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Acute Abdomen in Children

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***Abstrak*:** *This article aims to provide a comprehensive understanding of the etiology, clinical manifestations, diagnostic process, and management of acute abdomen in children. The article is compiled using a descriptive narrative approach based on literature review from relevant medical journals and reference books. The review covers aspects of abdominal anatomy, pain classification, surgical and non-surgical etiologies, and diagnostic and therapeutic approaches. Acute abdomen in children has a wide variety of etiologies, including inflammation, obstruction, trauma, vascular disorders, and congenital disorders. The main manifestation is abdominal pain that can be divided into visceral, somatic, and referred pain, with various characteristics such as colicky, ischemic, and projected pain. The diagnostic process involves a thorough history taking, a systematic physical examination (inspection, palpation, percussion, auscultation), and supporting examinations such as laboratory, radiology, ultrasound, and CT scan. Management measures include emergency treatment, hemodynamic stabilization, and surgery if necessary. Acute abdomen is not a final diagnosis, but rather a collection of symptoms from various pathological conditions that require rapid evaluation. Therefore, appropriate management and early referral to a surgical specialist are crucial in reducing the risk of complications in pediatric patients. Rapid, accurate, and multidisciplinary management is key to improving the prognosis and survival of pediatric patients with acute abdominal symptoms.*
Keywords : *Acute Abdomen, Child, Abdominal Pain, Diagnosis, Surgical Emergency*

INTRODUCTION

Acute abdomen is a medical emergency characterized by sudden and severe abdominal pain, often reaching the maximum score on the Visual Analog Scale (VAS), and typically requiring urgent clinical intervention. It may arise from a variety of causes, both surgical and non-surgical, including infections, inflammatory conditions, vascular occlusion, or mechanical obstruction of abdominal organs (Bickell et al., 2006). In pediatric patients, the presentation of acute abdomen often includes abrupt onset of pain accompanied by nausea, vomiting, fever, or signs of peritonitis, making it a diagnostic challenge due to the broad spectrum of potential underlying etiologies (Cohen et al., 2017). The diversity of clinical manifestations ranging from benign self-limiting illnesses to life-threatening surgical emergencies requires clinicians to maintain a high index of suspicion.

In the emergency setting, abdominal pain is one of the most frequent chief complaints. It is estimated that acute abdominal pain accounts for approximately 7–10% of all emergency department visits globally (Sartelli, 2016). In pediatric populations specifically, similar patterns are observed. For instance, a study conducted at the Pediatric Complex of Bangui reported that 8.5% of emergency consultations involved

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children with symptoms of acute abdomen (Gbangou, 2019). Likewise, data from the University of Iowa Children's Hospital in 2007 showed that 9% of 962 children aged 4 to 17 years presented with abdominal complaints suggestive of acute abdomen (Lee, 2008). Despite its frequency, the diagnosis of acute abdomen in children remains complex due to limitations in verbal expression, overlapping symptoms with common infections, and atypical presentations.

The hallmark of acute abdomen is abdominal pain of sudden onset, generally persisting for less than 24 hours. A key step in early clinical evaluation is differentiating between surgical and non-surgical causes. When a surgical origin is suspected such as in cases of appendicitis, volvulus, or perforated viscus prompt surgical intervention is crucial to prevent morbidity and mortality (Stringer, 2012). Therefore, accurate clinical assessment, including a thorough history taking, physical examination, and judicious use of laboratory tests and imaging modalities (such as ultrasound or CT scans), is critical. Even conditions commonly perceived as mild, such as viral gastroenteritis, may mimic more severe pathology and thus require careful differential diagnosis (Kharbanda, 2012).

Given the urgency and diagnostic complexity associated with acute abdomen in children, this paper aims to provide a comprehensive overview of the condition, including its anatomical and etiological basis, clinical features, diagnostic framework, and evidence-based management strategies. It is hoped that this article will serve as a valuable resource for medical students and healthcare professionals, particularly those involved in pediatric surgical care, such as at M. Natsir Solok Regional Hospital. By enhancing understanding and clinical decision-making, this work seeks to contribute to improved outcomes in the management of pediatric acute abdomen.

