Epidemiology and Health System Journal
doi:10.34172/ehsj.2023.06 2023 Spring;10(2):89-94 http://ehsj.skums.ac.ir

Original Article

Epidemiological, Clinical, and Diagnostic Aspects of Chronic Abdominal Pain in Children: A Study in Shahrekord, Iran

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Received: November 2, 2022
Accepted: January 23, 2023
ePublished: March 28, 2023

Abstract

Background and aims: Due to the multi-factoriality of chronic abdominal pain (CAP) in children, this study aimed to assess the main etiologies for CAP in children and its main determinants in a sample of the community of affected children living in Shahrekord, Iran.

Methods: This cross-sectional study was conducted on 400 children aged 3-14 years who were referred to a referral clinic in Shahrekord, Iran in 2022. Abdominal pain at least 3 times in 3 months, which disrupted daily activities, was the criterion for entering the study. A checklist was prospectively fulfilled by interviewing to assess different aimed data.

Results: The majority of children complained of periumbilical pain as the main site of chronic pain, and other pain points were much less common. The main characteristics that provided grounds for suspecting this type of pain included right abdominal pain without clear justification, growth disorder, and severe vomiting. The most common definitive diagnosis was functional constipation, followed by chronic gastritis and fecal impaction.

Conclusion: The occurrence of periumbilical pain, along with the occurrence of severe and frequent vomiting and growth failure can be considered diagnostic markers triad when suspecting the occurrence of CAP. The most common etiologies for such pains included functional constipation, chronic gastritis, and fecal impaction.

Keywords: Abdominal pain, Children, Epidemiology, Diagnosis

Introduction

Chronic abdominal pain (CAP) in children represents a wide variety of heterogeneous functional and organic disorders in the gastrointestinal tract. The overall prevalence of this complaint ranged from 0.5% to 40% based on children's age, their source, and the definition considered for pain.[1,2] In epidemiological aspects, the age peaks of CAP include 4-6 and 7-12 years, respectively.[3,4] Some are on the predominance of the prevalence of pain in girls, although this is still a challenge.[5] Various etiologies have been proposed for the occurrence of CAP in children, some of which have been confirmed and some of which are hypothesized. As an important and occasionally questionable etiology, a history of sexual, physical, and even emotional abuse has been proposed for CAP in children, thus, in a case-control study, considerably higher functional gastrointestinal disorders leading to CAP were reported in those children who were subjected to sexual harassment and abuse.[6,7] As another reason for CAP, the likelihood of this pain was significantly higher in those children with anxious parents, especially within the first six years of life.[8] However, in many cases, there is no specific cause for the occurrence of these pains. From a pathophysiological point of view, activating inflammatory cascades, gastrointestinal motility disturbances, hormonal imbalance, visceral sensation, and poor socioeconomic and even psychological factors (especially stressful lifestyle) are now suggested as the main determinants for childhood CAP.[9-11] Regarding its diagnosis, there are no confirmed and comprehensive criteria to diagnose the cause of this pain or distinguish organic from functional subtypes. However, the occurrence of some accompanying clinical manifestations is raised as an alarm to pay attention to the occurrence of these pains, which are mainly involuntary weight loss, gastrointestinal blood loss, repeated vomiting, severe diarrhea, persistent right upper or right lower quadrant pain, headache, anorexia, deceleration of linear growth, or arthralgia.[12] Additionally, a history of inflammatory bowel diseases and a stressful pattern in life, along with the aforementioned findings, can emphasize the importance of such pains in children. Further, regarding the use of imaging methods or laboratory tests in differentiating functional from organic pain, none of these tests have acceptable sensitivity or specificity to diagnose this condition. Regarding the prognosis of this type of pain, fortunately, the majority of

the cases of such pain in children have been controllable at the level of primary care and counseling, and the need to refer the patient to the level of secondary care has been felt only in 2% of cases.[1] Some studies have also evaluated the prognostic factors for the continuation of abdominal pain in children among which, the unbalanced psychological state in the family and the previous history of irritable bowel syndrome in the patient and her family have been highlighted.[13,14] Due to the multifactorial of CAP in children, it seems that the epidemiology, and clinical and even prognostic aspects of these pains are completely different in societies. Therefore, a precise understanding of these aspects is necessary for every society for its proper management. Herein, the current study sought to assess the main etiologies for CAP in children and its main determinants in a sample of the community of affected children living in the west of Iran.

