



Original article

Clinical spectrum of acute abdomen in children admitted to pediatric emergency department: A prospective study



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ABSTRACT

Introduction: Acute abdominal pain accounts for about 8% of all children attending the emergency department (ED) (Balachandran et al., 2013). In spite of being a common symptom seen in children, it is not uncommon for it to be a manifestation of a serious surgical emergency. There are inadequate published data from India regarding the spectrum of acute abdominal pain in children.

Objective: The objective of this study was to assess the clinical profile of children with nontraumatic acute abdominal pain admitted in the pediatric ED.

Methodology: This prospective observational study was conducted between June 2016 and July 2017. All the records of children aged between 2 and 18 years presenting with complaints of abdominal pain were collected in a predesigned proforma at the time of admission in the pediatric ED. Children who had undergone previous abdominal surgery and those with a history of trauma were excluded.

Results: A total of 720 children attending ED with complaints of abdominal pain were seen by the surgical team. According to their final diagnosis, they were divided into two groups: group I, 58 (8%; surgical); group II, 662 (92%; nonsurgical). Mean age of presentation was 7.5 ± 5.7 years; male-to-female ratio was 1.6:1. Detailed history and pain characteristics help in establishing the cause of pain.

Conclusion: The cause of pain in more than 90% of children presenting in the pediatric ED with complaints of abdominal pain is nonsurgical. Constipation was the most common diagnosis in these children, followed by acute gastroenteritis. Only in 8% children, the cause of pain is surgical, and acute appendicitis is the most common surgical cause.

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1. Introduction

Acute abdominal pain is one of the common complaints in children presenting to the pediatric emergency department (ED). It accounts for about 8% of all children attending the ED.¹ In spite of being a common symptom seen in children, it is not uncommon for it to be a manifestation of a serious surgical emergency. The common medical causes of acute abdominal pain in children are upper respiratory tract infection, otitis media, pharyngitis, functional constipation, urinary tract infection, gastroenteritis, and acute febrile illness. The common surgical causes include appendicitis, intussusception, intestinal obstruction, incarcerated hernia, acute pancreatitis, typhoid, and ischemic enteritis with perforation.¹ Pediatric abdominal pain poses a significant diagnostic challenge

owing to the wide variety of underlying causes and also due to the inability of the child or parent to describe it. Despite advances in diagnostic modalities, detailed clinical history and thorough physical examination remain the cornerstone for diagnosing the cause of pain.²

There are inadequate published data from India regarding the spectrum of acute abdominal pain in children presenting to the ED. The objective of this study was to assess the clinical profile of children admitted in the pediatric ED with nontraumatic acute abdominal pain.

2. Methodology

This study was conducted between June 2016 and July 2017 by the department of Pediatric Surgery with collaboration of the department of Pediatric Emergency, Institute of Child Health, Sir Ganga Ram Hospital, New Delhi, after approval from the Institutional Review Board. All the records of children aged between 2 and

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18 years presenting with complaints of acute abdominal pain were collected in a predesigned proforma at the time of admission in pediatric ED. Children who had undergone previous abdominal surgery and those with a history of trauma were excluded from the study. The collected data included demographic and clinical details. Chief complaint of pain in the abdomen was described according to site, nature, duration, and severity of pain. Face Pain Scale or visual analog pain score was used according to age. Associated complaints such as fever, vomiting, loss of appetite, not passed stool, diarrhea, burning micturition, bleeding per rectum, encopresis, ear ache/discharge, cough/running nose, and respiratory distress were noted. Findings of general and systemic examinations were noted. According to clinician's discretion, further investigations were conducted. Findings of laboratory investigations (blood and urine examination) and imaging tests were recorded. Radiological investigations were only conducted in cases where there was dilemma. All children received treatment as per their diagnosis and were followed up for 1 month: either in out-patient department (OPD) or over phone (on 7th, 14th, 21st, and 30th day after discharge from ED), for any episode of similar complaint, any admission to ED in this hospital or any other hospital, or any further radiological investigations repeated or further treatment received.

