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Review Article

## CAUSES OF ACUTE ABDOMINAL PAIN IN CHILDREN AND ADOLESCENT-SYSTEMATIC LITERATURE REVIEW

Faisal Mohammed Baqarwan <sup>1\*</sup>, Ahmed Ageel Alanazi <sup>2</sup>, Fatimah Abdulmohsen Alhussain<sup>2</sup>, Sarah Saleh AlBaridi <sup>3</sup>, Layan Yousef AlBassam <sup>3</sup>, Khalid Mnawer Almutiri <sup>4</sup>, Wudian Mahmmd Alshammery <sup>5</sup>, Seham Yahya Alzahrani <sup>6</sup>, Mshari Hamed Althomali <sup>7</sup>, Kholoud Hushish Al-Baqmi<sup>8</sup>

<sup>1</sup> Umm Al-Qura University, Makkah, Saudi Arabia,

<sup>2</sup> Almaarefa University, Riyadh, Saudi Arabia,

<sup>3</sup> Arabian Gulf University, Manama, Bahrain,

<sup>4</sup> Ibn Sina National College, Jeddah, Saudi Arabia,

<sup>5</sup> University Of Hail, Hail, Saudi Arabia,

<sup>6</sup> Tabuk University, Tabuk, Saudi Arabia,

<sup>7</sup> Taif University, Taif, Saudi Arabia,

<sup>8</sup> King Saud University, Riyadh, Saudi Arabia

**Abstract :**

*This review is aiming to discuss the causes of acute abdominal pain in children and adolescent, the presented review was conducted by searching in Medline, Emblaze, Web of Science, Science Direct, BMJ journal and Google Scholar for, researches, review articles and reports, published over the past years. were searched up to November 2018 for published and unpublished studies and without language restrictions, if several studies had similar findings, we randomly selected one or two to avoid repetitive results. On the basis of findings and results this review found stressful events, Somatization, Appendicitis, and functional abdominal pain.*

**Keywords:** *causes, acute abdominal pain, children, adolescent.*

**Corresponding author:**

**Dr. Faisal Mohammed Baqarwan,**  
Umm Al-Qura University, Makkah, Saudi Arabia.

QR code



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## INTRODUCTION:

Acute abdominal pain is one of the most common complaints in children, and it poses a diagnostic challenge owing to the variety of underlying causes. Acute abdominal pain is usually a self-limiting, benign condition, such as in gastroenteritis, constipation, or viral illness. [1] However, the challenge for the physician is to identify children who have uncommon and potentially life-threatening conditions that require urgent evaluation and treatment, such as appendicitis, intussusception, volvulus, or adhesion. [1,2] The frequency of surgical intervention in patients presenting with acute abdominal pain is around 1%. [3]

pain is integral to providing explanation and reassurance to the patient and family, as well as maximizing targeted therapeutic options. [4] Chronic, recurrent abdominal pain occurs in 9-15% of all children and adolescents. The American Academy of Pediatrics Subcommittee on Chronic Abdominal Pain and North American Society of Pediatric Gastroenterology, Hepatology and Nutrition define "functional abdominal pain" as the most common cause of chronic, idiopathic abdominal pain in childhood, after exclusion of anatomic, infectious, inflammatory, or other metabolic causes, and categorize "functional abdominal pain" as 1, or a combination of, 4 clinical entities; functional dyspepsia, irritable bowel syndrome, abdominal migraine (AM), and/or functional abdominal pain syndrome. First described nearly a century ago, AM occurs in 1% to 4% of children and has received considerable attention as one of many potential etiologies of recurrent abdominal pain in children. [5,6] In 2004, the International Headache Society (ICHD-2) included AM among its "periodic syndrome of childhood that are precursors for migraine" (Table 1). [7,8] In 2006, Rome III Gastroenterology established separate, but similar, criteria for AM, confirming AM as a well defined cause of recurrent abdominal pain. [9]

Acute appendicitis is the most common cause for emergent surgery in the pediatric population.<sup>10</sup> The current accepted imaging evaluation algorithm for pediatric appendicitis often involves a combination of US and CT. CT has been shown to be accurate, rapid and relatively operator-independent compared to US, which carries additional limitations including variable sensitivity, limited ability to diagnose alternative pathologies causing abdominal pain, and a high rate of nonvisualization of the appendix because of the location of the appendix or patient obesity.<sup>11</sup> Recent attention to the detrimental effects of

radiation on children has led to the investigation of alternative imaging methods to diagnose pediatric appendicitis. [12,13] The use of MR imaging in adults and pregnant patients for the diagnosis of appendicitis has been studied extensively. [14,15] Applying the same imaging protocols to children is limited because of exam length, availability of technology, frequent need for sedation, and cost.<sup>16</sup>