Materials and Methods

Study Population

This study was performed on children aged 3-14 years who were referred to a referral clinic in Shahrekord, Iran from 21 Apr to 25 December. Abdominal pain at least 3 times in a 3-month period, which caused disruption in daily activities,[15] was the criterion for inclusion in the study.

Type of the study

This study had a cross-sectional design.

Sampling Method and Sample Size

Sampling was performed by a convenience method, and the sample size was considered to be 384 children based on the following formula:

$n = Z^2pq/d^2$

$z = 1.96, \alpha = 0.1, p = 0.5, q = 0.5, d = 0.05$

Considering the dropout, 400 people were included in the study.

Used Tools and Data Collection Method

First, a checklist, including age, gender, duration of abdominal pain, area of pain, and symptoms, was completed, and then necessary examinations were performed by a pediatric gastroenterology specialist. If the child had the ability and literacy to read and write, the checklist was filled by the child under the supervision of the doctor; otherwise, the doctor or the student completed the checklist with the cooperation of the child's parents.

The disease was diagnosed based on multi-step measures. First, the history of the current illness was taken from the parents and the child by the researcher. This history included the location of pain, duration of pain, time of day and night when the pain starts, vomiting, fever, dysphagia, chronic or nocturnal diarrhea, gastrointestinal bleeding, weight loss, and family history of gastrointestinal diseases (e.g., inflammatory bowel disease, celiac disease, or peptic ulcer)[16] that were recorded in the checklist. Next, a physical examination was scheduled, including height and weight measurement, growth chart examination, abdominal examination for guarding, organomegaly, or mass, as well as perineal and rectal examination, examination for arthritis and puberty stage, oral mucosal lesions, and skin rash. Then, complete laboratory tests were performed, including cell blood count and blood biochemistry, urine and stool analyses, assessment of serum amylase and lipase, liver enzymes, and total serum immunoglobulin A (IgA) and IgA tissue transglutaminase levels. The last diagnostic procedure, if necessary, included imaging modalities such as abdominal and pelvic ultrasound, simple abdominal X-ray, computerized tomography scan, endoscopy, and colonoscopy. Finally, the clinical, laboratory, and imaging findings of the patients were analyzed to achieve the final diagnosis.

Analysis Method

For statistical analysis, means ± standard deviations (SD) were used for quantitative variables. One-way analysis of variance with Tukey's post hoc test and Fisher's exact test were employed for data analysis. *P* values less than 0.05 ($P \leq 0.05$) were considered statistically significant, and SPSS (version 23.0) was applied for statistical analysis.

Results

In total, 400 children with CAP were included in the study. The average age of children and the mean duration of abdominal pain were reported to be 7.20 ± 3.33 years and 8.10 ± 8.87 months, respectively. Overall, 59% of participants were females. The most common site of pain was periumbilical (70.75%), followed by left upper quadrant (17.0%), periumbilical plus sub umbilical (5.5%), periumbilical plus epigastric (5.75%), and right upper quadrant (0.5%), and the pain was generalized in only 0.5% of patients. With respect to underlying risk profiles (Figure 1), the most common risk factors were persistent pain in the right upper or lower abdominal quadrants (69.8%), deceleration of linear growth (27.7%), and severe vomiting (10.7%). Based on data in Figure 2, the most common diagnosis proposed for the children included functional constipation (85.3%), followed by chronic gastritis (9.7%) and fecal impaction (1.8%), while the most common definitive diagnoses were functional constipation (59.3%), chronic gastritis (13.5%), and fecal impaction (10.0%), respectively (Figure 3). The comparison of final diagnosis between boys and girls (Table 1) showed no significant difference; however, age had a significant effect on the type of the final diagnosis of the disease in such a way that children with chronic gastritis and those with biliary stones had the highest and the lowest mean ages, respectively ($P < 0.001$, Table 2). In this regard, no difference was also found in the mean duration of pain across different final diagnoses (Table 3). Moreover, a significant association was observed between the type of the final diagnosis and the presence of risk profiles so that no risk symptoms were observed in 78.5% of patients who had functional constipation, while 85.2% of patients with