3. Statistical analysis

Descriptive statistics was analyzed using SPSS, version 17.0, software. Continuous variables are presented as mean \pm standard deviation. Categorical variables are expressed as frequencies and percentages. The Pearson's chi-square test or the chi-square test of association was used to determine if there is a relationship between two categorical variables. $P < 0.05$ was considered statistically significant.

4. Results

A total of 720 children were admitted in the pediatric ED with chief complaints of abdominal pain during the study period. According to the final diagnosis after clinical examination and relevant investigations, they were divided into two groups: Group I consisted of 58 (8%) children with abdominal pain due to surgical cause (appendicitis, intussusception, perforation peritonitis, and torsion testis) and group II, with 662 (92%) children with pain due to a nonsurgical cause. Mean age of presentation in group I was 6.6 ± 4 years, and that in group II was 7.5 ± 5.8 years. Male-to-female ratio was 2:1 in group I and 3:2 in group II. On detailed clinical history regarding nature of pain, in group I, 11 children (18.9%) had complaints of colicky pain and 47 (81%) had dull aching pain. In group II, 438 (66%) children had dull aching pain and 224 (33%) had colicky pain. Pain score results showed that group I had a score of ≥ 4 in 49 (85%) children and group II had a score of ≤ 4 in 549 (83%). Associated symptoms in group I were vomiting (60%, 34/58), loss of appetite (60%, 34/58), fever (48%, 27/58), diarrhea (10%, 6/58), burning micturition (6%, 4/58), and encopresis (1.7%, 1/58). In group II, associated symptoms noted were fever (51%, 343/662), vomiting (62%, 412/662), loss of appetite (61%, 409/662), diarrhea (31%, 206/662), cough and cold (9.8%, 65/662), ear ache (2.2%, 15/662), burning micturition (1.6%, 11/662), and encopresis (0.35%, 2/662) (Table 1).

On general examination, signs of dehydration were observed in 9 (15.5%) cases in group I and 57 (8.6%) cases in group II. All these children received fluid and electrolyte correction as per rehydration therapy. Additional positive findings on general examination revealed cervical lymphadenitis in 18 (2.7%) children in group II.

On abdominal examination, in group I, 18 (31%) children had diffuse tenderness, 45 (77%) had tenderness in epigastric region, 41

Table 1

Distribution of cases according to symptoms and signs in both groups.

Features (symptoms & signs)	Group I (n = 58)	Group II (n = 662)
Fever	28 (48)	343 (51)
Vomiting	39 (67)	412 (62)
Loss of appetite	35 (60)	409 (61)
Diarrhea	6 (10)	206 (31)
Burning micturition	4 (6)	11 (1.6)
Encopresis	1 (1.7)	2 (0.3)
Ear ache	0	15 (2.2)
Respiratory tract infection	0	65 (9.8)
Abdominal tenderness	58 (100)	170 (25)
Abdominal distension	14 (24)	10 (1.5)
Palpable mass/lump	12 (20)	16 (2.4)
Absent bowel sounds	11 (18)	2 (0.3)
Loaded rectum on digital rectal examination	24 (41)	251 (37)

Data expressed as n (%).

(70%) had tenderness in umbilical region, 33 (56%) had right iliac fossa tenderness, 46 (79%) had left iliac fossa tenderness, 7 (12%) had tenderness in the inguinal region, and 1 (1.7%) had scrotal tenderness. In group II, 479 (72%) had diffuse tenderness, 83 (12%) children had epigastric tenderness, 70 (10%) had tenderness in the umbilical region, 18 (2.7%) had tenderness in left iliac fossa, and 12 (1.8%) had tenderness in the right iliac fossa. Other abdominal examination findings noted were that in group I, abdominal distension was present in 14 (24%), palpable abdominal lump/mass in 12 (20%), and absent bowel sounds in 11 (18%). In group II, 16 (2.4%) children had palpable fecaloma in the lower abdomen, 10 (1.5%) had abdominal distension, and 2 (0.3%) had absent bowel sounds. Digital rectal examination findings revealed loaded rectum in 24 (41%) children in group I and in 251 (37%) in group II. In addition, three children in group I and 4 in group II had blood staining on rectal examination (Table 1). On systemic examination, reduced air entry on one side was noted in 3 cases and adventitious sounds on chest auscultation noted in 8 cases in group II. No such findings were seen in any case of group I.

