



Original Article

Management of Surgical Gastro-intestinal Emergencies in Pediatric Age Group: Experience in A Tertiary Medical College Hospital

Bari MEU^{1*}, Arif AS², Siddiq E³, Mokul MH⁴, Saha T⁵, Aziz T⁶

Abstract

Introduction: Presentation of gastro-intestinal emergencies, especially in young children, varies widely, which renders recognition of the underlying disorder and treatment challenging. Critically targeted imaging techniques are becoming increasingly important in obtaining the correct diagnosis without unnecessary delay. Minimally invasive techniques have become the method of choice for the diagnosis and treatment of many abdominal emergencies in children.

Methods: This prospective study was conducted in department of surgery at Anwer Khan Modern Medical College Hospital, Dhaka from January 2020 to August 2022. All the pediatric patients irrespective of sex with diagnosis of gastro-intestinal emergencies undergoing surgical intervention were included in the study. All clinical and operative findings were recorded and in the post-operative period patients were followed up of their progress and treatment outcome.

Results: A total of 40 cases of gastro-intestinal emergencies were managed by surgical intervention during the study tenure. This study includes 7 cases of intestinal obstruction (5 for intussusception and 2 for worm bolus), 3 cases of infantile hypertrophic pyloric stenosis (IHPS) and 30 cases of acute appendicitis or their complications. Abdominal pain, distension and vomiting were the prominent symptoms of presentation. Wound infection was the commonest postoperative complication.

Conclusion: Acute abdominal complaints in children are common presentations in the emergency department. As in our country, many medical college hospitals do not have the individual pediatric surgery department, but we have to manage pediatric surgical emergencies as routine surgical emergencies in adult cases. So, they are often differing from those in adults and need to manage properly from the very beginning. This study was conducted to determine the etiology, presentation, diagnosis and outcome of surgical management for pediatric gastro-intestinal emergencies.

Keywords: Gastro-intestinal emergencies, Pediatric patients.

1. Dr. Md. Ehsan-Ul-Bari, Assistant Professor, Department of Surgery, Anwer Khan Modern Medical College, Dhaka.
2. Abdus Salam Arif, Professor, Department of Surgery, Anwer Khan Modern Medical College, Dhaka.
3. Erfan Siddiq, Registrar, Department of Surgery, Anwer Khan Modern Medical College, Dhaka.
4. Mokbul Hossain Mokul, Registrar, Department of Surgery, Anwer Khan Modern Medical College, Dhaka.
5. Tamal Saha, Assistant Registrar, Department of Surgery, Anwer Khan Modern Medical College, Dhaka.
6. Tarik Aziz, Assistant Registrar, Department of Surgery, Anwer Khan Modern Medical College, Dhaka.

***Correspondence:** Dr. Md. Ehsan-Ul-Bari, Assistant Professor, Department of Surgery, Anwer Khan Modern Medical College, Mobile No. 01717061775, Email: ehsan.rahat.er@gmail.com

Introduction

Surgical gastro-intestinal emergencies in pediatric age group often present as acute abdomen. Acute abdomen is a poorly defined term for a diverse range of acute abdominal disorders that require prompt treatment. The causes of these abdominal emergencies include inflammation and ischemia of abdominal organs, obstruction and perforation of a hollow organ and intestinal bleeding¹. Children with acute abdomen often present with acute abdominal pain, but vomiting, rectal blood loss and even sepsis may be the first symptom of severe abdominal

pathology². Children are often not able to provide the desired information, which makes recognition of the cause of abdominal complaints more difficult; the consequences of a missed diagnosis may be particularly devastating at a young age³.

Management of pediatric surgical emergencies are even more demanding than in adult surgical emergencies due to several reasons and due to these reasons, it's even harder in resource limited countries⁴. Delays in presentation, difference in social status, and a lack of brand-new imaging modalities and operative loupes still act to complicate care and adversely influence patients' outcomes⁵. However, disparities in the availability of health care and the modalities governing the referral to a specialty care giver significantly influence the time and quality of care given.