Research on the acute abdomen in children has become a major focus in the pediatric literature, given the complexity of its symptoms and the importance of early detection to prevent serious complications. According to Dickson, Jones, Telfer, and De Dombal (1988), acute abdominal pain accounts for approximately 7–10% of emergency department (ED) visits, making it one of the most common causes of hospitalization for pediatric patients. In the Pediatric Complex of Bangui, this complaint even reached 8.5% (Dickson et al., 1988).

The etiology of acute abdomen is diverse, ranging from non-surgical causes such as gastroenteritis, metabolic disorders (uremia, diabetic crisis), hematologic (sickle cell anemia, leukemia), to surgical causes such as appendicitis, intestinal obstruction, and intra-abdominal trauma (Sayuti, 2019; Care et al., 2024). In a recent study, Care et al. (2024) stated that appendicitis was the most common final diagnosis in pediatric acute abdomen cases, followed by cholecystitis and small bowel obstruction.

Classifying abdominal pain is crucial in the diagnostic process. Visceral pain originates from internal organs and is dull and poorly localized, while somatic pain is sharp and localized due to irritation of the parietal peritoneum. Referred pain arises from shared innervation between the affected organ and other areas of the body (Kim, 2013). The characteristics of this pain, such as colicky pain due to smooth muscle spasm, ischemic pain due to tissue necrosis, and migratory pain, such as in appendicitis, are important clues to early diagnosis (Kim, 2013; Sayuti, 2019).

The diagnosis of acute abdomen must be conducted systematically, starting with a focused history and a thorough physical examination (inspection, palpation, percussion, auscultation), followed by supporting examinations such as ultrasound, CT scan, and laboratory tests. Typical signs such as muscle defiance, localized tenderness, rebound tenderness, and Murphy's and Rovsing's signs can help identify the location and possible etiology (Sayuti, 2019).

In rare cases, abdominal pain can originate from uncommon causes. Maleki and Motamed (2018) reported a case of rectus muscle hematoma as a differential diagnosis for acute abdomen, emphasizing the need to comprehensively consider various clinical possibilities.

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Management of the acute abdomen consists of emergency measures (resuscitation, fluid and hemodynamic stabilization, antibiotics) and definitive surgical intervention, if necessary. Prognosis depends largely on the etiology and the speed of diagnosis and intervention (Care et al., 2024; Kim, 2013). Therefore, good clinical skills and the availability of diagnostic facilities are crucial in accelerating appropriate clinical decision-making.

METODOLOGI

This study employed a descriptive-narrative approach with a comprehensive literature review. The primary objective of this approach was to summarize and analyze current knowledge regarding the diagnosis and management of acute abdomen in children. Data were obtained from various primary and secondary sources, including articles from accredited international medical journals, pediatric and pediatric surgery textbooks, and official clinical guidelines from global health organizations such as the American Pediatric Surgical Association (APSA), the World Health Organization (WHO), and the European Society for Pediatric Gastroenterology, Hepatology, and Nutrition (ESPGHAN). The literature search was conducted through scientific databases such as PubMed, ScienceDirect, and Google Scholar, using the keywords "acute abdomen in children," "pediatric abdominal pain," "emergency pediatric surgery," and "abdominal pain diagnosis." Keyword combinations were performed using Boolean operators (AND/OR) to obtain relevant and comprehensive search results. Inclusion criteria included publications within the last five years (2020–2025), written in English or with English translations, and substantially discussing aspects of abdominal anatomy, pain etiology, pain classification, clinical manifestations, diagnostic procedures, and management approaches for acute abdomen in children. Selected articles included original research, systematic reviews, meta-analyses, case reports, and evidence-based clinical guidelines.

All articles were screened using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to ensure the validity and reliability of the literature review process. After screening and eliminating duplications, articles were analyzed qualitatively using content analysis techniques. The analysis results were categorized into key themes such as the definition and classification of acute abdomen, anatomical and physiological considerations, pain patterns and clinical symptoms, differential diagnosis based on pain location, ancillary examinations, and medical and surgical management strategies. All findings are systematically organized according to a logical sequence and clinical progression, starting with an introduction to the basic concepts of acute abdomen, followed by symptom characteristics, diagnostic approaches, and current therapeutic recommendations. The final results of this study are expected to provide a comprehensive understanding for medical practitioners in handling acute abdominal cases in the pediatric population more appropriately and based on the latest scientific evidence.