Plain X ray of the abdomen was conducted in 685 children, 37 (63%) in group I and 648 (97%) in group II. Fecal stippling suggestive of constipation was seen in 5 (13.5%) children in group I and 145 (22.4%) in group II. Other positive X ray findings noted were multiple air fluid levels seen in 10 (27%) children and free air under the diaphragm in 1 (2.7%) child in group I. Ultrasound abdomen (USG) abdomen was conducted in the ED for 280 (38%) children, 32 (55%) in group I and 248 (37.4%) in group II. Fifteen children (15/32, 47%) in group I were diagnosed with acute appendicitis, 9 (28%) had mesenteric lymphadenitis, 6 (18%) had intussusception, and one each had obstructed hernia and torsion testis. In group II, 11 4.4% of children had mesenteric lymphadenitis. None of the patients were advised abdominal computed tomography (CT) scan in the ED.

Acute appendicitis in 15 of 58 (26%) children was the most common diagnosis in group I. Other causes of abdominal pain in group I were ileocolic intussusception in 6 (10.3%), intestinal obstruction in 5 (8.6%), malrotation of gut in 4 (6.8%), perforation peritonitis in 3 (5%), obstructed hernia in 2 (3.4%), and acute scrotum in 1 patient (1.7%). The most common diagnosis in group II was constipation in 264 (40%) children. Other nonsurgical causes of abdominal pain in group II were acute gastroenteritis in 205 (31%), acute gastritis in 105 (16%), respiratory tract infection in 46 (7%), urinary tract infection in 13 (2%), otitis media in 12 (1.8%), enteric fever in 12 (1.8%), and type I diabetes mellitus in one child (Figs. 1 and 2).

All these children received treatment as per the diagnosis and were followed up for one month. None of the 58 children in group I had any complications after discharge from hospital, during the follow-up period. In group II, 230 children (34.7%) were lost to

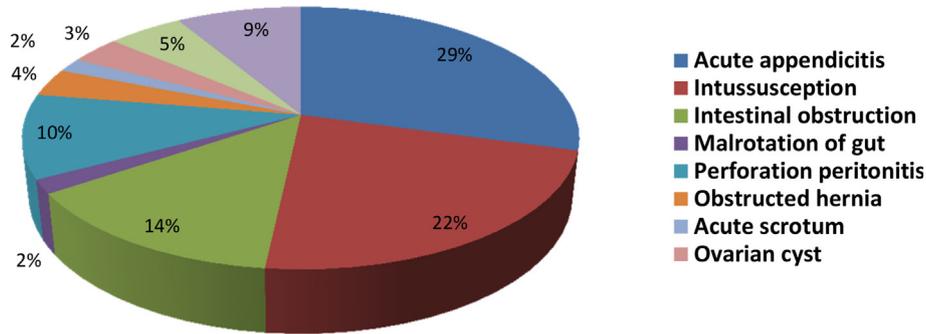


Fig. 1. Distribution of cases according to diagnosis in group I.

follow-up, and of the remaining 432 (65.3%) children, 46 (10.6%) had a history of revisit to the ED, 2 children were later diagnosed with appendicitis, and 44 had functional constipation.

5. Discussion

Acute abdominal pain in children is the most frequent complaint encountered in pediatric ED. A total of 11,980 children were attended to in the ED during the study period, and of these, 720 (6%) children with chief complaints of abdominal pain were referred to a pediatric surgeon for evaluation. Mean age of presentation in the present study is 7.5 ± 5.7 years (group I: 6.6 ± 4 years; group II: 7.5 ± 5.8 years). Sheikh and Latif⁸ have reported the mean age of 9.7 ± 2.9 years in their study involving 151 pediatric patients admitted with acute abdominal pain. Younger age of children in our study population can be attributed to the fact that older children are managed in peripheral medical facilities and that there is a referral bias for younger patients in our hospital, which is a tertiary care hospital. Overall male-to-female ratio was 1.6:1 (in group I, 2:1; in group II, 3:2). A retrospective study conducted by Caperell et al.³ using electronic medical records, comprising of 9424 patients' visits to the ED with abdominal pain, has reported higher incidence in female gender (61% in African American and 52% in white children) during the study period of two years. Higher incidence in male gender in our study may be due to the sociocultural difference in our population with preferential bias for boys in seeking medical treatment.

