



Final Diagnoses of Acute Abdominal Pain in Children Presenting to a Pediatric Emergency Department in Tehran, Iran: A Single-Center Cross-Sectional Study

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Abstract

Background: Acute abdominal pain is among the most common reasons for visits to a pediatric emergency department. A major diagnostic challenge is distinguishing abdominal pain that requires surgical intervention from conditions that can be managed medically.

Objectives: This study aimed to evaluate the final diagnoses of children presenting with acute abdominal pain at the emergency department of Mofid Children's Hospital in Tehran, Iran.

Methods: This retrospective cross-sectional study included 200 children with acute abdominal pain who presented to Mofid Children's Hospital, Tehran, Iran, between January and March 2021. Data were extracted from medical records under a waiver of informed consent approved by the institutional ethics committee. Patients were categorized into medical and surgical treatment groups. Demographic, clinical, and diagnostic variables were compared using SPSS version 27, and $P < 0.05$ was considered statistically significant.

Results: Of 200 children, 40 (20.0%) underwent surgery, whereas 160 (80.0%) received medical treatment only. The overall mean age was 6.99 ± 2.64 years, and 41.0% of the participants were male; no significant differences in age or sex were observed between the groups. The most common final diagnosis was gastroenteritis (50.5%), followed by appendicitis (13.5%) and constipation (8.0%). Among surgically managed cases, appendicitis accounted for 67.5%, whereas gastroenteritis was the most common diagnosis in the medical group (63.1%).

Conclusions: Most cases of pediatric acute abdominal pain in this study were managed medically; however, a substantial proportion required timely surgical evaluation. Accurate history taking, a thorough physical examination, and appropriate diagnostic investigations remain essential for determining the optimal management pathway.

Keywords: Abdominal Pain, Acute Abdomen, Children, Pediatrics

1. Background

Acute abdominal pain is a common clinical presentation associated with a wide range of medical

disorders, accounting for nearly 8% of emergency department referrals (1). The underlying causes range from self-limiting disorders, such as gastroenteritis, constipation, and urinary tract infections, to potentially

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life-threatening conditions, including appendicitis, incarcerated inguinal hernia, intestinal obstruction, testicular torsion, and intussusception, which may require urgent intervention or surgical management (2-5).

The differential diagnosis also varies across age groups: infantile colic is more common in children younger than 2 years, gastroenteritis is frequently observed in those aged 2 - 12 years, and appendicitis is more often seen in children older than 12 years (6). In addition, certain etiologies are sex-specific; for example, in girls, gynecologic causes such as ovarian torsion, cyst rupture, or ectopic pregnancy should be considered (7).

Several systemic conditions, including lower lobe pneumonia, tonsillitis, otitis media, hematologic disorders such as acute leukemia, and diabetic ketoacidosis, may present with acute abdominal pain in children and mimic surgical emergencies (8, 9). Inflammatory conditions, including Kawasaki disease and multisystem inflammatory syndrome in children (MIS-C), as well as infectious conditions such as COVID-19, may also manifest with gastrointestinal symptoms and lead to unnecessary surgical interventions (10-13). Therefore, clinicians should consider extra-abdominal causes when evaluating children with acute abdominal pain, particularly in the presence of systemic signs or nonspecific findings (14).

Abdominal pain can be classified as visceral, somatoparietal, or referred, with visceral pain being the most common type in children. Visceral pain receptors are located in the serosa, mesentery, intestinal muscles, and mucosa of hollow organs and are activated by factors such as stretching, tension, or ischemia. This type of pain is typically dull, poorly localized, and felt in the midline (15, 16). Three main pain regions also have anatomical associations: epigastric pain is linked to foregut structures (eg, the lower esophagus and stomach), periumbilical pain is linked to midgut organs (eg, the small intestine), and lower abdominal pain is linked to hindgut structures (eg, the colon) (17).

