

The impact of constipation on pediatric emergency department: a retrospective analysis of the diagnosis and management.

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Abstract. *Background and aim:* Functional constipation (FC) represents 95% of pediatric constipation cases. The aim of this study was to assess the prevalence of Functional Constipation in children admitted to Pediatric Emergency Department (ED) with acute abdominal pain, the demographic factors associated, the use of imaging exams and laboratory tests. *Methods:* A retrospective observational study was conducted on 4100 medical records of children aged 0 to 18 years. *Results:* Among children with abdominal pain, 11.3% of them had a discharge diagnosis of constipation and 45.5% underwent imaging exams. Most of children (93.9%) were discharged with home therapy and 6.5% of patients needed of additional visits. In ED 6.7% of patients underwent enema, 45.2% were discharged with indication to perform it at home. *Conclusions:* FC is a medical condition that could be managed in the outpatient setting, even if we observed a significant percentage of cases in ED. We observed over-utilization of radiologic tests, whereas the diagnosis should be clinical. (www.actabiomedica.it)

Key words: Children; Constipation; Emergency medicine; Health Care; Personalized medicine

Introduction

Constipation is a common problem in pediatric age with prevalence ranging from 0.7% to 29.6% (1,2). Functional constipation (FC) represents 95% of the cases of pediatric constipation and its aetiology, pathophysiology and prognosis are still not fully understood (3). This condition is characterized by symptoms such as abdominal pain, painful defecation, faecal incontinence, hard stools and feeling of incomplete evacuation of stool (4,5). It must be always considered between causes of abdominal pain in differential diagnosis with other surgical pathologies (e.g. acute appendicitis, intestinal invagination, etc.) but also non-surgical pathologies (e.g. acute gastroenteritis, etc.).

FC represents an important health problem for children and their parents and psychological aspects related to this condition should not be underestimated. It may have a great effect on the behavior of children that might affect their cognitive abilities and school performance (6).

Caperell et al. described that constipation was the most common cause of abdominal pain among children presenting to the Pediatric Emergency Department (ED) for care (7). It is often a chronic condition and it is common that parents seek care in ED for its management. Many studies have identified patient characteristics that are associated with frequent pediatric ED visits including chronic disease, minority race, social determinants, age (particularly younger than 1 year) and public insurance (8-10).

MacGeorge et al. stated that children with constipation use more health services than children without constipation. In truth this condition would not require access to the ED, linked to higher costs, but an outpatient visit would be sufficient (11). Radiographs are more likely to be ordered for the diagnosis of constipation in an ED visit (33.3%) compared with an office visit (15.0%), further contributing to the costs (12).

The evidence-based guidelines, published by the North American Society for Pediatric Gastroenterology, Hepatology and Nutrition (NASPGHAN) in 2014, recommends that the diagnosis of FC is based on clinical history and physical examination of the patient, using alarm signs and symptoms and diagnostic clues to identify an underlying disease. The routine use of an abdominal radiograph to diagnose constipation is not recommended and it has no role to diagnose functional constipation (13).

The main objective of this study was to evaluate the impact of constipation on paediatric emergency department analyzing the prevalence of FC in patients with acute abdominal pain in a tertiary care Pediatric ED and to determinate the demographic factors associated, the use of imaging exams and laboratory tests for the diagnosis and the frequency of additional ED revisits for constipation.

Materials and Methods

A retrospective observational study was conducted on patients, 0-18 years, admitted for acute abdominal pain to Pediatric ED of A. Gemelli Hospital, between 1 January 2017 and 31 December 2019. The data were pulled from the electronic hospital's information system used in the ED (Gipse).

We collected and analyzed 4100 electronic medical records of children, recording the following information: age, gender, triage code, time of admission to ED, symptoms, medical history, physical evaluation, laboratory tests, radiological examinations (ultrasound and/or abdominal radiograph), treatments, waiting timing in ED and hospitalizations.

Admission treatments were recorded in particular whether the child was already on PEG therapy or not.