Common associated presenting symptoms in group I were vomiting (60%), loss of appetite (60%), and fever (48%). Tseng et al.⁴ conducted a retrospective study between 2005 and 2007 on 400 children attending the ED with complaints of acute abdominal pain and have reported vomiting (65.2%) and fever (57%) as the commonly associated complaints, particularly in all children with acute appendicitis. Similar observation was made in the present

study. In group II, the most common associated complaint was fever seen in 343 (51%) children. During fever, most children have poor oral intake of fluids, which precipitates further worsening of underlying functional constipation. In the present study, although constipation was not the presenting complaint, 40% children in group II were found to have acute abdominal pain secondary to functional constipation and these children had symptomatic relief with treatment of constipation. Digital rectal examination revealed loaded rectum in 24 (41%) cases in group I and 251 (37%) cases in group II, which confirmed the diagnosis of constipation.

On abdominal examination, 350 (48%) children had diffuse tenderness, 180 (25%) had epigastric tenderness, 72 (10%) had tenderness in the right iliac fossa, 45 (6.2%) had tenderness in the umbilical region, 30 (4.1%) had tenderness in the periumbilical region, 22 (3%) had tenderness in the left iliac fossa, 12 (1.6%) had tenderness in the right hypochondrium, and 9 (1.2%) had tenderness in the lower abdomen. Location of tenderness and associated symptoms and signs elicited from detailed clinical history and physical examination helped in diagnosing the cause of pain. All 17 (29%) children with acute appendicitis in group I had tenderness in the right iliac fossa. Balachandran et al.¹ have also discussed the importance of detailed history and examination in children admitted to pediatric ED with acute abdominal pain and have listed the differential diagnosis of abdominal pain in children according to the location of pain and how it finally helps in the diagnosis and management. Wai et al.⁵ conducted a retrospective study on 237 children younger than 18 years and observed that duration of symptoms and the presence of fever, nausea/vomiting, right lower quadrant pain, rebound tenderness or leukocytosis did not predict admission in children with abdominal pain. In their study, abdominal pain not otherwise specified and acute gastroenteritis were the two most common discharge diagnoses.⁵

Acute appendicitis was the most common (29%) surgical cause of acute abdomen. Other causes were ileocolic intussusception

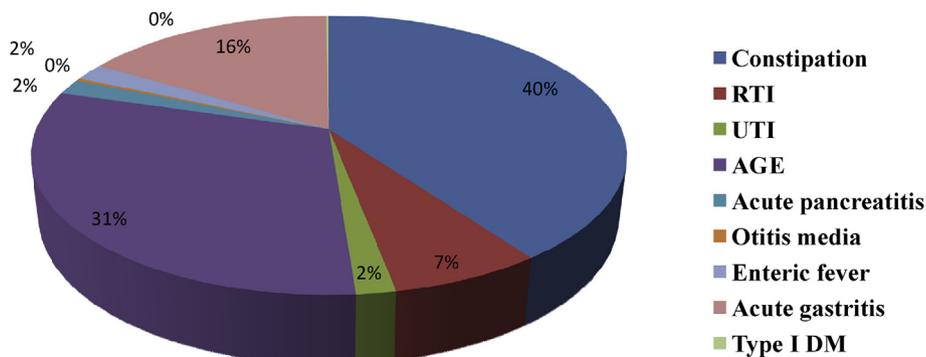


Fig. 2. Distribution of cases according to diagnosis in group II. DM, diabetes mellitus; RTI, respiratory tract infection; UTI, urinary tract infection.