Presentation with acute abdominal pain or abdominal symptomatology is a very common cause of presentation of children to hospital. The causes are dependent in part on the age of the child, in part on the presence of previous surgery, and can be divided into those that relate to congenital abnormalities at whatever age they present, acquired disease and infection. Children, particularly young children are often poor historians, and therefore the clinical examination and the laboratory investigations are important in helping to come to a diagnosis. Primary imaging of abdominal emergencies in childhood is a radiograph of the abdomen, followed by ultrasound. Further imaging depends on the results of these studies. An ordered review of the abdomen radiograph is important if the salient features on X-ray are not to be missed.

Practitioners should be competent with abdominal ultrasound in children and know where to seek the causes of disease, as these are different from those that are obtained in many instances in adults. Familiarity with the likely causes is important. The three commonest causes of acute abdominal pain in childhood are, in young infants, intussusception, appendicitis and mesenteric adenitis. In older children, inflammatory bowel disease and ovarian pathology are also included. This article details the approach to imaging and the salient features of some of the conditions. [17]

The causes of acute abdominal pain in children are listed in Table 1. A wide range of surgical and non-surgical conditions can cause acute abdominal pain in children. A brief discussion of some life-threatening and common causes of acute abdominal pain follows. Life-threatening causes of abdominal pain often result from hemorrhage, obstruction, or perforation of the gastrointestinal tract or intra-abdominal organs and may be associated with specific clinical features. Extra-abdominal causes of abdominal pain (e.g., diabetic ketoacidosis, hemolytic uremic syndrome, and myocarditis) also have other distinguishing clinical features. Common causes of abdominal pain include gastroenteritis, constipation, systemic viral illness, infections outside of the gastrointestinal tract

(e.g., streptococcal pharyngitis, lower lobe pneumonia, and urinary tract infection), mesenteric lymphadenitis, and infantile colic. [18]

## METHODS:

The present review was conducted November 2018 in accordance with the preferred reporting items for systematic reviews and meta-analyses (PRISMA) declaration standards for systematic reviews. We reviewed all the topics on causes of acute abdominal pain in children and adolescent such as stressful events, Somatization, Appendicitis, and functional abdominal pain .

To achieve this goal, we searched Medline, Embase, Web of Science, Science Direct, and Google Scholar for, researches, review articles and reports, published over the past 15 years.

Our search was completed without language restrictions. Then we extracted data on study year, study design, and key outcome on diabetes. The selected studies were summarized, and unreproducible studies were excluded. Selected data is shown in the Table 1.

### Inclusion criteria

Inclusion criteria were abdominal pain in children and adolescent: acute, recurrent,

### Exclusion criteria

Irrelevant articles [not related to the aim of this review and articles that did not meet the inclusion criteria in this review.

### Data extraction and analysis

Information relating to each of the systematic review question elements was extracted from the studies and collated in qualitative tables. Direct analysis of the studies of causes of acute abdominal pain in children and adolescent

## RESULTS:

The six diagnostic groups were compared on the two dependent variables, Positive Life Change score and Negative Life Change score, using analysis of variance. There was no significant difference among the groups with respect to Positive Life Change scores ( $F = .38$ ,  $df = 5/166$ ). There was, however, a significant difference among groups with respect to Negative Life Change scores ( $F = 85.78$ ,  $df = 5/166$ ,  $P < .0001$ ). Patients in group 4 (recurrent abdominal and chest pain) and group 5 (behavioral problems) reported significantly higher Negative Life Change scores than the other diagnostic groups (Table 1). Group 5 had significantly higher Negative Life

Change scores than group 4, although both groups scored significantly higher than the remaining four groups. Specific types of events were similar for all diagnostic groups. [26]

### Acute appendicitis

Acute appendicitis is the most common surgical cause of acute abdominal pain in children .19,20 Typically, children with appendicitis present with visceral, vague, poorly localized, periumbilical pain. Within 6 to 48 hours, the pain becomes parietal as the overlying peritoneum becomes inflamed. The pain manifests itself as a well-localized pain in the right lower quadrant. However, some of these characteristic manifestations are frequently absent, particularly in younger children. [21] Therefore, physicians should consider the diagnosis of appendicitis in all cases of previously healthy children who have a history of abdominal pain and vomiting, with or without fever or focal abdominal tenderness .[21,22]

### Abdominal trauma

Abdominal trauma may cause hemorrhage or laceration of solid organs, bowel perforation, organ ischemia from vascular injury, and intramural hematoma. Blunt abdominal trauma is more common than penetrating injury. Typical mechanisms of trauma include motor vehicle accidents, falling down, and child abuse.