Digestive surgical emergencies represent a vast pathological entity. It affects a large part of the population through the diversity of its symptoms and etiologies⁶. In developing country like Bangladesh, today also expert surgical facilities are not available in every tertiary care center and pediatric surgical cases are operated by general surgeons. Presentation of gastro-intestinal emergencies, especially in young children, varies widely, which renders recognition of the underlying disorder and treatment challenging⁷. Critically targeted imaging techniques are becoming increasingly important in obtaining the correct diagnosis without unnecessary delay⁸. Minimally invasive technique has become the method of choice for the diagnosis and treatment of many abdominal emergencies in children⁹.

Methods

This prospective study was conducted in department of surgery at Anwer Khan Modern Medical College Hospital, Dhaka from January 2020 to August 2022. We do not have separate pediatric surgical unit in our hospital but have a well-established pediatric department with neonatal intensive care unit. All the pediatric patients irrespective of sex with diagnosis of gastro-intestinal emergencies undergoing surgical intervention were included in the study.

On admission detailed history and thorough clinical examination was performed as per proforma. After admission, initially all patients were put on intravenous fluids, antibiotics and in selected cases nasogastric

suction decompression were done. After correction of dehydration and electrolyte imbalance in required cases, necessary laboratory and radiological investigations were carried out. Laboratory investigations included complete blood count, serum creatinine, serum electrolytes, etc. Radiological investigations included abdominal X-ray and ultrasound. Obtaining accurate history from children is a challenging to doctors, however abdominal pain is a nearly universal symptom. The final diagnosis of each case was made according to findings get from clinical examination, biochemical reports and radiological findings. All clinical and operative findings were recorded and in the post-operative period patients were followed up of their progress and treatment outcome.

Results

A total of 40 cases of gastro-intestinal emergencies were managed by surgical intervention during the study tenure. This study includes 7 cases of intestinal obstruction among them 5 were due to intussusception and 2 were for worm bolus [Figure: 1A, 1B]. 3 cases of infantile hypertrophic pyloric stenosis (IHPS) were included. Remaining 30 cases were acute appendicitis or their complications (Table-I).

Table-I: Distribution of patients according to diagnosis

Diagnosis	Number of cases
Intestinal Obstruction due to intussusception	5
Intestinal Obstruction due to worm	2
Infantile hypertrophic pyloric stenosis	3
Acute Appendicitis	30

Operative details like causes of obstruction, site of obstruction and operative procedure performed were recorded. Whenever required, specimen was sent for histopathological examination for definitive diagnosis. Postoperatively, patients were shifted to post-operative care unit for continuous monitoring. Patients were examined daily for detection of early post-operative complications if any. After discharge they were followed up for first 6 months for detection of late complications.

In terms of symptoms in intussusception (5 cases), common presentations were intermittent and colicky



Figure 1A: Worm bolus causing intestinal obstruction

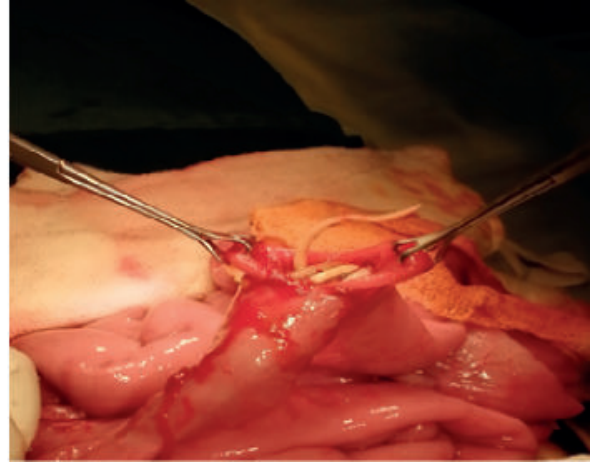


Figure 1B: Removal of worm bolus by enterotomy causing intestinal obstruction

pain, demonstrated by all of our patients. Emesis was the next common symptoms occurred in 4 cases followed by bloody stools reported in 2 cases. Clinical examination was done in the patients following the suspicion of intussusception. An abdominal mass was palpable in 3 cases and abdominal distension in one patient only. All diagnosis and suspicions were confirmed by abdominal ultrasound. All patients underwent laparotomy and manual reduction of intussusception.

In case of our two remaining cases of intestinal obstruction due to worm bolus were quite unlikely now a days due to yearly national anti-helminthic campaign and awareness program. Patients were presented with abdominal pain followed by nausea, vomiting and fever. Clinical examination revealed mild abdominal distension in both cases but a palpable lump on right iliac region in one case. The diagnoses were confirmed by abdominal ultrasound showing enlarged bolus of ascariasis causing the obstruction. Both patients underwent laparotomy and found small intestinal obstruction due to worm bolus [Figure:1A,1B].

