. The most frequently applied invasive procedures were band ligation (n:5, 5.8%) and epinephrine injection (n:4, 4.7%). Following the epinephrine injection to 2 (2.3%) patients with bleeding associated with Dieulafoy lesion, hemoclips were applied. Hemoclips were also applied to 1 (1.2%) patient with oesophageal foreign body-related tissue damage. Argon plasma coagulation was applied to 1 (1.2%) patient with gastric vascular malformation.

In the therapeutic endoscopy group, the rate of presentation with the combination of hematemesis and melena was significantly high (p =0.001). No significant difference was determined between the therapeutic and diagnostic endoscopy groups in respect of risk factors and causes of bleeding. The need for octreotide at the rate of 69.2% in the therapeutic endoscopy group was determined to be significantly high (p <0.001) (Table IV). The Sheffield score groups were compared with the gastroscopy groups. The rate of therapeutic endoscopy was found to be significantly high in the group with Sheffield score >8. The diagnostic rates of the Sheffield score in the determination of the need for therapeutic endoscopy were calculated. Sensitivity and specificity were found to be at an extremely good level (76.92%, 75.34%, respectively). According to these values, the test accuracy was calculated to be 75.58% (Table V).

The diagnostic rates of the Sheffield score in the determination of the need for octreotide were calculated. According to these values of sensitivity of 60.71%, specificity of 94.83%, and accuracy of 83.72%, this was found to be an extremely successful evaluation criterion (Table VI).

Table IV. Clinical characteristics of the patients according to the gastroscopy types.

Characteristic	Categories	Therapeutic endoscopy N (%)	Diagnostic endoscopy only N (%)	p
Presentation	Hematemesis	5 (38.5)	51 (69.9)	0.001*
	Melena	1 (7.7)	14 (19.2)	
	Hematemesis and Melena	6 (46.2)	8 (11.0)	
	Hematemesis and Hematochezia	1 (7.7)	0 (0.0)	
Risk Factors	None	2 (15.4)	16 (21.9)	0.862
	Only NSAID	2 (15.4)	36 (49.3)	
	Multiple NSAID	0 (0.0)	1 (1.4)	
	Corticosteroid	0 (0.0)	2 (2.7)	
	NSAID+Corticosteroid	0 (0.0)	4 (5.5)	
	NSAID+*H. pylo*ri	0 (0.0)	4 (5.5)	
	H. pylori infection	2 (15.4)	6 (8.2)	
	Portal hypertension	5 (38.5)	1 (1.4)	
	Critical disease	2 (15.4)	1 (1.4)	
	Swallowing of foreign body	0 (0.0)	1 (1.4)	
	Gastrointestinal surgery	0 (0.0)	1 (1.4)	
Cause of bleeding	Erosive oesophagitis	0 (0.0)	1 (1.4)	0.895
	Oesophageal ulcer	1 (7.7)	8 (11.0)	
	Mallory-Weiss syndrome	0 (0.0)	7 (9.6)	
	Ozefageal varices	5 (38.5)	0 (0.0)	
	Oesophageal foreign body	1 (7.7)	0 (0.0)	
	Hemorrhagic erosive gastritis	0 (0.0)	5 (6.8)	
	Gastric ulcer	0 (0.0)	28 (38.4)	
	Portal hypertensive gastropathy	0 (0.0)	1 (1.4)	
	Gastric vascular malformation	1 (7.7)	0 (0.0)	
	Duodenal ulcer	3 (23.1)	20 (27.4)	
	Dieulafoy lesion	2 (15.4)	0 (0.0)	
	Stomach ulcer+duodenal ulcer	0 (0.0)	2 (2.7)	
	Gastrojejunostomy anostomosis ulcer	0 (0.0)	1 (1.4)	
Octreotide requirement	Present	9 (69.2)	11 (15.1)	< 0.001*
	None	4 (30.8)	62 (84.9)	

*p < 0.05 was accepted as statistically significant. NSAID: Nonsteroidal anti-inflammatory drugs, NSAID+Corticosteroid: Concomitant of NSAID and corticosteroid use, NSAID+ *H. pylori*: Concomitant of NSAID use and *H. pylori* positivity, ICU: Intensive Care Unit.

Table V. Comparisons of the gastroscopy types according to the Sheffield scores.