Management of acute abdominal pain ranges from conservative medical therapy, including analgesia, hydration, and targeted treatment of underlying causes, to urgent surgical intervention. Accurate and prompt identification of the underlying etiology is therefore critical for selecting the appropriate management approach. This requires clinicians to obtain and document a complete history, perform a thorough physical examination, and request appropriate laboratory or imaging investigations as needed (18, 19).

Despite extensive international research on pediatric acute abdominal pain, regional Iranian data remain limited and are largely derived from small, single-diagnosis case series. To date, no study has specifically

quantified, using a structured comparative design, the proportion of children ultimately requiring surgical versus medical management, together with their clinical and demographic features.

2. Objectives

This study aimed to provide updated regional data on etiologic patterns and to compare surgical and medical cases in a pediatric emergency department. We hypothesized that most children presenting with acute abdominal pain in our setting would be managed medically, with a smaller proportion requiring surgical intervention.

3. Methods

3.1. Study Design

This retrospective cross-sectional study included children presenting with acute abdominal pain to the emergency department at Mofid Children's Hospital in Tehran, Iran, between January and March 2021. Acute abdominal pain was defined as abdominal pain lasting less than 7 days and requiring emergency department evaluation.

The inclusion criteria were age younger than 18 years and the presence of acute abdominal pain. Because this was a retrospective, record-based study, individual parental consent was not required, and data were extracted from medical records under a waiver of informed consent approved by the institutional ethics committee. The exclusion criteria were incomplete medical records and a documented history of chronic abdominal pain.

Because this was a retrospective study, no formal sample size calculation was performed. During the 3-month study period, 211 children presented to the emergency department with a chief complaint of acute abdominal pain; 11 were excluded because of incomplete records ($n = 6$) or chronic abdominal pain ($n = 5$), leaving 200 children who met the inclusion criteria and were enrolled in the study.

3.2. Patient Classification

Patients were categorized according to the treatment ultimately received during hospitalization. Children who underwent abdominal surgery were classified as the surgical group, whereas those managed without surgery were assigned to the medical group.

The decision to proceed with surgery was made by the attending pediatric surgeon based on clinical findings (eg, localized peritoneal signs, rebound tenderness, and

guarding), laboratory markers (leukocytosis and elevated C-reactive protein), and imaging findings (abdominal ultrasonography or, when indicated, computed tomography) suggestive of a surgical abdomen. Children without such findings were managed conservatively with observation, hydration, and symptomatic treatment.

3.3. Data Collection

A structured checklist was used to collect demographic information, clinical presentation, laboratory and imaging findings, surgical consultation status, treatment type (medical vs surgical), and final diagnoses. After data collection, all information was entered into SPSS version 27 for statistical analysis.

3.4. Statistical Analysis

Quantitative variables were assessed for normality using the Kolmogorov-Smirnov test. Normally distributed variables were compared between the surgical and medical treatment groups using the independent-samples t-test, whereas nonnormally distributed variables were analyzed using the Mann-Whitney U test. Categorical variables were compared using the chi-square test or Fisher exact test, as appropriate. $P < 0.05$ was considered statistically significant.

This study was designed as a descriptive comparison of surgical and medical cases rather than as a prognostic or predictive analysis. Given the relatively small number of surgical outcomes ($n = 40$) compared with the number of candidate predictor variables, multivariable analysis was not performed because the resulting events-per-variable ratio would have been low and would have carried a substantial risk of overfitting. The retrospective nature of the data also introduced variable missingness that would have further compromised a multivariable model. Univariate comparisons were therefore used to describe, rather than independently predict, factors associated with surgical management.

4. Results

A total of 200 children with acute abdominal pain were enrolled. Of these, 40 (20.0%) underwent surgery, whereas 160 (80.0%) received medical treatment only.