RESULTS AND DISCUSSION

Anatomy & Etiology

The abdomen is a body cavity located between the thorax and pelvis. It contains internal organs (viscera) and is protected by a wall composed of the abdominal muscles, vertebral column, and ilium. To facilitate clinical location, the abdomen is generally divided into nine regions using two horizontal lines drawn at the level of the ninth rib cartilage and the upper part of the iliac crest, and two vertical lines drawn from the eighth rib cartilage to the middle of the inguinal ligament on the left and right sides of the body. This division helps in more accurately identifying the location of abdominal pain or abnormalities.

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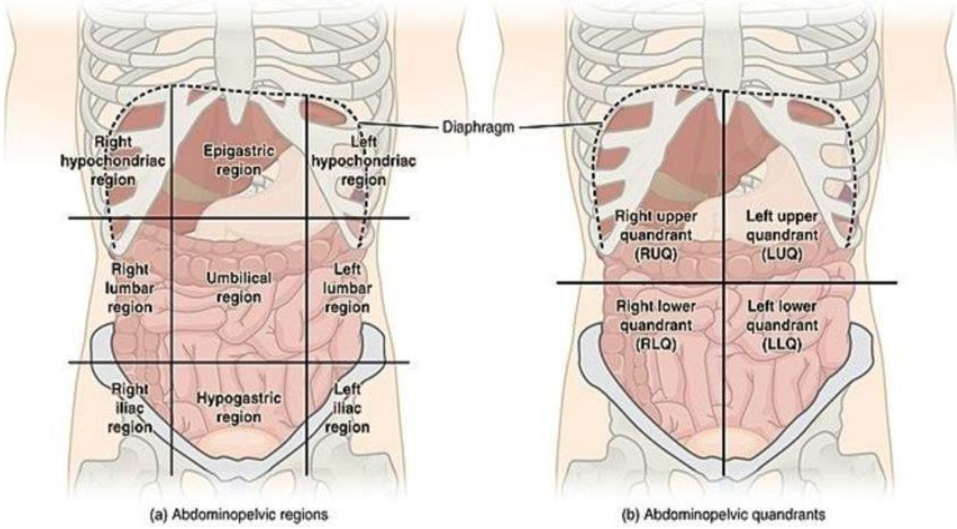

Figure 1. Division of 9 Abdominal Regions and 4 Abdominal Quadrants[1]

An acute abdomen is a sudden onset of severe pain in the abdominal region and indicates a medical emergency requiring immediate treatment. These symptoms are often accompanied by nausea or vomiting and can be caused by surgical or non-surgical conditions. A common non-surgical cause is gastroenteritis, while appendicitis is the most common surgical cause. Epidemiologically, abdominal pain accounts for 5–10% of emergency department visits, with approximately 25% of patients experiencing this complaint. CDC data indicates that 11% of ER visits in 2008 were due to abdominal pain, and 12.5% of these were emergencies. The most common final diagnosis was appendicitis (28%), followed by cholecystitis (10%) and small bowel obstruction (4%).

The etiology of acute abdomen is divided into non-surgical and surgical. Non-surgical causes include metabolic disorders (uremia, diabetic crisis), hematologic disorders (sickle cell anemia, leukemia), and drug or chemical poisoning. Meanwhile, surgical causes include bleeding (ruptured viscera, ectopic pregnancy), infection (appendicitis, abscess), gastrointestinal perforation, obstruction (hernia, adhesions), and ischemia (mesenteric thrombosis). Acute abdomen can also be caused by inflammation (infection or chemical), mechanical disorders (intestinal obstruction), neoplasms, trauma, congenital defects, and vascular disorders. The location and characteristics of pain often reflect the structure of the organ involved, thus providing important clues in early diagnosis.

