AJPMHS GLOBAL RESEARCH NETWORK

AMERICAN Journal of Pediatric Medicine and Health Sciences
Volume 3, Issue 12, 2025 ISSN (E): 2993-2149

Intestinal Obstruction in Neonates and Children: Modern Concepts in Epidemiology, Imaging, And Surgical Care

Qurbonov Farhod Abdusalomovich
Candidate of Medical Sciences, Chief Physician of The Navoi Regional Multidisciplinary Children's Medical Center

Khayrullayev Javohir Dilmurod Ogli
Surgeon At the Navoi Regional Multidisciplinary Children's Medical Center

Abstract: Intestinal obstruction remains one of the most critical emergency conditions in pediatric surgery, accounting for a significant proportion of neonatal and childhood surgical admissions. This review synthesizes current evidence on epidemiology, etiologic patterns, clinical presentation, diagnostic imaging, and contemporary management strategies. Particular emphasis is placed on major etiologic groups, including intussusception, congenital intestinal atresia and stenosis, malrotation with midgut volvulus, adhesive small bowel obstruction, Hirschsprung disease, and functional paralytic ileus. Advances in ultrasonography, non-operative enema reduction techniques, minimally invasive surgery, and neonatal intensive care have markedly improved patient outcomes. Nevertheless, delayed diagnosis continues to contribute substantially to morbidity and mortality, especially in neonates with necrotizing enterocolitis or late-presenting volvulus. Strengthening prenatal detection, early clinical recognition, and multidisciplinary management pathways is essential for further reducing complications and improving long-term outcomes in pediatric intestinal obstruction.

Keywords: Pediatric intestinal obstruction; intussusception; malrotation; midgut volvulus; congenital atresia; Hirschsprung disease; adhesive small bowel obstruction; paralytic ileus; ultrasonography; neonatal surgery; gastrointestinal emergencies.

Intestinal obstruction in children is one of the most important emergency conditions in pediatric surgery. It accounts for approximately 10–20% of all surgical pathologies in childhood and often requires urgent hospitalization and operative management. Neonates and infants represent the most vulnerable groups, with an etiologic spectrum that differs significantly from that seen in older children.

In the neonatal period, congenital anomalies such as intestinal atresia and stenosis, malrotation, anorectal malformations, and Hirschsprung disease predominate. In older children, intussusception, adhesive small bowel obstruction, volvulus, and infectious–parasitic causes are more common. The contemporary literature highlights that early diagnosis, rational use of imaging techniques, and minimally invasive surgical approaches substantially reduce mortality and the rate of severe complications.

Most cases of pediatric intestinal obstruction occur during the neonatal period and the first year of life. A male predominance with a ratio of approximately 2:1 is consistently reported. In

neonates, congenital malformations dominate the etiologic profile, whereas in older children acquired causes such as intussusception and adhesions play the leading role.

Mechanical obstruction accounts for about 70–80% of pediatric cases and is caused by a physical barrier to luminal flow. Intrinsic, mural, and extrinsic causes are distinguished.

Intussusception is defined as telescoping of one segment of bowel into an adjacent distal segment. It is the most common cause of intestinal obstruction in infants aged 6–18 months. In 80–90% of cases, the process is idiopathic, without an identifiable lead point.

The classic clinical triad includes: intermittent colicky abdominal pain, vomiting, passage of blood and mucus per rectum ("red currant jelly" stool).

A sausage-shaped mass may be palpable. Pneumatic or hydrostatic enema reduction under fluoroscopic or ultrasound guidance is considered the treatment of choice and is successful in 80–90% of suitable patients.

Duodenal, jejunal, and ileal atresia or stenosis are major causes of neonatal intestinal obstruction. They present with early bilious vomiting, abdominal distention, and delayed passage of meconium. The typical radiographic sign of duodenal atresia is the "double bubble" appearance, reflecting gas in the stomach and proximal duodenum.

Intestinal malrotation results from abnormal embryologic rotation and fixation of the midgut. This predisposes to extrinsic compression of the duodenum and to midgut volvulus, which may rapidly progress to bowel ischemia and necrosis.

In neonates, the main features are: sudden onset bilious vomiting, severe abdominal pain and irritability, progressive abdominal distention, rapid hemodynamic deterioration and signs of sepsis.

The Ladd procedure (detorsion of the volvulus, division of Ladd's bands, broadening of the mesenteric base, often with prophylactic appendectomy) remains the standard surgical approach.