The triage color code was assigned to the patients by the triage nurse basing on the child's general conditions, vital signs and the level of severity of pain. The *FLACC scale* (Face, Legs, Activity, Cry, Consolability scale) was used to assess pain for children between the ages of 2 months and 5 years. The *Wong-Baker Faces Pain Rating Scale* was used for children over the age of 6, based on a series of faces ranging from a happy face at 0 to a crying face at 10. The white color code was assigned to a child with pain inferior to 5 or no pain and normal vital signs, the green code corresponds to a pain equal to 5 to 6 and normal vital signs; the yellow code to a pain rated equal to or greater than 7 with initial alteration of vital signs (tachycardia, fever, etc). The red color corresponds to a severe alteration of vital signs.

The readmissions of patients who had received a previous evaluation were recorded, as well as discharge treatments. The diagnosis of FC was reached according to NASPGHAN guidelines and the Rome III Criteria (Table 1).

This study was approved by the Institutional Review Board and Ethic Committee of our institution.

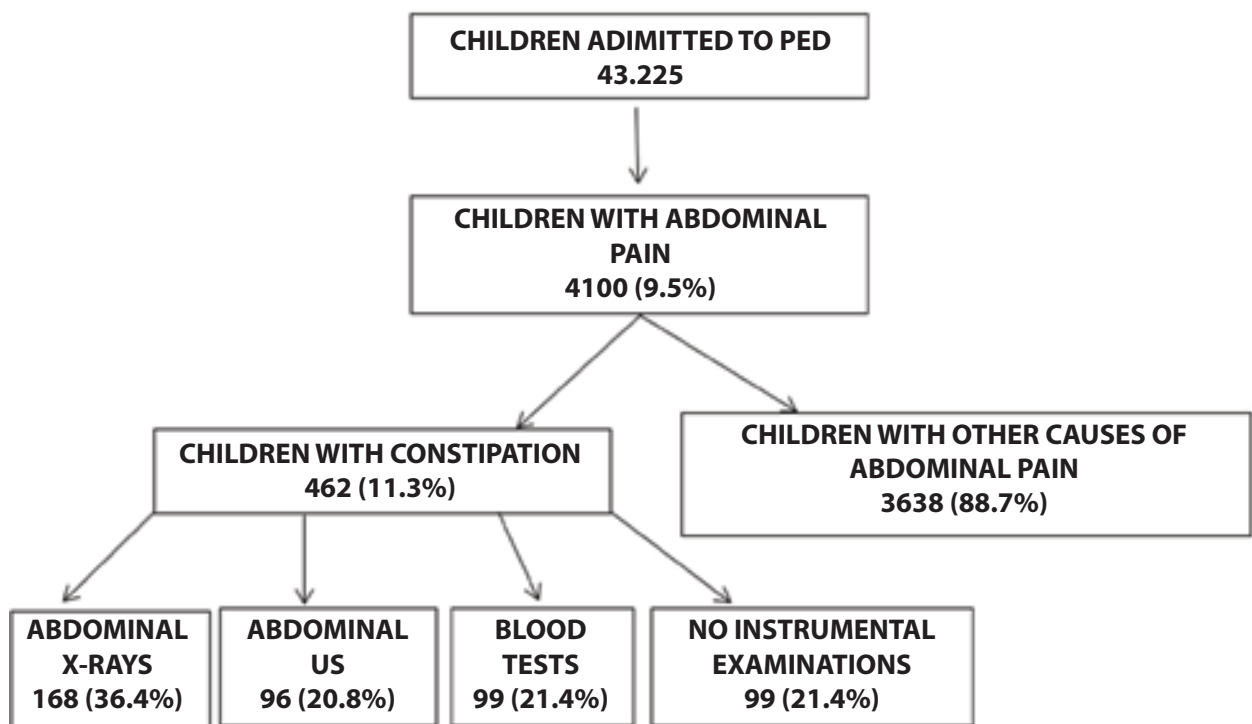
All statistical analysis was performed using Statistical Package for the Social Sciences software (version 25.0). Continuous variables were expressed as median or mean; categorical data were expressed as absolute numbers and percentages. χ^2 and ANOVA tests were used. $P < 0.05$ was considered statistically significant.