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Abdominal Pain Location	Possible Causes of Pain
Epigastric	Pancreatitis, duodenal ulcer, gastric ulcer, cholecystitis, pancreatic cancer, hepatitis, intestinal obstruction, early appendicitis, sbitite appendicitis, pneumonia, pulmonary infarctionn
Right Hypochondrium	Cholecystitis, cholangitis, hepatitis, pancreatitis subpnenic abscess, pneumonia, pulmonary embim
Left Hypochondrium	Spienic pain due to lymphoma, viral infection, subphrenic abscess, gastric ulcer, pneumonia pulmonary embolism, myocardial pain
Periumbilical	Pancreatitis, pancreatic cancer, intestinal obstruction, aortic aneurysm, early sign apendicitis
Lumbar	Kidney stones, pyelonephritis, perinephric abscess colon cancer
Inguinal and Suprapubic	Diseases in the colon area, appendicitis (especially in right inguinal region), diveiticulosis (left side), salpingitis, ovarian cyst, ectopic pregnancy

Figure 2. Etiology of Abdominal Pain based on Location4

Clinical Manifestations

Patients with an acute abdomen generally present with a primary complaint of sudden abdominal pain. This pain can be classified into three main types: visceral pain, somatic pain, and referred pain. Visceral pain arises from stimulation of the abdominal organs, such as strain, injury, or excessive smooth muscle contraction. Because the visceral peritoneum is innervated by the autonomic nervous system, visceral pain is vague, cannot be pinpointed, and is often described by patients placing their entire hand on the painful area. This pain is usually not aggravated by movement, allowing patients to remain active. Meanwhile, somatic pain arises from stimulation of the parietal peritoneum, which is innervated by peripheral nerves. This pain is sharp, localized, and worsens with movement or deep breathing. Friction between the parietal and visceral peritoneum, as in acute appendicitis, can also cause contralateral pain. Referred pain occurs when stimulation from one organ is felt in another location due to shared innervation. Examples include diaphragmatic irritation felt as pain in the shoulder (C3–C5) or acute cholecystitis pain radiating to the tip of the shoulder blade.

In addition to the type of pain, the nature of pain in the acute abdomen is also very diverse and provides important diagnostic clues. 1) Projected pain occurs due to inflammation or direct injury to sensory nerves, such as pain from shingles or phantom pain after amputation. Hyperesthesia or hyperalgesia is often found in the skin overlying the inflamed organ, characterized by tenderness, pain on movement, pain on coughing, and muscular defense. 2) Continuous pain is persistent pain that generally originates from stimulation of the parietal peritoneum due to inflammation, where the abdominal wall muscles reflexively contract to protect the irritated area. Colicky pain is intermittent visceral pain, usually caused by smooth muscle spasm of hollow organs, such as intestinal obstruction, gallstones, or ureteral stones. This pain arises from increased intraluminal pressure that causes ischemia and is often accompanied by nausea, vomiting, and restlessness due to forced movement (the colic triad). 3) Ischemic pain is severe, continuous, and not relieved by conventional analgesics. This pain indicates tissue necrosis, such as in bowel strangulation or mesenteric

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thrombosis, and is often accompanied by systemic symptoms such as tachycardia, worsening general condition, and even shock. 4) Shifting pain describes pain that changes as the disease progresses. For example, in appendicitis, pain is initially felt around the navel as visceral pain, then shifts to the right lower abdomen when inflammation involves the peritoneum, and if necrosis occurs, the pain becomes severe ischemic.

The onset and progression of pain also provide important information about the severity of the condition. Sudden pain lasting seconds to minutes often indicates an emergency, such as hollow organ perforation, ruptured aneurysm, ruptured ectopic pregnancy, or intra-abdominal abscess. Pain that develops rapidly (hours) or slowly (several hours) usually indicates an inflammatory process such as cholecystitis or pancreatitis. Pain onset accompanied by systemic symptoms—such as sweating, tachypnea, and shock—requires immediate treatment, including resuscitation and possible laparotomy.

The characteristics of the pain, such as location, severity, duration, and response to analgesics, also help identify the cause. Sharp, persistent, superficial pain suggests peritoneal irritation, such as ulcer perforation, ruptured appendicitis, ovarian abscess, or ectopic pregnancy. Colicky pain has an intermittent pattern and is usually relieved by conventional analgesics. In contrast, pain due to strangulation or ischemia of the mesenteric vessels is difficult to relieve, even with narcotic analgesics. Factors that aggravate or alleviate the pain are also important to evaluate in establishing a correct diagnosis of acute abdomen.