We have managed 3 cases of infantile hypertrophic pyloric stenosis of 5-7 weeks of age and all are male child. Common presentation of these cases was projectile vomiting after feeds, visible gastric peristalsis and a palpable epigastric lump. The diagnoses of all cases were confirmed by using abdominal ultrasound showing doughnut sign. Ramstedt's pyloromyotomy was done by an open supraumbilical incision [Figure: 2].

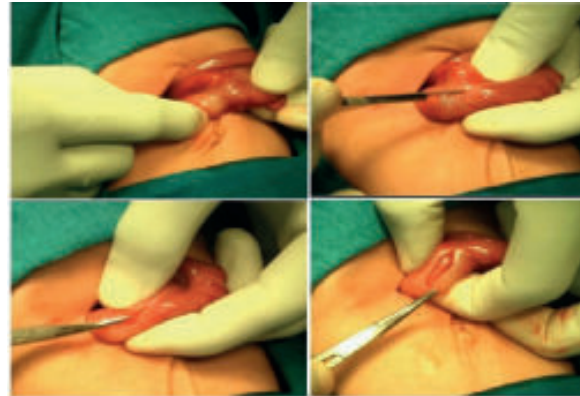


Figure 2: Ramstedt's pyloromyotomy has done for infantile hypertrophic pyloric stenosis

Acute appendicitis is the most common cause of emergency abdominal surgery in pediatric patients. There is high rate of morbidity and mortality of acute appendicitis in children mainly due to delayed diagnosis. A total of 30 pediatric patients with age range 6-17 years were managed for acute appendicitis in the study period. Male: female ratio was 1.5:1. Common presentations of our cases were migratory right iliac fossa pain, nausea or vomiting, right lower quadrant tenderness with rebound phenomena, and a raised temperature of 38-39° C. Most of the cases having leukocytosis and raised C-reactive protein (CRP) level. Abdominal ultrasonography was performed in all cases as it is an excellent screening tool for acute appendicitis with a high sensitivity (88 per cent) and specificity (94 per cent). All the cases underwent laparoscopic appendicectomy.

Post-operative recovery was almost uneventful in all our cases. Common post-operative complication was wound infection found in 5 out of 40 cases.

Discussion

In our prospective study total 40 cases were included. Among them intestinal obstruction cases were 7 in number, among them 5 were due to intussusception and 2 were for worm bolus. The diagnosis of intestinal obstruction was made on the basis of detailed history, clinical findings, and radiological investigations¹⁰. Necessary surgical intervention was performed after adequate resuscitation and after taking due informed written consent of the parents or legal guardian. Depending upon the diagnosis and condition of patient appropriate surgical procedure was performed¹¹.

Intussusception occurs when one segment of bowel invaginates into a more distal segment. This is the leading cause of acute intestinal obstruction in infants, and it occurs most commonly between 3 and 12 months of age. The most common intussusception is ileocolic but the small bowel may intussuscept into itself. Typically, this small bowel intussusception then prolapses through the ileocecal valve. The intussusception continues through the colon a variable distance, occasionally as far as the rectum, where it can be palpated on rectal examination. Colo-colic intussusceptions are rare. All our 5 cases having ileocolic intussusception. In infants, the lead point for the intussusception may be hypertrophied Peyer patches. In children older than 2 years of age, a specific lead point such as a polyp, a Meckel diverticulum, an intestinal duplication, or a tumor should be considered. A diarrheal illness or viral syndrome may occur several days to a week before the onset of abdominal pain and obstruction. Henoch–Schönlein purpura has been associated with intussusception (generally small bowel-small bowel)¹². The primary manifestation of intussusception is colicky abdominal pain in an infant or toddler. Children with vomiting, especially if bilious, and intermittent abdominal pain should be evaluated for intussusception. The condition of the patient is highly variable between being happy and playful between episodes to critical ill children with evidence of peritonitis and shock. Children with evidence of shock or bowel obstruction may need immediate operative care. Most children present with significant intermittent abdominal pain. Gradually, the child becomes more irritable and anorectic, and may vomit.