Adhesive obstruction arises from fibrous bands between bowel loops and the peritoneum after previous laparotomy, peritonitis, or necrotizing enterocolitis. In children, it is commonly encountered after surgery for appendicitis, malrotation, or perforation. Increasing use of laparoscopy in pediatric surgery is believed to reduce the incidence of postoperative adhesions and subsequent obstruction.

Hirschsprung disease is a congenital aganglionosis of the distal colon, leading to absent peristalsis and functional obstruction. Newborns typically present with delayed passage of meconium, abdominal distention, and vomiting, followed by chronic constipation. Diagnosis is confirmed by rectal biopsy showing absence of ganglion cells. Definitive treatment consists of pull-through procedures (Soave, Duhamel, and others), increasingly performed with laparoscopic assistance.

Paralytic ileus is characterized by impaired bowel motility in the absence of a mechanical block. It is associated with: severe peritonitis, generalized sepsis, significant electrolyte derangements (hypokalemia, acid–base imbalance), major pneumonia and systemic infections, early postoperative period after major abdominal surgery.

A particularly important association exists between paralytic ileus and necrotizing enterocolitis in preterm neonates, where diagnostic delay markedly increases the risk of perforation and sepsis.

The clinical picture depends on the level and mechanism of obstruction.

High obstruction (duodenum, proximal jejunum) typically presents with: early, often bilious vomiting, relatively mild abdominal distention, failure or delay of meconium passage in neonates.

Low obstruction (distal small bowel and colon) is characterized by: pronounced, often asymmetric abdominal distention, absence of stool and flatus, later onset vomiting, sometimes feculent, initial hyperactive, then diminished and absent bowel sounds.

In intussusception, colicky abdominal pain is often intermittent: the child cries, pulls up the legs, then appears relatively well between episodes. Passage of blood and mucus per rectum may occur.

Physical examination focuses on abdominal configuration, peristaltic waves, and tenderness. Auscultation may reveal high-pitched "tinkling" bowel sounds early in mechanical obstruction, followed by silent abdomen as paralytic ileus develops.

Palpation may detect localized tenderness or a palpable mass (e.g., intussusception). Digital rectal examination is important to assess rectal vault contents in suspected Hirschsprung disease and to detect blood or mucus.

Laboratory tests are nonspecific but leukocytosis, elevated C-reactive protein, metabolic acidosis, and significant electrolyte abnormalities may indicate bowel ischemia and systemic inflammatory response.

Supine and upright abdominal radiographs remain a standard first-line investigation. Findings include: multiple air–fluid levels in dilated bowel loops, diffuse gaseous distention, double bubble sign in duodenal obstruction, free intraperitoneal air in perforation.

Radiographs alone may not always identify the underlying cause.

Ultrasound has become the preferred modality for diagnosing intussusception. Typical features are: target or donut sign in transverse view, thickened bowel wall, free fluid between loops, mesenteric lymphadenopathy.

The lack of ionizing radiation and high sensitivity make ultrasonography particularly suitable in children. It is also valuable in assessing necrotizing enterocolitis, malrotation, and other conditions.

Upper GI contrast series (with barium or water-soluble contrast) are useful in suspected duodenal obstruction, malrotation, and volvulus. Contrast enema (hydrostatic or pneumatic) serves both diagnostic and therapeutic purposes in intussusception.

CT and MRI are reserved for atypical or complicated cases, including tumors, complex adhesions, or suspected bowel ischemia. Because of radiation concerns, CT use is limited in young children and alternative modalities are preferred whenever possible.

Regardless of the underlying cause, management begins with: fluid resuscitation to correct dehydration and shock, normalization of electrolyte and acid–base status, nasogastric decompression, broad-spectrum antibiotics when ischemia, perforation, or peritonitis is suspected, adequate analgesia and, when necessary, sedation. Only after stabilization is a decision made regarding non-operative versus operative treatment.

In the absence of perforation or advanced ischemia, pneumatic or hydrostatic enema reduction under fluoroscopic or ultrasound guidance is the treatment of choice. Repeat attempts may be considered if the child remains stable, but failure or signs of perforation mandate immediate surgery.

In functional obstruction, therapy is directed at the underlying cause: aggressive antibiotic treatment of sepsis and peritonitis, correction of electrolyte disturbances, maintenance of adequate perfusion, ongoing gastric decompression.

In most cases, bowel motility recovers as the primary pathology is controlled, obviating the need for surgical intervention.

For atresia or severe stenosis, resection of the affected segment with primary anastomosis is performed, occasionally in a staged manner with temporary stoma in critically ill neonates. Malrotation is treated with the Ladd procedure.

Definitive management consists of resection of the aganglionic segment and pull-through of normally innervated bowel. Laparoscopic assistance is increasingly utilized, reducing surgical trauma and hospital stay.