### Intestinal obstruction

Intestinal obstruction may produce a characteristic cramping pain. This clinical feature is usually associated with serious intra-abdominal conditions that require urgent diagnosis and treatment. Causes of intestinal obstruction include intussusception, malrotation with midgut volvulus, necrotizing enterocolitis, incarcerated inguinal hernia, and postoperative adhesions. [20]

### Gastroenteritis

Gastroenteritis is the most common medical condition of abdominal pain in children.23 Children with acute gastroenteritis may develop fever, severe cramping abdominal pain, and diffuse abdominal tenderness before diarrhea begins. Viruses including rotavirus, Norwalk virus, adenovirus, and enterovirus are the most frequent causes. [23] Bacteria and parasites can also cause acute abdominal pain in children.

### Constipation

Children with constipation often present with fecal impaction and severe lower abdominal pain. Constipation is likely in children with at least two of

the following characteristics: fewer than three stools weekly, fecal incontinence, large stools palpable in the rectum or through the abdominal wall, retentive posturing, or painful defecation. [24]

### Mesenteric lymphadenitis

Because mesenteric lymph nodes are usually in the right lower quadrant, this condition sometimes mimics appendicitis, except the pain is more diffuse. Often, signs of peritonitis are absent. In one series of 70 children with clinically suspected acute appendicitis, 16% had a final diagnosis of mesenteric lymphadenitis established by ultrasound, clinical course, or surgery. [25]

The relation of chronicity of abdominal pain to severity of somatization symptoms reported at the time of the clinic visit was examined in a Diagnostic Group x Abdominal Pain Chronicity repeated-measures analysis of variance (ANOVA) with CSI score as the dependent variable. Contrary to the results reported by Ernst et al. (1984), there were no main or interaction effects involving abdominal pain chronicity. The interaction of Diagnostic Group with Time of Administration was significant,  $F(1, 54) = 4.16, p < .05$ . A univariate ANOVA for Diagnostic Group with post hoc analysis using Duncan's Multiple Range Test indicated significantly higher CSI scores at the initial administration in the RAP and organic groups in comparison to the well group,  $F(2, 107) = 18.59, p < .001$  (for RAP,  $M = 20.34, SD = 12.10$ ; for organic,  $M = 23.39, SD = 12.76$ ; for well,  $M = 7.93, SD = 9.98$ ). At the 3-month followup

there was a significant difference among the diagnostic groups, with RAP patients scoring significantly higher on the CSI than either organic or well patients,  $F(2, 94) = 5.94, p < .01$  (for RAP,  $M = 10.83, SD = 9.41$ ; for organic,  $M = 5.81, SD = 5.37$ ; for well,  $M = 5.64, SD = 5.64$ ). [27]

There were 132 cases of pathologically confirmed appendicitis out of 364 pediatric patients (36.3%) included in the study. Overall sensitivity and specificity were 96.2% (95% CI [91.4–98.4%]) and 95.7% (95% CI [92.3–97.6%]), respectively. Positive predictive value and negative predictive value were 92.7% (95% CI [86.6–96.3%]) and 97.8% (95% CI [94.7–99.1%]), respectively. The appendix was visualized in 243 cases (66.8%). Imaging confirmed alternative diagnoses in 75 patients, including most commonly colitis, enteritis or terminal ileitis ( $n=25, 6.9%$ ), adnexal cysts ( $n=25, 6.9%$ ) and mesenteric adenitis ( $n=7, 1.9%$ ). [28]

The search for gastroenterology clinic patients by ICD-9 code revealed 2443 children evaluated at least once from 1/1/2006 to 12/31/2007 with the diagnosis of recurrent abdominal pain on 1 or more visits. From this patient list, 600 charts were randomly selected and evaluated, with all visits included as data, regardless of time period, such that the complete work-up and pattern of disease was recorded for each included patient. [29]