The pattern of pain in a child with an intussusception is often consistent and characteristic, and the diagnosis is suggested strongly if a history of episodic pain is obtained. The child may appear to be comfortable and well between episodes. Occasionally, the infant may appear lethargic and listless. At times, patients with intussusception have been misdiagnosed as being in a postictal state or encephalopathic¹³.

The localized portion of the intussusception leads to partial or complete obstruction and generalized abdominal distension like one of our cases. In some cases, the intussuscepted mass can be palpated as an ill-defined, sausage-shaped structure if the abdomen is not too distended. This mass is most often palpable in the right upper quadrant.

When children arrive in the ED early in the course of intussusception, there is often no history of having passed a currant jelly stool, although blood may be found on rectal examination (50% to 75% of cases have occult blood). However, the absence of bloody stools should not preclude making the diagnosis of a possible intussusception. Infants and young children with colicky abdominal pain and emesis should be evaluated for intussusception. Only 20% of infants with intussusception have the triad of colicky abdominal pain, abdominal mass, and bloody stools.

As the bowel becomes more tightly intussuscepted, the mesenteric veins become compressed, whereas the mesenteric arterial supply remains intact. This leads to the production of the characteristic currant jelly stool, which may be passed spontaneously or found on the rectal examination. As the intussusception becomes swollen, the pressure of entrapment occludes the arteries. At this point, the bleeding lessens, but the bowel can become gangrenous and even perforate, leading to peritonitis. The patient should receive IV fluids to correct dehydration. Surgery should be consulted immediately if the patient is critically ill or has signs of peritonitis. Nasogastric suction minimizes the risk of vomiting and aspiration if the child is critically ill. Once perfusion is improved and blood has been sent for CBC, electrolytes, and a blood bank sample, the patient should have diagnostic imaging¹⁴.

Plain radiograph findings of intussusception are variable and depend primarily on the duration of the symptoms and the presence or absence of complications. In early cases, a normal gas pattern is seen. Distal colonic air cannot be interpreted as an absence of

intussusception. Unless the radiograph exhibits air in the cecum, ileocolic intussusception cannot be excluded by radiograph. To improve yield, some centers utilize prone films or left lateral decubitus radiographs to enhance air movement into the cecum. In the patient with symptoms longer than 6 to 12 hours, flat and upright films often show signs of intestinal obstruction, including distended bowel with air–fluid levels. A characteristic “target” sign may be seen or more commonly a paucity of gas in the right lower quadrant. Occasionally, the actual head of the intussusception can be seen on a plain film as a soft tissue mass¹⁵.

USG can be used diagnostically with reported sensitivity of 98% to 100%. Whether all patients should have plain films prior to USG is debatable. If signs of intestinal obstruction or peritonitis, plain films may demonstrate pneumatosis or free air and thereby expedite operative care. Oftentimes, the radiologist may request a plain film prior to enema reduction but not necessarily before USG.

An aggregation of *Ascaris lumbricoides* is sometimes the cause of low small intestinal obstruction in children, usually under 10 years of age, and those living in or near tropics¹⁶. In majority of the cases, obstruction is partial and responds favorably to conservative treatment. Complete obstruction commonly follows an attempt to deworm a heavily infested child. It paralyzes the worms and so makes them even more likely to form a ball and obstruct the gut.

Intestinal obstruction due to worm bolus were quite unlikely now a days due to yearly national anti-helminthic campaign and awareness program. Heavy infestations can cause intestinal obstruction, partly or completely. The intestinal loop loaded with the bolus of round worms undergoes torsion and gives rise to volvulus. Intussusception results from hyperperistalsis induced by the irritating effect of round worms. Kumar et al have suggested that the excretory products of the worm produce spasm of ileocecal valve making it a closed loop obstruction¹⁷. Toxins released by the ascaris produce intestinal ischemia and infarction resulting in necrotic patches in the intestinal wall¹⁸. In our cases early diagnoses were confirmed by abdominal ultrasound showing enlarged bolus of ascariasis causing the obstruction and prompt decision were taken for laparotomy [Figure:1A,1B]. Their recovery was uneventful.

