

Literature Review

Gastrointestinal Bleeding in Pediatrics

Muzal Kadim¹

¹ Gastrohepatologi Division, Department of Child Health, Faculty of Medicine, Universitas Indonesia, Cipto Mangunkusumo Hospital, Jakarta, Indonesia

Corresponding author:

Muzal Kadim MD
muzalk@yahoo.com

Abstract:

Gastrointestinal bleeding (GI) may occurs in infants and children. Most etiologies of GI bleeding are mild and self-limited, but may advance into life-threatening condition if not treated properly. Upper GI bleeding and lower GI bleeding can be classified based on bleeding sites that is above or below Treitz ligament. Causes of GI bleeding in infants and children varies according to their age and bleeding sites. Some conditions may be misunderstood as GI bleed such as consumption of certain red coloured food. Diagnosis of gastrointestinal bleeding in children includes complete history taking, thorough physical examination, laboratory examination, radiological examination, and other supportive modality such as endoscopy. Early diagnosis and proper therapy can improve outcomes and prevent severe conditions.

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Introduction

Gastrointestinal (GI) bleeding in infants and children is a condition that may trigger parental anxiety due to its alarming nature.¹ Most etiologies of GI bleeding are mild and self-limited.² However, in some cases, the symptoms may develop into life-threatening emergencies. Massive bleeding is the most lethal complications as it may cause severe shock and even death.^{1,3} However, episodes of severe uncontrolled bleeding are quite rare and thus, some healthcare workers might be unfamiliar in dealing with this condition.³

GI bleeding can be undetected, ranging from occult bleeding detectable only through laboratory examinations to gross hematemesis, hematochezia, or melena.⁴ The hospitalization rate due to upper GI bleeding were estimated at around 36 to 102 cases per 100,000 population per year. Meanwhile, lower GI bleeding occurred less frequently in about 20 per 100,000 patients of all ages.^{5,6} Currently, there is still lack of documentation on the actual incidence of GI bleeding among pediatric population. However, the general number is estimated to be less than the adult population. Interestingly, the most frequent chief of complaint in pediatric patients who came to the emergency room were symptoms of lower GI bleeding. The mortality rate that was caused by GI bleeding is quite high, varying from 3.5 to 14%. Thus, the author would like to provide new insight on pediatric GI bleeding to increase the awareness on the topic.

Classifications of GI bleeding

Establishing the etiology through anamnesis and complete physical examination should only be conducted once the patient is stabilized. Distinguishing between local or systemic cause of hemorrhage should be the main concern during the investigation efforts.¹ Systemic causes are frequently associated with systemic disorder (such as coagulation disorder, hemophilia, Von Willebrand disease, etc) and/or bleeding from other organs in the body. On the other hand, local causes are bleeding which can be tracked from inside the GI system. Other methods of classification are through the anatomical location: upper or lower GI system, separated by the ligament of Treitz.⁷ **Table 1** shows the clinical features could be used to differentiate the source of the bleeding.

Table 1. Clinical differences between upper and lower GI bleeding.

Diagnosis Approach

Figure 1 shows the steps to approach GI bleeding. The clinical approaches that should be conducted in children with GI bleeding include determination of the

Source of Bleeding	General Manifestation
Upper GI Bleeding	• Hematemesis • Melena
Small Intestine Bleeding	• Hematochezia (in profuse bleeding) • Melena or hematochezia
Lower GI Bleeding	• Commonly hematochezia, except in slow motility

presence of hemodynamic emergencies, finding the source of bleeding, and composing differential diagnosis based on clinical symptoms and patient's age.⁴