Overall, 41.0% of participants were male. Males accounted for 55.0% of the surgical group and 37.5% of the medical group; however, the difference in sex distribution between the 2 groups was not statistically significant ($P = 0.068$). The overall mean age was 6.99 ± 2.64 years (range, 2–14 years). Children who underwent surgery had a slightly higher mean age than those who received medical

treatment (7.43 ± 3.27 vs 6.88 ± 2.48 years; $P = 0.494$) (Table 1).

Among all participants, 16 children (8.0%) had underlying medical conditions, including labial adhesion in 5 patients (2.5%), diabetes mellitus in 5 (2.5%), neurodevelopmental delay in 3 (1.5%), and neurogenic bladder dysfunction in 3 (1.5%). All children with underlying medical conditions received medical treatment.

Overall, gastroenteritis was the most common final diagnosis (50.5%), followed by appendicitis (13.5%), constipation (8.0%), mesenteric lymphadenitis (5.5%), incarcerated hernia (4.0%), and infectious diseases (4.0%). Less frequent diagnoses included urinary tract infection (UTI) (3.0%), urinary obstruction (3.0%), poorly controlled diabetes mellitus (3.0%), and trauma (3.0%).

Regarding treatment categories, the most common diagnosis in the surgical group was appendicitis (67.5%), followed by incarcerated hernia (20.0%). In contrast, gastroenteritis was the most frequent diagnosis in the medical group (63.1%), followed by constipation (10.0%) and mesenteric lymphadenitis (6.9%) (Table 2).

5. Discussion

In this study, most children presenting with acute abdominal pain were managed medically, whereas 20% required surgical intervention. This pattern is consistent with previous literature, including reports by Hijaz et al. and Erkan et al., indicating that most pediatric abdominal pain cases are self-limited, with only 15%–20% ultimately requiring surgery (20, 21).

The mean age of participants was consistent with previous reports, supporting the observation that acute abdominal pain is more common among school-aged children (22, 23). The study population was predominantly female, with females representing 59.0% of participants. This finding is consistent with the study by Almalki et al. (4). However, our results differ from those of Baştuğ et al., who reported a male predominance, possibly because of differences in the prevalence of appendicitis in those cohorts (24). Appendicitis is known to be more common in boys, potentially because of hormonal, anatomical, and immunologic factors affecting lymphoid hyperplasia and appendiceal lumen obstruction (25). Neither age nor sex differed significantly between the surgical and medical groups; however, these univariate comparisons cannot exclude an association after adjustment for other clinical variables.

Eight percent of the patients had underlying medical conditions, most commonly labial adhesion, diabetes mellitus, and neurodevelopmental delay, and none

Table 1. Demographic Characteristics of Patients by Type of Treatment ^a

Characteristics	Surgery, n = 40	Medical, n = 160	Total, n = 200	P Value
Male	22 (55.0)	60 (37.5)	82 (41.0)	0.068
Age, y	7.43 ± 3.27	6.88 ± 2.48	6.99 ± 2.64	0.494

^a Values are expressed as No. (%) or mean ± SD.

Table 2. Distribution of Final Diagnoses by Type of Treatment ^a

Final Diagnosis	Surgery, n = 40	Medical, n = 160	Total, n = 200
Appendicitis	27 (67.5)	0 (0.0)	27 (13.5)
Incarcerated hernia	8 (20.0)	0 (0.0)	8 (4.0)
Trauma	0 (0.0)	6 (3.8)	6 (3.0)
Inguinal hernia	5 (12.5)	0 (0.0)	5 (2.5)
Gastroenteritis	0 (0.0)	101 (63.1)	101 (50.5)
Constipation	0 (0.0)	16 (10.0)	16 (8.0)
Mesenteric lymphadenitis	0 (0.0)	11 (6.9)	11 (5.5)
Infectious diseases	0 (0.0)	8 (5.0)	8 (4.0)
Urinary tract infection	0 (0.0)	6 (3.7)	6 (3.0)
Urinary obstruction	0 (0.0)	6 (3.7)	6 (3.0)
Poorly controlled diabetes mellitus	0 (0.0)	6 (3.7)	6 (3.0)

^a Values are expressed as No. (%).

required surgical intervention. Similarly, previous studies have shown that such comorbidities may complicate the clinical presentation but do not independently increase the likelihood of requiring surgery (4, 26). The exclusive medical management of children with comorbidities in our study likely reflects both the nonsurgical nature of these conditions and greater clinical caution favoring observation in medically complex children. However, because comorbidities were unevenly distributed between the groups, this imbalance represents a potential source of confounding.