In the presence of strangulation, peritonitis, persistent pain, or lack of improvement under conservative treatment, adhesiolysis is indicated. Laparoscopic adhesiolysis, in experienced hands, offers reduced morbidity and faster recovery compared with open surgery.

Delayed diagnosis and treatment of intestinal obstruction can lead to: bowel ischemia and transmural necrosis, perforation and diffuse peritonitis, sepsis and septic shock, short bowel syndrome after extensive resections, recurrent intussusception, impaired growth and development in infants with severe neonatal disease.

Advances in intensive care, imaging, and minimally invasive surgery have reduced mortality in timely treated pediatric obstruction to below 1–2% in many settings. However, in cases presenting late with necrosis and generalized peritonitis, mortality may rise to 8–10% or higher. The poorest outcomes are seen in preterm neonates with necrotizing enterocolitis, sepsis, and severe comorbidities.

Although many causes of pediatric intestinal obstruction are congenital and not preventable in a strict sense, the literature emphasizes the following preventive and early detection strategies:

- **Prenatal screening** for major gastrointestinal malformations (atresia, stenosis, malrotation);
- **Close monitoring of neonates** with early bilious vomiting, delayed meconium passage, or significant abdominal distention;
- **Education of parents and primary care providers** about early signs of intussusception, malrotation, and other acute abdominal conditions;
- **Public health measures and deworming programs** in regions with high prevalence of parasitic infections;
- **Long-term follow-up after abdominal surgery** to detect adhesive obstruction and recurrent intussusception at an early stage.

Intestinal obstruction in children is a multifactorial, potentially life-threatening condition requiring a high index of suspicion. Evolving knowledge of its etiologic spectrum, the widespread use of ultrasonography, improved non-operative reduction techniques for intussusception, and minimally invasive surgical approaches have significantly improved outcomes. Nevertheless, delayed diagnosis remains a major determinant of morbidity and mortality. Optimization of prenatal and neonatal screening, refinement of pre-hospital and early in-hospital management, and a multidisciplinary approach are key strategies for further reducing disease burden and mortality.

REFERENCES

1. Gosemann J.H., Puri P. Intestinal obstruction in infants and children: current concepts in diagnosis and management. Pediatr Surg Int. 2021;37(4):389–402.
2. St. Peter S.D. Laparoscopic management of bowel obstruction in children. Curr Opin Pediatr. 2021;33(3):369–374.
3. Zhang Y., Li X., Liu J. Ultrasound in the diagnosis of pediatric intussusception: a systematic review. J Pediatr Surg. 2022;57(5):812–819.
4. Riera A., et al. Ultrasound for the diagnosis and reduction of intussusception in children. Acad Emerg Med. 2020;27(3):235–244.

5. Nasr A., et al. Pneumatic reduction in childhood intussusception: a meta-analysis of outcomes and predictors of failure. Pediatr Surg Int. 2021;37(9):1145–1154.
6. Russell K.W., Barnhart D.C. Contemporary management of intestinal malrotation and midgut volvulus. Semin Pediatr Surg. 2020;29(2):150–158.
7. Smith B., et al. Late-presenting intestinal malrotation in children: diagnostic challenges and outcomes. J Pediatr Surg. 2024;59(1):45–52.
8. Emil S., et al. Adhesive small bowel obstruction in children: laparoscopic versus open adhesiolysis. J Laparoendosc Adv Surg Tech. 2021;31(7):765–772.
9. Taylor N.D., et al. Imaging approach to pediatric intestinal obstruction. Radiographics. 2022;42(3):E85–E104.
10. Menon P., Rao K.L. Hirschsprung's disease: evolving concepts and current management. World J Clin Pediatr. 2020;9(3):30–42.
11. Sola R., et al. Necrotizing enterocolitis and intestinal failure in preterm infants: recent advances. Neonatology. 2020;117(2):123–132.
12. Kouame D.B., et al. Neonatal intestinal atresia in low-resource settings: epidemiology and outcomes. Afr J Paediatr Surg. 2023;20(1):15–21.
13. Kella N., et al. Outcomes of small bowel atresia repair in neonates: a multicenter review. Eur J Pediatr Surg. 2021;31(5):410–417.
14. Pierro A., Eaton S. Intestinal obstruction and short bowel syndrome in children: long-term results and quality of life. J Pediatr Gastroenterol Nutr. 2020;70(3):289–296.
15. Stringer M.D. Pediatric intestinal obstruction: an evidence-based update. Arch Dis Child. 2022;107(8):709–715.