**Table (1) Results from Sequencing Studies.**

Author and year	Sample	Causes	Key point
John W 1985. <sup>26</sup>	172 adolescents,	stressful events	Clinical observations have frequently suggested a relationship between these complaints and recent stressful events.
Lynn S.1991. <sup>27</sup>	A comparison group of well patients ( $n = 41$ )	Somatization	Symptoms of somatization were investigated in pediatric patients with recurrent abdominal pain
Jeffrey L 2014. <sup>28</sup>	364 consecutive pediatric patients	Appendicitis	contrast-enhanced MRI is capable of accurately diagnosing acute appendicitis while detecting many alternative entities of abdominal pain
Laura C. 2011. <sup>29</sup>	600 children	functional abdominal pain	Ultimately, functional abdominal pain will be the most common diagnosis and this condition is composed of 4 entities; functional dyspepsia, irritable bowel syndrome, functional abdominal pain syndrome, and/or AM.

**DISCUSSION:**

The study shows that a standard measure of stressful life events, administered systematically to the patients of an adolescent clinic, can differentiate patients with recurrent pain from other patient groups. Patients with recurrent pain for which no organic etiology could be identified had significantly higher Negative Life Change scores than patients seen for routine checkup, acute minor illness, stable chronic illness, or pain with clinically diagnosed organic cause. Furthermore, Negative Life Change scores differentiated patients referred for behavioral problems from all other patient groups. Thus, the data suggest that this measure is a useful adjunct to the clinical interview. [26]

Results indicate that pediatric patients with recurrent abdominal pain report high levels of somatization symptoms at the clinic visit and are significantly more likely than well patients and patients with organically based abdominal pain to maintain these symptoms 3 months following the clinic visit. Followup investigations of RAP patients rarely have reported subsequent organic findings that would explain the patient's original complaints (Apley, 1975; Christensen & Mortensen, 1975; Stickler & Murphy, 1979). Nevertheless, it is possible that in some RAP patients continuing abdominal pain and other symptoms reflect an as yet undiagnosed organic disease or physiological processes (e.g., aberrations in intestinal motility) that create physical discomfort but are not associated with organic pathology (cf. Barr & Feuerstein, 1983). If this is the case, then the symptomatology of RAP patients may one day be understood as a consequence of limitations in medical diagnosis and available treatment. [27]

In recent years MR for pediatric appendicitis has emerged as promising imaging tool. Prior studies regarding the use of MRI for acute appendicitis in pediatric cohorts did not use intravenous contrast agents, used US as a selection tool, did not detail the extent of alternative diagnoses of abdominal pain illuminated by MRI, and have been limited to the use of 3-T MRI, while our study exclusively scanned patients at 1.5 T [1, 8, 9, 11]. [28]

Until recently developed diagnostic criteria were published, the existence of AM was controversial, and therefore prevalence data were rare. The majority of data originated in Europe, with 1 UK study demonstrating that the prevalence of AM was 2.4%.<sup>8</sup> In a study using diagnostic criteria similar to ICHD-2, Abu-Arafeh and Russell reported the prevalence of AM was 4.1% in 2165 children aged 5-15 years.<sup>12</sup> Comparable to those results, our data from a US academic gastroenterology practice determined the

prevalence of AM to be 4% among children 1-21 years with recurrent abdominal pain. An additional 11% of patients were deemed as "probable" AM based on having met diagnostic criteria except for 1 criterion for which documentation was lacking. [29]

**CONCLUSIONS:**

The results of this studies show the causes of acute abdominal pain in children and adolescents. On the basis of findings and results this review found stressful events, Somatization, Appendicitis, and functional abdominal pain are common causes of acute abdominal pain in children and adolescents