		Therapeutic gastroscopy N (%)	Diagnostic gastroscopy only N (%)	*p*
Sheffield Score	≤ 8	3 (23.1)	55 (75.3)	< 0.001*
	> 8	10 (76.9)	18 (24.7)	
Diagnostic rates	**Rate**	**95% CI****		
Sensitivity	76.92%	46.19%-94.96%		
Specificity	75.34%	63.86%-84.68%		
Positive Likelihood Ratio	3.12	1.89-5.14		
Negative Likelihood Ratio	0.31	0.11-0.83		
Positive Predictive Value	35.71%	25.21%-47.79%		
Negative Predictive Value	94.83%	87.07%-98.04%		

*$p < 0.05$ was accepted as statistically significant. **Confidence interval.

Discussion

Although UGB is uncommon in childhood, the majority of large, prospective studies related to incidence have evaluated the incidence in Intensive Care Units (ICUs) and have reported it to be approximately 6% [4-6]. In a retrospective cohort study in Toronto, it was reported that of 316,020 presentations at the Emergency Department, only 0.2% were because of hematemesis. Despite the rarity of this in the paediatric age group, this type of presentation is a cause of severe concern for parents[7].

In the current study, the most common form of clinical presentation was hematemesis; 65.1% hematemesis, 17.4% melena, 16.3% hematemesis+melena, 1.2% hematemesis+hematochezia. The highest Hgb level was determined in patients presenting with isolated hematemesis, it was lower in those with isolated melena, and extremely low in those who presented with hematemesis+melena, or hematemesis+hematochezia (p <0.01). There was a greater need for endoscopic treatment in patients who presented with hematemesis+melena (p =0.001). These findings were consistent with other studies in literature. Nasher et al[8] reported that hematemesis was the most common clinical presentation, but the Hgb level was lower in those who presented with melena and the lowest Hgb level was in patients presenting with the combination of hematemesis+melena. In a multicentre, retrospective cohort study in China that included 1218 children, hematemesis was reported to be the most common clinical presentation (59.3%). In that large cohort, Yu et al[9] determined that the Hgb level was lower in the melena and hematemesis+melena groups, and the requirement for endoscopic treatment was higher. Similar to the findings of the current study, the need for endoscopic treatment was determined at the highest level in the children who presented with hematemesis+melena[9]. Especially in older children, it is more likely that hematemesis rather than melena will be noticed by parents. As hematemesis is a more dramatic presentation, it probably causes a more rapid presentation at hospital. This probability could explain the higher level of Hgb in children presenting with isolated hematemesis compared to those with isolated melena. The combination of hematemesis and melena at the time of presentation is related to greater blood loss and can suggest a more serious source of the bleeding which requires an endoscopic treatment intervention.

Consistent with findings in literature, the most common risk factor in the current study group was exposure to NSAIDs, and the use of

Table VI. Diagnostic rates of the need for octreotide.

Diagnostic rates	Rate	95% CI*
Sensitivity	60.71%	40.58%-78.50%
Specificity	94.83%	85.62%-98.92%
Positive likelihood ratio	11.74	3.75-36.76
Negative likelihood ratio	0.41	0.26-0.66
Positive predictive value	85.00%	64.41%-94.67%
Negative predictive value	83.33%	75.86%-88.83%
Accuracy	83.72%	74.20%-90.80%

*Confidence interval.

NSAIDs (54.8%) was determined to be at a higher rate than in previous reports. Yu et al[9] reported NSAID use as 12.4% in a large cohort study. In a case-crossover study by Grimaldi et al[10], in which risk factors in 177 children with UGB were evaluated, it was reported that 36% of the cases could be attributed to NSAIDs. Long-term use of NSAIDs as anti-inflammatories in some diseases (e.g., rheumatismal diseases), use at a higher dose than recommended, and combined use with other NSAIDs, increase the risk of gastrointestinal complications[11]. Patients in the current study with long-term use because of comorbid diseases and multiple NSAID use could account for the increased rate of bleeding associated with NSAID exposure. Of the patients with NSAID exposure, 6 were using steroids, 1 salicylates, and in 4, there was also *H. pylori* positivity. Although these 11 patients constituted 23% of those with NSAID exposure, this hypothesis alone cannot explain the high rate of NSAID use in the study cohort. In a previous study in Turkey by Kalyoncu et al[12], the rate of NSAID use was reported to be 56% in 34 children with UGB aged younger than 2 years. This phenomenon can be attributed to uncontrolled drug use by parents in Turkey and low levels of awareness and education in society about rational drug use.