Diagnosis

a. History

Important aspects to consider when assessing an acute abdomen include the onset pattern, progression, location, intensity, character, precipitating and alleviating factors, and associated symptoms. The patient's age is a crucial factor in assessing abdominal pain, and the prevalence of each etiology varies widely. 1 Based on its location or spread, pain can be referred or projected. Biliary pain typically radiates to the flank and shoulder blades, while pancreatitis pain is felt penetrating to the flank. Shoulder pain may be due to diaphragmatic irritation.

The onset of pain in an acute abdomen can indicate its source. Pain can be sudden, severe, or rapidly progressive, or it can also gradually increase in severity. For example, in perforated hollow organs, irritation of the peritoneum from chemicals is felt more quickly than the inflammatory process. Similarly, the intensity of the pain varies. A healthy person can suddenly experience severe abdominal pain caused by an obstruction, perforation, or torsion. Gradual pain is usually caused by an inflammatory process, such as cholecystitis or pancreatitis.1,2

The patient's position to relieve pain can be a clue. In acute pancreatitis, the patient will lie on the left side with the spine, hips, and knees flexed. Sometimes the patient will sit hunched over with the hips and knees flexed. Acute appendicitis, which is located retrocecally, forces the patient to lie with the hips flexed, relaxing the irritated psoas muscle. An acute abdomen that causes diaphragmatic irritation will make the patient more comfortable in a semi-sitting position, which facilitates breathing. Patients with localized or generalized peritonitis are immobilized by pain, while patients with colic are compelled to move because of the pain.1,2,5

A history of systemic symptoms is important in the evaluation of an acute abdomen. Abdominal pain is usually accompanied by high fever and chills, which can indicate pelvic inflammatory disease and urinary tract infection. Other systemic symptoms such as anorexia, nausea, and vomiting are common accompanying symptoms in an acute abdomen, especially acute appendicitis and acute cholecystitis. Constipation is found in large bowel obstruction and in generalized peritonitis.1,5

b. Physical Examination

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A careful physical examination is essential for the diagnosis of an acute abdomen. Examination of the external genitalia, testicles, anus, and rectum should be included as part of the physical examination of the acute abdomen.1 The examination, which focuses on the abdominal examination, consists of:

1. Inspection
   During the abdominal inspection, note the contour of the abdomen, including whether it appears distended or whether there is a mass that suggests an insertional hernia or tumor**.** Also note the presence of previous surgical scars, abdominal distension, and visible intestinal peristalsis (Darmsteifung). The presence of skin erythema or edema may indicate cellulitis of the abdominal wall.1
2. Palpation
   Palpation reveals two symptoms: pain and muscular defense. An acute abdomen stimulates the peritoneum through local or generalized inflammation or irritation, depending on the extent of the irritation. Pain can be tender or rebound. Muscular defense arises from the pain of diffuse peritonitis, which increases with palpation, causing the abdominal muscles to reflexively contract in response to mechanical stimulation to protect the abdomen.1
   There are several specific palpation techniques, such as the Murphy sign (deep palpation in the right upper abdomen that causes severe pain and momentary cessation of breathing) for cholecystitis, and the Rovsing sign (pain in the right lower abdomen on palpation in the lower left/left side) for appendicitis. Rebound tenderness in the right lower quadrant in appendicitis and rebound tenderness throughout the abdomen in peritonitis.1
3. Percussion
   Percussion is used to assess gas-filled bowel distension, free intra-abdominal air, the degree of ascites, or the presence of peritoneal inflammation, as well as the presence of any dull masses. In ileal obstruction, tympany is heard throughout the abdomen except in the right upper quadrant, where the liver lies beneath the abdominal wall. If tympany extends to the right upper quadrant, free intraperitoneal air is suspected. Diminished liver dullness is a typical sign of perforation (a sign of pneumoperitoneum, where air obscures the liver dullness). Percussion can be used to detect ascites by examining shifting dullness or a fluid wave.1,2
4. Auscultation
   Bowel sounds are usually evaluated for quantity and quality. Note the presence or absence of bowel sounds, as well as their characteristics. In paralytic ileus, bowel sounds are absent, while in obstructive ileus, they may be increased.[1,2]

c. Supporting Examinations

1. Laboratory Examinations
   Laboratory tests, such as a complete blood count, can detect leukocytosis, which indicates inflammation or infection.[2]
2. Radiological Examination
   A chest x-ray can rule out thoracic abnormalities or thoracic trauma. It should also be noted that there is free air under the diaphragm or the presence of bowel in the thoracic cavity in diaphragmatic hernias. A plain abdominal x-ray helps detect free air (perforation), intestinal obstruction, gallstones, or kidney stones. Ultrasonography and CT scans are useful as additional tests in patients who have not undergone surgery and who are suspected of having trauma to the liver and retroperitoneum.[1,2,5]