Results

During the study period a total of 43.225 children from 0 to 18 years were admitted to Pediatric ED A. Gemelli Hospital. There were 4100 children (9.5%) who presented abdominal pain and 462 (11.3%) of them had a discharge diagnosis of constipation: 214 (46.3%) were female and 248 (53.7%) male. Instead 3638 (88.7%) children were discharged with other abdominal conditions, such as gastroenteritis, appendicitis, mesenteric adenitis, intussusception, etc. The median age of all children with diagnosis of FC was 8 years. Details about accesses to ED for abdominal pain and FC are shown in **Figure 1**. As regards comorbidities, 6 (1.3%) children

Table 1. Rome III diagnostic criteria for functional constipation

Rome III diagnostic criteria for functional constipation*
In the absence of organic pathology, 2 of the following must occur:
For a child with a developmental age <4 years
1. 2 defecations per week
2. At least 1 episode of incontinence per week after the acquisition of toileting skills
3. History of excessive stool retention
4. History of painful or hard bowel movements
5. Presence of a large fecal mass in the rectum
6. History of large-diameter stools that may obstruct the toilet
Accompanying symptoms may include irritability, decreased appetite, and/or early satiety, which may disappear immediately following passage of a large stool
For a child with a developmental age 4 years with insufficient criteria for irritable bowel syndrome:
1. 2 defecations in the toilet per week
2. At least 1 episode of fecal incontinence per week
3. History of retentive posturing or excessive volitional stool retention
4. History of painful or hard bowel movements
5. Presence of a large fecal mass in the rectum
6. History of large-diameter stools that may obstruct the toilet
* from Tabbers et al. Evaluation and Treatment of Functional Constipation in Infants and Children: Evidence-Based Recommendations From ESPGHAN and NASPGHAN (21)

**Figure 1.** The figure shows the flowchart of the study.

were affected by genetic syndromes or congenital defects with neurological outcomes, 8 (1.7%) were affected by neuropsychiatric disorders, 8 (1.7%) were celiac, 2 (0.4%) were lactose intolerant and only one (0.2%) was affected by an early inflammatory bowel disease.

There was 225 (48.7%) of these children with a past clinical history of FC reported by their parents and in particular in 14.7% of these had already been recommended to undertake a specific constipation therapy with polyethylene glycol (PEG).

Most of children with constipation (95.3%) were admitted with green triage code, while 20 (4.3%) were admitted with yellow code and 2 (0.4%) with white code.

Our data showed that the greatest frequency of access was recorded during pediatrician's morning shift (143 admissions, corresponding to 30.9%), in particular between 8:00 AM and 2:00 PM.

All children complain abdominal pain and physical examination was not conclusive. No digital rectal exploration was routinely carried out.

As for imaging studies and blood tests, 210 (45.5%) patients underwent one or more imaging. Abdominal X-rays were performed in 168 (36.4%) patients, abdominal ultrasound in 96 (20.8%) patients and blood tests in 99 (21.4%) and no patient underwent abdominal computed tomography scan. Data on imaging studies and laboratory tests stratified by age are shown in Table 2.

Analyzing data, statistically significant differences regarding the performance or not of imaging and/or blood tests were found between the various age groups. In particular, it emerged that children aged between 7 and 12 were the most subjected to x-rays of the abdomen (37.4%). Similarly, abdominal ultrasound was also performed with greater frequency in the age group between 7 and 12 years, 21.9%, as well as 24.1%

of these children are subjected to blood tests, such as white blood cell count and C reactive protein, in the suspicion of abdominal pain of another cause. No statistically significant difference between male and female was observed, as well as in relation to the admission time in ED (Table 3).

Among children with diagnosis of constipation, 25 (5.4%) were admitted to short-stay observation (SSO), while only 3 (0.6%) of them were admitted to our pediatric surgery department and just one (0.2%) refused observation. Whereas 434 (93,9%) patients were discharged with home therapy. Moreover, 30 (6.5%) patients - 17 (56.7%) females and 13 (43.3%) males - were undergoing to an additional visit during the study period because of the persistence of the symptoms. The diagnosis was confirmed in all of them.

Besides the average time spent at the Pediatric ED by patients discharged with diagnosis of constipation was 3 hours and 37 minutes; in particular, for patients who were admitted to SSO it was 17 hours and 16 minutes, while patients which were not admitted to SSO it was 2 hours and 50 minutes.