(22%), intestinal obstruction (10%), intestinal malrotation (9%), perforation peritonitis (5%), obstructed hernia (3%), and acute scrotum (3%). The most common nonsurgical cause of pain in group II was constipation (40%), and others were acute gastroenteritis (31%), acute gastritis (16%), respiratory tract infection (7%), urinary tract infection (2%), otitis media (2%), enteric fever (2%), and type I diabetes mellitus (2%). Earlier studies have reported respiratory tract infection as the most common final diagnosis seen in children attending ED with complaints of pain in the abdomen. In our institution, children with respiratory tract infection are diagnosed and managed by medical team and hence were already diagnosed before referral for surgical consultation.

In a retrospective study by Scholer et al.⁶ 1141 children aged 2–12 years, admitted in the ED with complaints of acute abdominal pain, were evaluated, and they observed that 18.6% children had a final diagnosis of upper respiratory tract infection, 16.6% had pharyngitis, 16% had viral syndrome, 15.6% had nonspecific abdominal pain, and among these, less than 1% required surgery. In our study, 8% of children had a surgical cause for abdominal pain, although surgery was performed in 7.5% of cases. Higher incidence of surgery in our series is because we have included only those children with a chief complaint of abdominal pain and most children with upper and lower respiratory tract infections had already been excluded. A prospective study conducted by Reynolds and Jaffe⁷ on 377 children attending ED with complaints of abdominal pain has reported that 7% of children had a final diagnosis of constipation and 2% had otitis media. Recent studies have reported constipation as the most common nonsurgical cause of acute abdominal pain and appendicitis as the most common surgical cause, which is similar to our observation.

Sheikh and Latif⁸ studied 1420 children, aged 2–14 years, and observed that 40.4% children in their series had acute appendicitis and 25.8% had nonspecific abdominal pain. Abantanga et al.⁹ studied 956 children with acute abdominal pain and reported typhoid perforation (68%) as the most common surgical emergency followed by acute appendicitis (16%). According to their study, poor hygiene and ignorance lead to so many cases of enteric fever in their area.⁹ Although 2% of children in group II had abdominal pain associated with enteric fever in the present study, we did not encounter any case of abdominal pain due to enteric fever–associated perforation peritonitis. This is possibly due to our hospital being a tertiary care center and our study population comprising children from urban areas. In addition, currently, diagnosis of enteric fever is suspected early and appropriately treated with antibiotics timely, and hence, complicated sequelae such as perforation peritonitis are avoided.

Plain X ray of the abdomen was the most common investigation recommended in the ED in our study and helped in confirming the diagnosis of constipation when fecal stippling was seen and ruling out surgical causes such as intestinal obstruction or intestinal perforation. Abdominal ultrasound confirmed the clinical diagnosis of acute appendicitis in all cases and diagnosed mesenteric lymphadenitis and intussusception in others. Specificity and sensitivity of ultrasound for diagnosis of appendicitis are reported to be 80–100%.¹⁰ CT scan facility is available in our institution during emergency hours, but in our study, all cases of acute

appendicitis, ileocecal intussusception, obstructed hernia, and torsion testis were clinically diagnosed and thereafter confirmed on abdominal ultrasound, and none of them required abdominal CT scan. Published literature supports the use of contrast-enhanced CT scan of the abdomen for confirming the diagnosis of acute appendicitis¹¹ whenever in doubt, but it has also been observed that even with the use of CT scan, the rate of negative appendicectomy and appendicular perforation has remained unchanged.^{12,13}

All the cases who were discharged from the ED after initial management were followed up for 1 month, and during this period, 46 cases were readmitted to the ED with complaints of abdominal pain, out of which, two cases were diagnosed with acute appendicitis (both cases had refused for further investigations on previous admission) and remaining 44 cases with functional constipation.¹

6. Conclusion

The cause of pain in more than 90% of children presenting to a pediatric ED with complaints of abdominal pain was nonsurgical. Constipation was the most common diagnosis in these children, followed by acute gastroenteritis. Only in 8% of children, the cause of pain was surgical, and acute appendicitis is the most common surgical cause.

Conflicts of interest

All authors have none to declare.

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