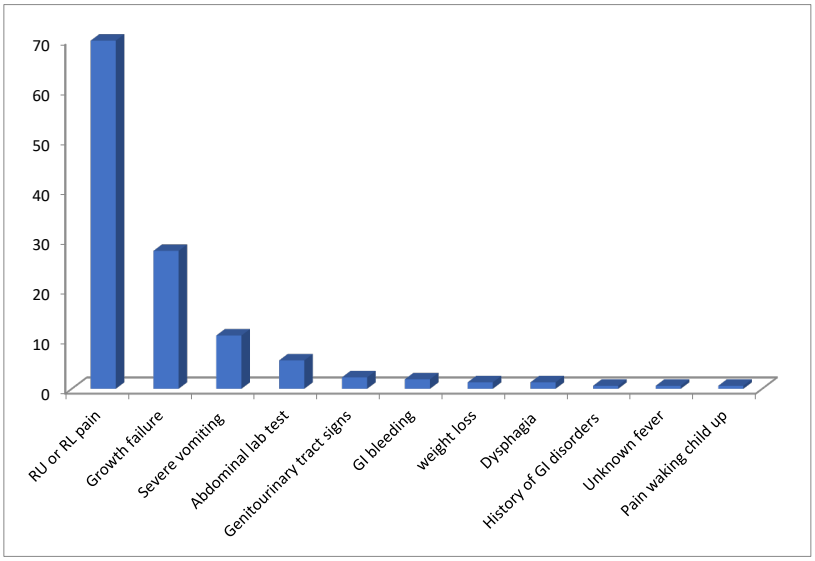

Figure 1. The Main Underlying Risk Profiles in Children Undergoing Chronic Abdominal Pain. *Note*. RU, right upper; RL, right lower; GI, gastrointestinal