**REFERENCES:**

1. D'Agostino J. Common abdominal emergencies in children. *Emerg Med Clin North Am* 2002; 20:139-153.
2. Grant HW, Parker MC, Wilson MS, Menzies D, Sunderland G, Thompson JN, et al. Adhesions after abdominal surgery in children. *J Pediatr Surg* 2008; 43:152-156
3. Scholer SJ, Pituch K, Orr DP, Dittus RS. Clinical outcomes of children with acute abdominal pain. *Pediatrics* 1996; 98:680-685.
4. Di Lorenzo C. Chronic abdominal pain in children: A technical report of the American Academy of Pediatrics and the North American Society for Pediatric Gastroenterology, Hepatology and Nutrition: AAP Subcommittee and NASPGHAN Committee on Chronic Abdominal Pain. *J Pediatr Gastroenterol Nutr.* 2005; 40:249-261.
5. 2. Brams W. Abdominal migraine. *JAMA.* 1922; 78:2627.
6. 3. Popovich DM, Schentrup DM, McAlhany AL. Recognizing and diagnosing abdominal migraines. *J Pediatr Health Care.* 2010; 24:372-377.
7. 4. Oleson J. The International Classification of Headache Disorders: 2nd edition. *Cephalalgia.* 2004; 24(Suppl. 1):9-160.
8. 5. Cuvellier JC, Lépine A. Childhood periodic syndromes. *Pediatr Neurol.* 2010; 42:1-11.
9. 6. Rasquin A, Di Lorenzo C, Forbes D, et al. Childhood functional gastrointestinal disorders: Child/adolescent. *Gastroenterology.* 2006; 130:1527-1537.
10. Herliczek TW, Swenson DW, Mayo-Smith WW (2013) Utility of MRI after inconclusive ultrasound in pediatric patients with suspected appendicitis: retrospective review of 60 consecutive patients. *AJR Am J Roentgenol* 200:969-973

11. 2. Hernanz-Schulman M (2010) CT and US in the diagnosis of appendicitis: an argument for CT. *Radiology* 255:3–7
12. 3. Brenner DJ, Elliston CD (2004) Estimated radiation risks potentially associated with full-body CT screening. *Radiology* 232: 735–738
13. Miglioretti DL, Johnson E, Williams A et al (2013) The use of computed tomography in pediatrics and the associated radiation exposure and estimated cancer risk. *JAMA Pediatr* 167:700–707
14. 6. Barger RL Jr, Nandalur KR (2010) Diagnostic performance of magnetic resonance imaging in the detection of appendicitis in adults: a meta-analysis. *Acad Radiol* 17:1211–1216
15. 7. Dewhurst C, Beddy P, Pedrosa I (2013) MRI evaluation of acute appendicitis in pregnancy. *J Magn Reson Imaging* 37:566–575
16. 8. Moore MM, Gustas CN, Choudhary AK et al (2012) MRI for clinically suspected pediatric appendicitis: an implemented program. *Pediatr Radiol* 42:1056–1063
17. H.M.L. Carty Paediatric emergencies: non-traumatic abdominal emergencies 2002 10.1007/s00330-002-1499-7.
18. Joon S, Acute Abdominal Pain in Children 2013 Dec;16(4):219-224
19. Ross A, LeLeiko NS. Acute abdominal pain. *Pediatr Rev* 2010; 31:135–144.
20. Carty HM. Paediatric emergencies: non-traumatic abdominal emergencies. *Eur Radiol* 2002; 12:2835–2848.
21. Kwok MY, Kim MK, Gorelick MH. Evidence-based approach to the diagnosis of appendicitis in children. *Pediatr Emerg Care* 2004; 20:690–698.
22. Bundy DG, Byerley JS, Liles EA, Perrin EM, Katz nelson J, Rice HE. Does this child have appendicitis? *JAMA* 2007; 298:438–451.
23. Mason JD. The evaluation of acute abdominal pain in children. *Emerg Med Clin North Am* 1996; 14:629–643.
24. Loening-Baucke V, Swidsinski A. Constipation as cause of acute abdominal pain in children. *J Pediatr* 2007; 151:666–669.
25. Vignault F, Filiatrault D, Brandt ML, Garel L, Grignon A, Ouimet A. Acute appendicitis in children: evaluation with US. *Radiology* 1990; 176:501–504.
26. John W, Lynn W, Gerald H, and Juliette T Stressful Life Events and Somatic Complaints in Adolescents 1985;75;1
27. Lynn S. Walker, 1,3 Judy Garber, 2 and John W. Greene Somatization Symptoms in Pediatric Abdominal Pain Patients: Relation to Chronicity of Abdominal Pain and Parent Somatization 1991 0091-0627/91/0800-0379\$06.50
28. Jeffrey L. Koning & John H. Naheedy & Peter G. Kruk Diagnostic performance of contrast-enhanced MR for acute appendicitis and alternative causes of abdominal pain in children 2014 10.1007/s00247-014-2952-x.
29. Laura C, Donald L, Marc T, Erin M, Brooke S, Crystal M, Abdominal Migraine: An Under-Diagnosed Cause of Recurrent Abdominal Pain in Childrenhead 2011 10.1111/j.1526-4610.2011.01855.x.