Infantile Hypertrophic Pyloric Stenosis (IHPS) is a common cause of surgery during infancy with prevalence of 2-8 per 1000 live births¹⁹. Its etiology is still not fully understood. It seems that there are genetic, familial and environmental predisposition factors required for the development of IHPS²⁰. Typically, IHPS presents between the 2nd and 4th week of life. Occasionally a palpable mass in the mid-epigastrium and a hypochloremia, hypokalemic metabolic alkalosis in laboratory test is detected. Abdominal radiography mostly shows gastric dilatation²¹. This condition results from interaction of a dominant gene of low penetrance and a multifactorial background such as environmental and maternal etiology²². There are some reports of IHPS in infants during the newborn period with vomiting and oral feeding intolerance at birth, which were diagnosed just at the time of surgery. Although these patients are symptomatic since birth, few of them underwent operation within the 1st week of life. This might be related to the low suspicion of this condition in a newborn. Moreover, early diagnosis will help to shorten the duration of hospital stay and improve the prognosis of HPS. In addition, reduced hospitalization will depend on earlier operation on patients with normal electrolyte indices at the early stage of disease. Current guideline might not be sufficient for diagnosis of HPS in newborn because of thin pyloric muscle thickness, equivocal clinical finding, and electrolyte variants²³.

In the diagnosis and treatment of acute appendicitis in childhood and adulthood, there is increasing discussion of the possibility of nonsurgical treatment, of the optimal timing of surgery, and of the appropriate postoperative care. Nonetheless, the available evidence base does not suffice to justify a change from primarily surgical treatment, in either children or adults. Thus, appendectomy remains the treatment of choice for uncomplicated acute appendicitis in all age groups. Surgery should not, however, be delayed by more than 12 hours in children and adolescents²⁴. Acute appendicitis is presented commonly among pediatric patients and is diagnosed through clinical presentation, physical examination, and imaging studies. Evidence has shown us the importance of a prompt diagnosis for reducing life-threatening complications. The physical exam plays an important role in diagnosis, changing the paradigm about using analgesia for patients difficult to examine. Nowadays, experts have developed several risk scores, such as the Alvarado score, Pediatric Appendicitis Score

(PAS), and Pediatric Appendicitis Risk Calculator (pARC), that can improve the accuracy of diagnosis and save time²⁵. Abdominal ultrasonography was performed in all cases as it is an excellent screening tool for acute appendicitis with a high sensitivity (88 per cent) and specificity (94 per cent). All the cases underwent laparoscopic appendicectomy. Five of our cases of laparoscopic appendicectomy having port site infection.

Conclusion

Acute abdominal complaints in children are common presentations in the emergency department. As in our country, many medical college hospitals do not have the individual pediatric surgery department, but we have to manage pediatric surgical emergencies as routine surgical emergencies in adult cases. So, they are often differing from those in adults and need to manage properly from the very beginning. Imaging techniques are becoming increasingly important in the diagnosis of acute abdomen in children, with emphasis on ultrasonography and targeted low-radiation CT. Urgent operative intervention remains the best treatment for most acute abdominal disorders. Although the focus is increasingly on minimally invasive approaches, for diagnosis and treatment, the surgical approach with the best outcome expectations should be chosen based on a careful evaluation of the clinical picture and individual expertise of a surgeon.