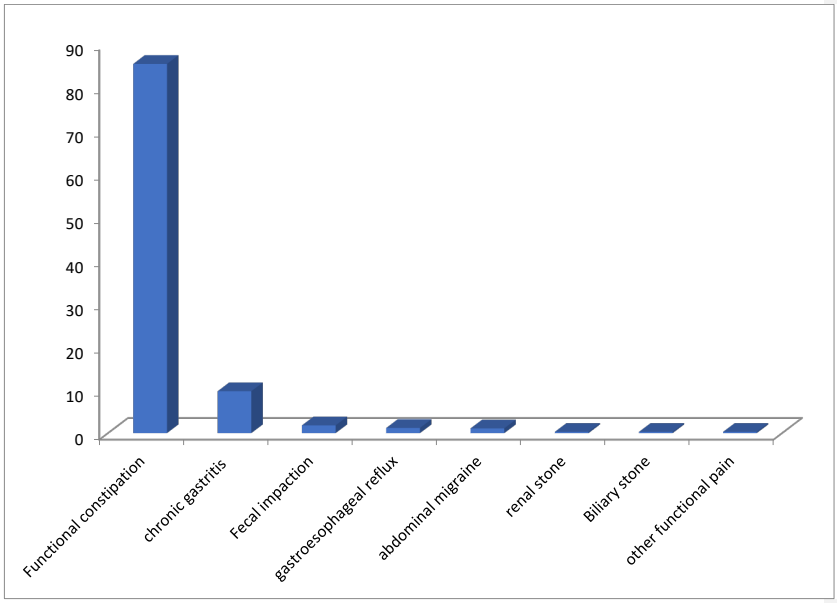

Figure 2. Probable Diagnoses in Children Undergoing Chronic Abdominal Pain

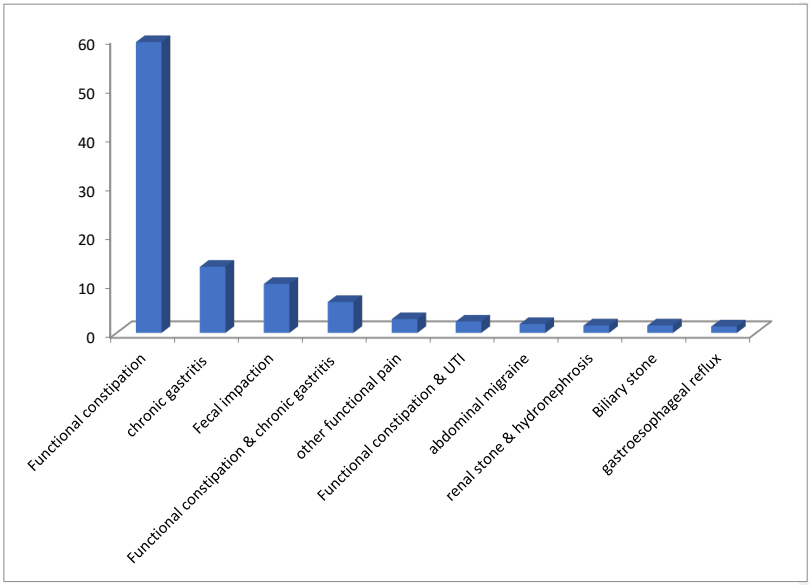

Figure 3. Final Diagnoses in Children Undergoing Chronic Abdominal Pain. *Note*. UTI: Urinary tract infection

chronic gastritis mentioned high levels of underlying risk factors ($P<0.001$, Table 4). Table 5 summarizes data on the relationship between the final diagnosis of the cause of abdominal pain and the location of the pain in the studied samples. The most common cause in children with pain in the upper left quadrant was chronic gastritis. In addition, fecal impaction and functional constipation were the most prevalent causes in children with periumbilical and subumbilical pain. In children with periumbilical pain, the mentioned cause was functional constipation. Finally, the corresponding causes were chronic gastritis and functional constipation in children with periumbilical and epigastric pain.

Table 1. Comparing Final Diagnosis in Both Genders

Diagnosis	Girls	Boys	*P* Value*
Functional constipation	140 (59.3)	97 (59.1)	0.503
Chronic gastritis	34 (14.4)	20 (12.2)	
Functional constipation and chronic gastritis	11 (4.7)	14 (8.5)	
Renal stone and hydronephrosis	4 (1.7)	2 (1.2)	
Gastroesophageal reflux disease	3 (1.3)	2 (1.2)	
Fecal impaction	23 (9.7)	17 (10.4)	
Biliary stone	2 (0.8)	4 (2.4)	
Other functional pains	6 (2.5)	5 (3.0)	
Abdominal migraine	5 (2.1)	2 (1.2)	
Functional constipation and urinary tract infection	8 (3.4)	1 (0.6)	

*Fisher's exact test.

Table 2. The Mean Age According to the Final Diagnosis

Diagnosis	Mean Age (Year) (Mean ± SD)	*P*-value*
Functional constipation	6.67 ± 3.17	<0.001
Chronic gastritis	8.51 ± 3.40	
Functional constipation and chronic gastritis	8.44 ± 3.72	
Renal stone and hydronephrosis	5.83 ± 1.81	
Gastroesophageal reflux disease	6.80 ± 5.22	
Fecal impaction	8.18 ± 3.46	
Biliary stone	4.58 ± 2.28	
Other functional pains	9.68 ± 2.35	
Abdominal migraine	7.64 ± 1.97	
Functional constipation and urinary tract infection	4.94 ± 2.17	

Note. SD: Standard deviation.
*One-way analysis of variance with Tukey's post hoc test.