The common reasons for UGB in children vary according to geographical location. The most common reasons have been reported to be gastric erosion in Taiwan (44.6%), Saudi Arabia (44%) and Southern Iran (28%), and oesophageal varices in India (39.4%)[13-16]. In western countries, gastric and duodenal ulcers have been reported to be the most common reason. However, those studies were conducted 30 years ago. Cleveland et al[17] determined an increase in the incidence of gastric and duodenal ulcers associated with high prevalence of *H. pylori* in eastern countries compared to the past. In the USA, the most frequent cause of bleeding is vomiting-induced hematemesis, and it has been reported that the incidence of peptic ulcer has decreased compared to the past in western countries due to successful diagnosis and treatment of *H. pylori* [17]. In the current study, gastric ulcer (32.5%) and duodenal ulcer (26.7%) were seen to be the most common causes of bleeding. When the causes of bleeding were compared with the risk factors, NSAID exposure was determined to be significantly higher in patients with gastric ulcer (p =0.010). In patients with duodenal ulcer, the most common risk factor was seen to be *H. pylori* infection although it was not statistically significant. Ertem et al[18] reported that one in four children in Turkey are infected with *H. pylori* before the age of 4 years, and one in every two children younger than 11 years. The high frequency of gastric and duodenal ulcers in the current study can be explained by the high prevalence of *H. pylori* and NSAID exposure in Turkey.

Zheng et al[19] analyzed the risk factors related to UGB in children and developed a scoring system to predict the severity of UGB. In that study, children were separated into groups of mild UGB and severe UGB according to the International Classification of UGB in adults. The scoring system was developed by comparing the risk factors in the two groups[19]. However, in this classification used in adults, the patients are separated into 3 groups as mild, moderate, and severe, and the parameters are not suitable for use in a paediatric age group[20].

Thomson et al[3] grouped children with UGB as those requiring and not requiring therapeutic intervention, and compared various clinical parameters between these groups. Using detailed statistical modelling to evaluate the clinical characteristics that created a statistically significant difference between the two groups, a more reliable scoring system was developed. According to Thomson et al[3], by predicting the need for endoscopic treatment, this scoring system can be a reference for paediatricians in respect of patients to be transferred or not to a centre where EGD can be performed. In the current study, the Sheffield score was calculated as ≤8 in 58 patients and >8 in 28 patients. When the risk factors were compared between the high-score and low-score patient groups, portal hypertension, critical disease, and the combination of NSAID+*H. pylori* were determined at a statistically significantly higher rate in the patients with a high Sheffield score (p =0.033). According to the American College of Gastroenterology, *H. pylori* infection is a significant risk factor for gastrointestinal complications associated with NSAIDs. In a retrospective multicentre study by Cardile et al[21], it was reported that in children presenting with UGB following NSAID use, *H. pylori* gastritis accompanying NSAID use and exposure to other drugs were the most common risk factors. Malekiantaghi et al[22] compared children with UGB following NSAID use and children with bleeding who had not used any drugs. *H. pylori* prevalence was found to be 40% in the group with NSAID exposure and 8% in the control group, and the Hgb level was re-

ported to be lower in those infected with *H. pylori*. In the current study, portal hypertension, critical disease, and the combination of NSAID+*H. pylori* were determined to be the most common risk factors in the patients with a high Sheffield score. Although a hemostatic intervention was made to the majority of the patients with portal hypertension and critical disease, no therapeutic intervention was made to any of the patients with NSAID+*H. pylori* combination. As far as is known, NSAID exposure in children infected with *H. pylori* can create more severe bleeding by increasing gastric mucosal damage, but the response to medical treatment is better in these cases compared to those with other risk factors.