Gastroenteritis (50.5%), appendicitis (13.5%), constipation (8.0%), and mesenteric lymphadenitis (5.5%) were the leading diagnoses overall, consistent with Ghani et al. and Blok et al., who also identified gastroenteritis as the main cause of pediatric acute abdominal pain (27, 28). Among surgical cases, appendicitis (67.5%) and incarcerated hernia (20.0%) predominated, consistent with previous studies reporting appendicitis as the dominant surgical cause of acute abdomen in children (16, 29). Variations across studies may reflect differences in population characteristics, dietary patterns, and health care system structures. The regional health care context should therefore be considered when comparing epidemiologic trends (30).

Strengths of this study include the sample size and the comparison of surgical and medical cases, providing a comprehensive overview of the final diagnostic spectrum of acute abdominal pain in children. To our knowledge, this study is one of the few recent reports from Iran evaluating the distribution of final diagnoses among pediatric patients presenting with acute abdominal pain.

The study has several limitations. First, the single tertiary-center setting may limit the generalizability of the findings to other settings. Second, the relatively short 3-month study period may not capture seasonal variation. Third, because the study period coincided with the COVID-19 pandemic, presentation patterns, health care-seeking behavior, and the proportion of surgical versus medical cases may have been influenced by pandemic-related changes. Fourth, the retrospective design may be subject to information bias due to incomplete records. Fifth, all children with underlying medical conditions were managed medically, resulting in an imbalance in baseline characteristics between groups that may have introduced selection bias. In addition, as noted above, the limited number of surgical events precluded multivariable and subgroup analyses. Future multicenter prospective studies with adequate power for multivariable modeling are recommended.

5.1. Clinical Implications

Based on our findings, we propose the following stepwise approach to pediatric acute abdominal pain: 1) focused history and physical examination for peritoneal signs; 2) baseline laboratory tests, including complete blood count, C-reactive protein, and urinalysis; 3) ultrasonography for atypical or laboratory-positive cases; and 4) early surgical consultation when appendicitis, incarcerated hernia, or intestinal obstruction is suspected. Because gastroenteritis was by far the most common diagnosis in our study, clinicians should nevertheless maintain a high index of suspicion for atypical or evolving appendicitis in children with an initially benign-appearing presentation, particularly when symptoms persist or worsen over time.

5.2. Conclusions

Most cases of pediatric acute abdominal pain in this study, most commonly gastroenteritis, were managed medically, whereas approximately 1 in 5 children, most often because of appendicitis, required timely surgical evaluation. Because gastroenteritis and early appendicitis can present with overlapping features, careful attention to localized peritoneal signs, inflammatory markers, and imaging findings remains essential to distinguish between them and guide appropriate management decisions.

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Footnotes

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Data Availability: The data set presented in the study is available on request from the corresponding author during submission or after its publication.

Ethical Approval: This study was reviewed and approved by the Ethics Committee of the Research Institute for Children's Health at Shahid Beheshti University of Medical Sciences, Tehran, Iran (IR.SBMU.RICH.REC.1400.012). The study was conducted in accordance with the ethical principles of the Declaration of Helsinki.

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Informed Consent: Given the retrospective design of the study and the use of previously collected clinical data, the requirement for informed consent was waived by the Ethics Committee of Shahid Beheshti University of Medical Sciences.

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