Differential Diagnosis

Patient age is a very important factor when assessing abdominal pain in children of different age groups.

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Younger than 2 yr	2 to 5 yr	5 to 12 yr	Older than 12 yr
Infantile colic	Gastroenteritis	Gastroenteritis	Appendicitis
Gastroenteritis	Appendicitis	Appendicitis	Gastroenteritis
Constipation	Constipation	Constipation	Constipation
UTI	UTI	Functional pain	Dysmenorrhea
Intussusception	Intussusception	UTI	Mittelschmerz
Volvulus	Volvulus	Trauma	PID
Incarcerated hernia	Trauma	Pharyngitis	Threatened abortion
Hirschsprung's disease	Pharyngitis	Pneumonia	Ectopic pregnancy
	Sickle cell crisis	Sickle cell crisis	Ovarian/Testicular torsion
	HSP	HSP	
	Mesenteric adenitis	Mesenteric adenitis	

Figure 3. Differential Diagnosis of Acute Abdomen Based on Predominant Age

1. Management
   a. Emergency Management Measures[1]
      1) Resuscitation measures to restore the respiratory and cardiovascular systems, which are life-saving measures.
      2) Restoration of fluid and electrolyte balance.
      3) Prevention of infection by administering antibiotics.
      4) Analgesic administration should be considered because it can relieve symptoms of acute abdomen.
   b. Definitive Management Measures[1] Goals:
      1) Save the patient's life by stopping the source of bleeding.
      2) Minimize potential defects by:
         a) Eliminating the source of contamination.
         b) Minimizing existing contamination by cleaning the peritoneal cavity.
         c) Restoring continuity of the intestinal passage and preserving as much healthy bowel as possible to minimize physiological defects.
2. Prognosis

In general, an acute abdomen is an indication for surgery. Currently, ultrasound and CT scans are widely used to determine the cause of an acute abdomen. All patients with an acute abdomen should be examined by a surgeon. The patient's prognosis depends on the cause.[1]

CONCLUSIONS

An acute abdomen represents a critical clinical syndrome rather than a definitive diagnosis. It is characterized by the sudden onset of severe abdominal pain and encompasses a spectrum of underlying etiologies, including surgical and non-surgical causes such as inflammation, mechanical obstruction, vascular compromise, neoplasms, congenital anomalies, and trauma. The clinical presentation may involve visceral or somatic pain, which reflects the involvement of specific intra-abdominal organs and the underlying pathological process. Due to its non-specific symptoms and potentially life-threatening implications, early recognition and accurate differentiation of acute abdomen cases are essential.

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Effective evaluation begins with a detailed medical history focusing on pain characteristics such as onset, location, quality, duration, and radiation followed by a thorough physical examination emphasizing abdominal inspection and palpation for signs such as muscular rigidity or rebound tenderness, which may indicate peritoneal irritation. However, these clinical assessments alone are often insufficient to determine a definitive diagnosis, necessitating the use of laboratory investigations and imaging modalities like ultrasound or computed tomography (CT) to identify the source of pathology.

Importantly, the term "acute abdomen" should prompt immediate clinical attention and not be misconstrued as a conclusive diagnosis. In emergency settings, timely referral to surgical specialists is paramount when signs of an acute abdomen are detected. Prior to referral, stabilization of the patient's hemodynamic status should be prioritized, while the administration of analgesics must be judicious to avoid masking critical clinical signs. A multidisciplinary approach combining prompt diagnosis, early resuscitation, and coordinated surgical consultation is vital to improving patient outcomes and reducing morbidity and mortality in pediatric acute abdomen cases.[2]

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