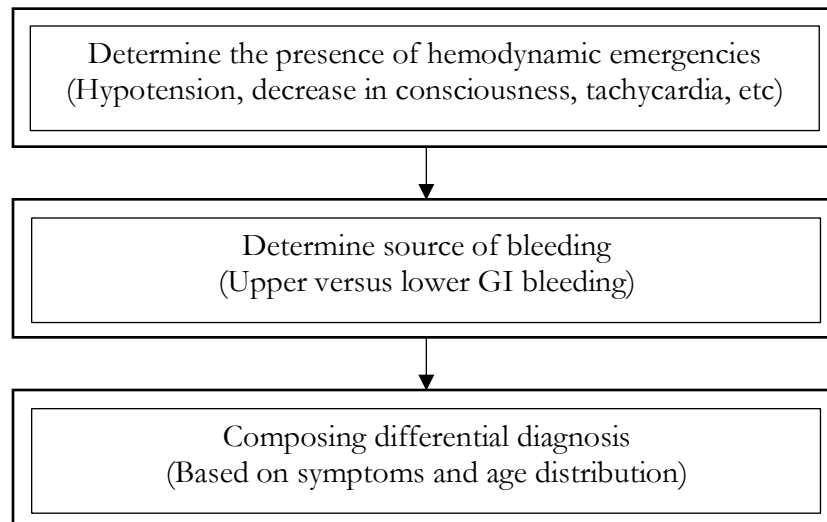


Figure 1. Clinical approach on GI bleeding in children

1. Anamnesis

The most common etiologies of GI bleeding may vary between age groups. In neonates, GI bleeding often occurs as a consequence of infective colitis. Meanwhile, in critically ill neonates, necrotizing enterocolitis or stress ulcers are the most possible suspects. In infants, GI bleeding is often caused by infectious colitis, cow's milk protein allergy, and intussusception. In children and adolescents, bleeding may occur due to gastritis or peptic ulcer, in addition to infective colitis. Other causes of GI bleeding are the rupture of esophageal or gastric varices and stress ulcers in severely ill child.⁷ The details of the most commonly found diagnosis according to the age group and location of the GI bleeding are shown in **Table 2**.⁷⁻¹⁰

Table 2. Causes of GI bleeding based on the age group.

Age group	Site of Bleeding	Common	Rare
Infant	Upper GI tract	Esophagitis	Peptic Ulcer
	Lower GI tract	• Anal fissure • Cow milk protein allergy • Necrotizing enterocolitis	• Vascular lesion • Hirschsprung enterocolitis • Meckel diverticulum • Intestine duplication • Intussusception • Infective enterocolitis
Children	Upper GI tract		
	Esophagus	• Esophagitis • Mallory-Weiss tear	• Esophagitis • Esophageal varices • Corpus alienum • Cyst duplication
	Gastric	• Gastritis: prolapse gastropathy; nonsteroidal anti-inflammatory drug (NSAID) overuse • Stress ulcer	• Gastritis • Peptic ulcer • Leiomyoma • Varices • Vascular malformation
	Duodenum	• Duodenitis • Crohn's disease	• Ulcer • Vascular malformation • Foreign object • Lymphoid hyperplasia • Varices • Cyst duplication
	Lower GI tract	• Anal fissure • Intussusception • Infective enterocolitis • Inflammatory bowel disease (> 4 years) • Meckel diverticulum • Perianal vasculitis due to streptococcus infection • Polyps	• Inflammatory bowel disease (< 4 years) • Vascular malformation • Intestine duplication • Henoch-Schonlein purpura (HSP) • Dysentery • Hemorrhoid • Rectal/colon varices • Ulcer • Nodular lymphoid hyperplasia • Rectal trauma

Upon assessing pediatric patients with GI bleeding, these particular questions should be addressed quickly: (1) Is the patient really experiencing GI bleeding? (2) Is the volume of blood loss significant enough to cause hemodynamic problems? (3) Is there any active bleeding occurring at the moment? (4) What actions should be taken immediately? One of the approaches often overlooked during the approach of whether the patient really experiencing GI bleeding is the tracing the history of food or drug consumption is important to investigate the possibility of GI bleeding in children.¹¹⁻¹⁶ Conditions that are often mistaken as GI bleeding are listed in **Table 3**.¹⁷

Table 3. Conditions that were commonly misinterpreted as GI bleeding.

Hematemesis	• Swallowing mother’s blood while lactation (if the cracked nipple is present), or during birth • Nasal or pharyngeal bleeding • Food coloring, beet
Melena	• Iron preparation • Nasal or pharyngeal bleeding • Red dragon fruits, blueberries, spinach, beet, bismuth, charcoal
Hematochezia	• Menstruation • Hematuria

2. Physical examination

Careful physical examination is also necessary to confirm the diagnosis and severity of GI bleeding. The laboratory and radiological examinations may take time to be completed. In this case, the common cause may be identified from physical examination. Again, the initial approach to GI bleeding in children is emphasized on the assessment of hemodynamic emergencies. Tachycardia is the most profound early sign of shock in children.¹⁶ Other signs of hypovolemic state include fatigue, pallor, and hypotension.^{16,18} Furthermore, postural hypotension with ≥ 10 mmHg decrease in blood pressure is likely to indicate at least 20% of blood loss. Prompt fluid therapy must be conducted in order to prevent morbidity and mortality.^{16,19} Some of the common findings found among patients with GI bleeding are shown in **Table 4**.

Table 4. Signs and symptoms associated with GI bleeding.