Table 3. The Mean Duration of Abdominal Pain According to Final Diagnosis

Diagnosis	Mean Age (Year) (Mean ± SD)	*P* Value*
Functional constipation	8.10 ± 8.96	<0.001
Chronic gastritis	8.96 ± 10.61	
Functional constipation and chronic gastritis	6.60 ± 6.70	
Renal stone and hydronephrosis	4.17 ± 3.40	
Gastroesophageal reflux disease	3.40 ± 0.55	
Fecal impaction	9.36 ± 10.05	
Biliary stone	3.17 ± 1.17	
Other functional pains	11.00 ± 7.21	
Abdominal migraine	9.43 ± 2.76	
Functional constipation and urinary tract infection	5.56 ± 7.00	

Note. SD: Standard deviation.
*One-way analysis of variance.

Discussion

Although the majority of CAP cases in children are benign and do not require invasive treatments, occasionally tracking the cause and pathophysiology of such pains is highly difficult and necessitates multifaceted evaluations.

In the present study, the final diagnosis of the cause of abdominal pain in the studied children included functional constipation (59.3%), chronic gastritis (13.5%), fecal impaction (10%), chronic gastritis and functional constipation (6.3%), and functional abdominal pain not otherwise specified (2.8%). In addition, other causes included functional constipation and urinary tract infection (2.3%), abdominal migraine (1.8%), kidney stones and hydronephrosis (1.5%), gallstones (1.5%), and gastroesophageal reflux (1.3%). The findings indicated a higher prevalence of functional causes, including functional constipation. In the study of Gijsbers et al on children with CAP, 90 of 200 children (45%) had constipation, of which 72 (36%) cases had functional constipation,[17] which is similar to our study results. In a study in the United States, the functional causes of abdominal pain were observed in 95.9% of children, which was caused by functional constipation in 82.2%, and organic causes were observed in 3.3%, which included reflux and infection.[18]

Although several guidelines have been provided by international organizations for the management of these patients,[19] there are still many challenges in determining the final diagnostic and treatment approach for such pains. The cause of such challenges is a multiplicity of causes, underlying risk factors, especially non-physical and non-functional factors, as well as various types of disease, including functional and organic forms. In

Table 4. The Association of Final Diagnosis and Underlying Risk Profiles

Diagnosis	Risk (+)	Risk (-)
Functional constipation	51 (32.1)	186 (77.2)
Chronic gastritis	46 (28.9)	8 (3.3)
Functional constipation and chronic gastritis	15 (9.4)	10 (4.1)
Renal stone and hydronephrosis	3 (1.9)	3 (1.2)
Gastroesophageal reflux disease	3 (1.9)	2 (0.8)
Fecal impaction	22 (13.8)	18 (7.5)
Biliary stone	2 (1.3)	4 (1.7)
Other functional pains	4 (2.5)	7 (2.9)
Abdominal migraine	6 (3.8)	1 (0.4)
Functional constipation and urinary tract infection	7 (4.4)	2 (0.8)

Table 5. The Association of Final Diagnosis and Site of Pain

Diagnosis	Right Upper	Left Upper	Periumbilical and Subumbilical	Periumbilical	Periumbilical and Epigastric	Diffuse
Functional constipation	0 (0.0)	21 (30.9)	7 (31.8)	205 (72.4)	4 (17.4)	0 (0.0)
Chronic gastritis	1 (50.0)	27 (54.4)	2 (4.5)	12 (4.2)	3 (13.0)	0 (0.0)
Functional constipation and chronic gastritis	0 (0.0)	5 (7.4)	0 (0.0)	11 (3.9)	9 (39.1)	0 (0.0)
Renal stone and hydronephrosis	0 (0.0)	0 (0.0)	3 (13.6)	3 (1.1)	0 (0.0)	0 (0.0)
Gastroesophageal reflux disease	0 (0.0)	3 (4.4)	0 (0.0)	2 (0.7)	0 (0.0)	0 (0.0)
Fecal impaction	0 (0.0)	2 (2.9)	3 (6.4)	26 (9.2)	2 (8.7)	2 (100)
Biliary stone	1 (50.0)	0 (0.0)	0 (0.0)	4 (1.4)	1 (4.3)	0 (0.0)
Other functional pains	0 (0.0)	0 (0.0)	1 (4.5)	10 (3.5)	0 (0.0)	0 (0.0)
Abdominal migraine	0 (0.0)	0 (0.0)	0 (0.0)	5 (1.8)	2 (7.8)	0 (0.0)
Functional constipation and urinary tract infection	0 (0.0)	0 (0.0)	2 (9.1)	5 (1.8)	2 (8.7)	0 (0.0)

evaluating various aspects of CAP in the selected children in our study, the majority of obtained points were as follows:

First, the majority of children complained of periumbilical pain as the majority site of chronic pain, and other pain points were much less common. Second, the main characteristics that provided grounds for suspecting this type of pain were right abdominal pain without clear justification, growth disorder, and severe vomiting. Third, the most common definitive diagnosis included functional constipation, followed by chronic gastritis and fecal impaction. In addition, the results demonstrated no association between the final diagnosis of abdominal pain and gender/duration of pain, while patients' age and underlying risk profiles seem to help differentiate the definitive causes of CAP. In other words, paying attention to some background characteristics such as the patient's age and underlying risk factors for her can help in reaching the final diagnosis faster. Of course, this study did not evaluate one of the most important etiological factors, including the history of psychological disorders or stressful life, which is considered a major limitation of the present study.

Various studies have investigated various epidemiological aspects of CAP in children, which, of course, have reported major differences in the statistics presented in this field due to demographic and environmental differences. In a recent study by Martins et al,[20] the first 60% were girls with a mean age of 8.3 years. At referral, the mean duration of symptoms was also 2.8 years. Similar to our study, functional abdominal pain not otherwise specified was totally the most common diagnosis (70.4%). In their study, 32% of patients did not further require specialized follow-ups. In a study by Spee et al,[21] waking up at night with pain, high levels of other somatic complaints, increasing age, and CAP at baseline independently predicted CAP at one year. Gieteling et al[22] also indicated that having a family history of gastrointestinal symptoms predicts the persistence of CAP. In addition, strong evidence was detected for no relationship between the female gender and the duration of CAP, and moderate results that the severity of abdominal pain does not predict the persistence of CAP. It seems that demographic differences, individual characteristics, genetic factors and their interaction with the environment, studied ages, and even diagnostic approaches can all be important causes in the observed differences regarding etiological and risk factors in the occurrence of such a complaint among children. Therefore, to plan the management of this problem in each society, one should focus on the findings of the studies in that society.

Conclusion

In summary, first, the occurrence of periumbilical pain and the occurrence of severe and frequent vomiting, as well as growth failure can be considered a diagnostic technique triad when suspecting the occurrence of CAP. The most common etiologies for such pains were reported to be functional constipation, chronic gastritis, and fecal impaction among Iranian children. It seems that the gender of the patient and underlying risk factors can be highly helpful in distinguishing between the causes of CAP in children and can be effective in modifying the diagnostic and management guidelines for such patients in our society.

Acknowledgments

This article was derived from a research project approved by the Research and Technology Deputy of the Shahrekord University of Medical Sciences (approval No. 3459). Hereby, the researchers gratefully thank the patients who participated in this study.

Authors' Contribution

Conceptualization: Karamali Kasiri.
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Formal analysis: Fatemeh Deris.
Funding acquisition: Karamali Kasiri.
Investigation: Karamali Kasiri and Hassan Talakesh.
Methodology: Fatemeh Deris.
Project administration: Hassan Talakesh.
Resources: Sare Mohamadi.
Software: Fatemeh Deris.
Supervision: Karamali Kasiri.
Validation: Sare Mohamadi.
Visualization: Sare Mohamadi.
Writing–original draft: Karamali Kasiri, Hassan Talakesh.
Writing–review & editing: Karamali Kasiri, Hassan Talakesh, Sare Mohamadi.

Competing Interests

The authors declared there is no conflict of interests.

Ethical Approval

Written consent was obtained from all parents before entering the study. This study protocol was approved by the Ethics Committee of Shahrekord University of Medical Sciences (IR.SKUMS.REC.1399.223).

Funding

This study was financially supported by Shahrekord University of Medical Sciences.

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