Endoscopic hemostatic intervention was applied to 13 of the current study patients, of which 3 had a Sheffield score of ≤ 8 (3 false negatives). Of the 73 patients applied with only diagnostic endoscopy, 18 had a Sheffield score of >8 (18 false positives). Despite the lower values according to Thomson et al[3], the sensitivity (76.92%) and specificity (75.34%) of the Sheffield score were found to be at extremely good levels for the prediction of the need for therapeutic intervention. The negative predictive value (NPV) was 94.83% and the positive predictive value (PPV) was 35.71% (Table V). Although the PPV was low in this study, the Sheffield score can be considered reliable for use. In 11 of the 18 patients with a high score, hemostatic intervention was not applied during endoscopy as they had non-variceal UGB (NVUGB) associated with a peptic ulcer, and octreotide treatment was administered in the gastroscopy preparation process.

Although the efficacy of octreotide in controlling bleeding is a matter of debate in literature, there are a not insignificant number of studies reporting that it is useful in massive non-variceal bleeding. Octreotide was determined to be effective in massive peptic ulcer bleeding in a prospective, randomized, controlled study, and it was reported that it could be selected as the first step before referral to a gastroenterology centre[23]. Eroglu et al[24] evaluated the efficacy of octreotide in children with NVUGB and reported that bleeding was brought under control by octreotide in 50% of patients. In a meta-analysis that compared the efficacy of octreotide with a placebo or H2RA in patients with NVUGB, octreotide was determined to reduce the risk of continued or re-bleeding especially in bleeding associated with peptic ulcer. It has been reported that to slow or stop bleeding, it can provide resuscitative benefit in the first step of treatment and lesions can be better visualized during EGD[25]. In the light of this information, it was thought that in this patient group with a high rate of false positives, the bleeding was brought under control with octreotide and thus the need for a therapeutic hemostatic intervention was eliminated. However, the presence of these patients in this study cohort prevented the efficacy of the Sheffield score from being completely shown. Although this was a limitation, this study can be considered to be of guidance for further prospective studies to confirm the efficacy of the Sheffield scoring system. Another limitation of the current study was that the data were collected retrospectively, but the cohort consisted of patients with Sheffield score calculated prospectively on first presentation.

NVUGB stops spontaneously in the majority of cases. Therefore, it is important to determine patient groups at high risk who do not have spontaneous termination of bleeding in respect of the decision to be made for medical or endosopic treatment. Jenkins et al[26] analyzed the comparative studies available related to vasoactive drug treatment of patients with NVUGB. Some studies determined no significant difference in vasoactive treatment compared to control groups, whereas when the sample included all the patients with bleeding regardless of severity, it was reported that the result could have been affected by patients in which the bleeding could stop spontaneously. It was concluded that vasoactive treatment was effective, especially in patients with a risk of re-bleeding or in high-risk patients where bleeding would not stop spontaneously. As a result of that analysis, it was recommended that for patients with high-risk prognostic factors, vasoactive treatment should be started together with hemodynamic stabilization, and endoscopy should be applied later[26]. Consistent with the literature, for the current study patients thought to be high risk, octreotide treatment was started before endoscopy, at the stage of hemodynamic stabilization and/or endoscopy preparation. As there is no confirmed scoring system for the prediction of paediatric patients requiring emergency therapeutic intervention, which is high risk, this decision was made on the basis of clinical experience.

However, the Sheffield scoring system is a system for the prediction of high-risk patients requiring a fully invasive endoscopic intervention. This suggests that this system could also

be of guidance in respect of octreotide treatment before endoscopy in patients with NVUGB. In this study, the Sheffield score was determined to have PPV of 85% (95% confidence interval [CI] 64.41%-94.67%), and NPV of 83.33% (95% CI 75.86%-88.83%) in the determination of the need for octreotide treatment. Although the data related to octreotide use are not clear, extremely encouraging results have been reported that it is beneficial in patients with massive bleeding and in high-risk patient groups. The group most likely to benefit from octreotide treatment is patients with a high score who are predicted to need an invasive intervention.

Conclusions

The Sheffield score can be considered to be extremely effective in the prediction of high-risk patients with a requirement for endoscopic therapeutic intervention, and this need for an invasive intervention can be reduced with the administration of octreotide at the stage of endoscopy preparation and/or referral to a gastroenterologist. Nevertheless, there is a need for further large-scale prospective studies with well-defined patient subgroups to examine in more detail vasoactive drug treatments administered to high-risk groups of children with UGB.

Conflict of Interest

The author has no conflict of interests to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Informed Consent

Informed consent was obtained from all individual participants included in the study.

Ethics Approval

Approval was obtained from the Ethics Committee of Necmettin Erbakan University Medical Faculty.

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