References

- Seth A, Chanchlani R, Rakhonde AK. Neonatal gastrointestinal emergencies in a tertiary care center in Bhopal, India: A prospective study. *IJSS Journal of Surgery*. 2015; 1(5): 1-4.
- L.W.E.van Herun, M.P.Pakarinen, T.Wester. Contemporary management of abdominal surgical emergencies in infants and children *BJS* 2014; 101: e24-e33
- Ademuyiwa, A.O., Bode, C.O., Adesanya, O.A. and Elebute, O.A. (2012) Non-Trauma Related Paediatric Abdominal Surgical Emergencies in Lagos, Nigeria: Epidemiology and Indicators of Survival. *Nigerian Medical Journal*, 53, 76-79.
- Akhigbe T, Adeyanju A, Nasir A, Smith F, Condon E, Waldron D. Pattern of presentation and outcome of pediatric appendicitis: a regional hospital experience *J of Pediatr Surg*, 2013; 12(3):79-83
- Lukman O, Abdur-Rahman O, Adeniran J, et al. Paediatric surgical abdominal emergencies in a north central Nigerian centre. *Ann Pediatr Surg*. 2012; 8(2):25-8
- Pujari A, Methi RN, Khare N. Acute gastrointestinal emergencies requiring surgery in children at Indira Gandhi Government Medical College and Hospital, Nagpur. *Afr J Paediatr Surg*. 2008; 5(2):61-4.
- Rothrock SG, Pagane J. Acute appendicitis in children: emergency department diagnosis and management. *Ann Emerg Med* 2000;36(1):39-51.
- Andersson RE, Hugander AP, Ghazi SH, et al. Diagnostic value of disease history, clinical presentation, and inflammatory parameters in appendicitis. *World J Surgery* 1999;23(2): 133-40.
- Rothrock SJ, Skeoch G, Rush JJ, Jhonson NE. Clinical features of misdiagnosed appendicitis in children. *An Emerg Med*. 1999; 120(1): 45-50
- Rajendra KG, Budhwani KS, Dharendra KS. Exploratory laparotomy for acute intestinal conditions in children: A review of 10 years of experience with 334 cases. *Afr J Paediatr Surg*. 2011; 8(1):62-9.
- D'Agostino J. Common abdominal emergencies in children. *Emerg Med Clin North Am*. 2002 Feb;20(1):139-53.
- Loukas M, Pellerin M, Kimball Z, et al. Intussusception: an anatomical perspective with review of the literature. *Clin Anat* 2011; 24: 552-561
- Edwards EA, Pigg N, Courtier J, et al. Intussusception: past, present and future. *Pediatr Radiol* 2017; 47: 1101-1108
- Applegate KE. Intussusception in children: evidence-based diagnosis and treatment. *Pediatr Radiol* 2009; 39: S140-S143
- Usang UE, Inah GB, Inyang AW, et al. Intussusception in children: comparison between ultrasound diagnosis and operation findings in a tropical developing country. *Afr J Paediatr Surg* 2013; 10: 87-90.
- Charles VM. Intestinal obstruction. In: Charles VM, Russel RCG, Williams NS editors. *Bailey and Love's short practice of surgery*. 22nd ed. London: HK Lewis and company Ltd. 1995; 51: 810-27
- Kumar M, Varier PS, Ramachandran P. Intestinal obstruction and gangrenous necrosis due to ascariasis. *Ind J Surg*. 1973; 35:54-55.
- Conrey JV. The role of ascaris lumbricoides in intestinal perforation. *Am J Surg*. 1975; 94:542-548. doi: 10.1016/0002-9610(57)90576-7.

19. Stark CM, Rogers PL, Eberly MD, Nylund CM. Association of prematurity with the development of infantile hypertrophic pyloric stenosis. *Pediatr Res.* 2015; 78:218-22.
20. Takahashi T, Sato Y, Yamazaki T, Hayashi A, Okamoto T. vomiting in infant with congenital nephrotic syndrome: Answers. *Pediatr Nephrol.* 2017; 32(9):1521-23.
21. Zhu J, Zhu T, Lin Z, Qu Y, Mu D4. Perinatal risk factors for infantile hypertrophic pyloric stenosis: A meta-analysis. *J Pediatr Surg.* 2017; 52(9):1389-97.
22. Ranells JD, Carver JD. Infantile hypertrophic pyloric stenosis: epidemiology, genetics, and clinical update. *Adv Pediatr.* 2011; 58(1):195-206.
23. Andrassy RJ, Haff RC, Larsen GL. Infantile hypertrophic pyloric stenosis during the first week of life. Approaches to diagnosis, based on observations of a newborn whose vomiting began on the first day. *Clin Pediatr (Phila).* 1977; 16(5): 475-6.
23. Leaphart CL, Borland K, Kane TD, et al. Hypertrophic pyloric stenosis in newborns younger than 21 days: remodeling the path of surgical intervention. *J Pediatr Surg.* 2008; 43(6): 998–1001.
24. Gorter RR, Eker HH, Gorter-Stam MA, et al. Diagnosis and management of acute appendicitis EAES consensus development conference 2015. *Surg Endosc.* 2016; 30:4668–4690. doi: 10.1007/s00464-016-5245-7.
25. Bhangu, A., Soreide, K., Di Saverio, S., Assarsson, J. H., & Drake, F. T. (2015). Acute appendicitis: modern understanding of pathogenesis, diagnosis, and management. *Lancet*, 386(10000), 1278–1287.