Skin	Pallor, jaundice, ecchymosis, abnormal blood vessels, skin rash, skin turgor, hematoma, petechiae, purpura, warm/cold acral, spider angioma
Head, eye, ear, nose, and throat	Nasopharyngeal injection, oozing, enlarged tonsils, bleeding
Cardiovascular	Blood pressure Heart rate: examined in supine, sitting, and standing position Pulse rate: examined in supine, sitting, and standing position Gallop Capillary refill time
Abdomen	Mass, hepatomegaly, splenomegaly, tenderness, caput medusae
Perineum	Fissure, fistula, rash, induration, hemorrhoid, or vascular lesion
Rectum	Fresh blood, melena, tenderness

The following manifestations could serve as guidance in determining the severity of bleeding:^{16,18,20}

1. The patient's general condition and hemodynamic status: pallor, restlessness, sweating, lethargy, abdominal pain, orthostatic changes of the pulse > 20 bpm, or ≥ 10 mmHg decrease in blood pressure when changing the position from supine to sitting; these conditions is related with the presence of profuse bleeding.
2. The volume of blood loss: the volume loss is proportionate with the increase in morbidity and mortality
3. Origin of the bleeding: bleeding from ruptured varicose veins or ulcer may cause serious blood loss

3. Laboratory Examination

Below are some of laboratory test that could help to identify the cause and severity of GI bleeding:^{18,21}

1. Hemoglobin or hematocrit examination to determine the amount of blood loss.
2. Platelet count and function as well as the partial thromboplastin time (APTT) and prothrombin time (PT) to rule out systemic disorders. Thrombocytopenia is often associated with sepsis, certain viral infections,

idiopathic thrombocytopenic purpura (ITP), hypersplenism, necrotizing enterocolitis, and others.

3. Crossmatch tests if transfusion is most likely required for the patient.
4. Liver function test. Decreased albumin accompanied by impaired coagulation may indicate cirrhosis, which leads to portal hypertension and esophageal varices.
5. The increase in urea and creatinine levels indicates a possible decrease in renal function due to hypovolemic shock. Blood urea nitrogen (BUN) to creatinine ratio could be used to determine between upper or lower GI bleeding. Increased BUN refers to upper GI bleeding due to ingested blood. The elevation of BUN to creatinine ratio ≥ 30 indicates upper GI bleeding with 98% sensitivity and 69% specificity.
6. The Apt-Downey test may be performed to distinguish whether hematemesis in infants is caused by bleeding from their GI tract, ingestion of the maternal blood during birth, or suckling from cracked nipples. This test is based on the infants' blood containing $>60\%$ of fetal hemoglobin, which is alkaline resistant. Maternal blood contains mature hemoglobin, which would turn into yellow-brown hematin when mixed with alkali.

4. Radiological Examination

The role of radiological examination in diagnosing GI bleeding is now being replaced by endoscopy. However, not all health centers can perform endoscopy. Furthermore, the radiological examinations could help examine the areas that were not observable using endoscopy. The following are radiological examinations to identify GI bleeding:²²⁻²⁵

1. Plain abdominal x-ray may show the signs of necrotizing enterocolitis (NEC), such as bowel dilatation, bowel wall thickening, and pneumatosis intestinalis (air in the subserosa/submucosa).
2. Ultrasonography (USG) of the abdomen is indicated for patients with GI bleeding accompanied by hepatosplenomegaly. USG is also helpful in detecting portal hypertension and chronic liver disease.
3. Abdominal CT-scan and MRI are useful to determine intra-abdominal vasculature.
4. Meckel's scan could be performed to explore Meckel's diverticulum.
5. Angiography is indicated in active bleeding lesions or recurrent chronic bleeding that is not evident in the previous examination. Bleeding rate >0.5 mL/min is required to recognize the source of bleeding.

5. Endoscopy

Endoscopy is an excellent diagnostic tool for finding the etiology of GI bleeding. It provides a great visualization of GI mucosa and may help to identify the bleeding source. Some therapeutic measures such as polyp extractions may also be performed during endoscopic examination.^{26,27}

Summary

Gastrointestinal bleeding may occur in infants and children, triggering parental anxiety. Classification can be made based on bleeding sites; that is upper and lower GI bleed that are separated by Treitz ligament. Some conditions may be misunderstood as GI bleeding. Causes of GI bleeding may vary between different age group in children. Most etiologies of GI bleeding are mild and self-limited. Diagnostic approaches in GI bleeding are based on history taking, physical examination, laboratory tests, radiological imaging as well as endoscopy.

Conflict of Interest

None declared.

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