As far as the therapy is concerned, 31 (6.7%) patients underwent enema during the observation in ED. Moreover, 36 (7.8%) patients had already performed an enema before coming to ED.

All patients with FC were discharged with dietary advice and toilet training and were prescribed therapy with PEG; 209 (45.2%) children were discharged with indication to perform the enema at home and 298 (64.5%) were discharged with the only therapy with PEG.

Discussion

Our study shows that FC is an important health problem in pediatric age. In our ED, in a period of

Table 2. Imaging exams and laboratory tests performed in Pediatric ED in patients with suspected constipation

Age	Patients undergone X-rays	Patients undergone US	Patients undergone blood tests	P value
0-2 years	8 (30.8%)	6 (23.1%)	4 (15.4%)	0.006
3-6 years	37 (24.2%)	21 (13.7%)	18 (11.8%)	
7-12 anni	70 (37.4%)	41 (21.9%)	45 (24.1%)	
13-18 years	53 (55.2%)	30 (31.3%)	32 (33.3%)	

Table 3. Characteristics of the study population

		N (%)	Patients undergone X-rays/ US**/Blood exams	Patients not undergone exams	P value
AGE	0-2 years	26 (5.6%)	9 (34.6%)	17 (65.4%)	<0.001
	3-6 years	153 (33.1%)	50 (32.7%)	103 (67.3%)	
	7-12 years	187 (40.5%)	90 (48.1%)	97 (51.9%)	
	13-18 years	96 (20.8%)	61 (63.5%)	35 (36.5%)	
GENDER	Male	248 (53.7%)	116 (46.8%)	132 (53.2%)	0.5
	Female	214 (46.3%)	94 (43.9%)	120 (56.1%)	
TIME OF ACCESS	8.00 AM - 2.00 PM	143 (30.9%)	77 (53.8%)	66 (46.2%)	0.06
	2.00 PM - 8.00 PM	137 (29.7%)	62 (45.2%)	75 (54.8%)	
	8.00 PM - 0.00 AM	102 (22.1%)	41 (40.2%)	61 (59.8%)	
	0.00 AM - 8.00 PM	80 (17.3%)	30 (37.5%)	50 (62.5%)	
TRIAGE CODE	Green	440 (95.3%)	194 (44.1%)	246 (55.9%)	-
	Yellow	20 (4.3%)	14 (70.0%)	6 (30.0%)	
	White	2 (0.4%)	2 (100.0%)	0 (0.0%)	
DISCHARGE	Home	434 (93.9%)	182 (41.9%)	252 (58.1%)	-
	Ward	3 (0.7%)	3 (100.0%)	0 (0.0%)	
	SSO*	25 (5.4%)	25 (100.0%)	0 (100.0%)	

* Short Stay Observation

**Ultrasound

3 years, its incidence was 11.3% out of total cases of abdominal pain evaluated. Abdominal pain caused to FC is usually significant, despite 95.3% of these children were admitted to our ED with green triage code; only 4.3% of children were admitted with yellow code and most of them presented other underlying conditions such as neurological disorders, etc. This could be related to the children's good general condition and their normal vital signs at the admission to ED. However the high percentage of green codes assigned to these patients could also be explained by the poor execution of pain scales by the triage nurses. For this reason, courses on the pain in the pediatric age should be periodically given to both doctors and nurses working in ED.

Our data showed that 48.7% of children already had a past clinical history of FC reported by their parents, and many of them had already been prescribed therapy with PEG by their pediatrician. This confirms that FC is a chronic problem in pediatric age, resolution is often not immediate, probably also due to the poor compliance of the child to the therapy. Children

reject fiber in their feeding and have often a retentive attitude due to play; they tend to drink little during the day and also therapy with PEG is often inadequate. The execution of enema is postponed by the parent because it is considered an invasive procedure for the child; this can worsen the picture of constipation, sometimes even leading to severe cases of bowel sub-occlusion.

In the evaluation of these patients, for ED pediatricians, the location of the pain is not a sufficient criterion to guide diagnosis, but the clinical history can help in the clinical decision. Usually children with constipation may appear quiet, withdrawn, embarrassed and angry during medical evaluation compared with children with other chronic gastrointestinal disorders (14,15). Then denial of the symptoms is common in constipated children (16).

Furthermore abdominal pain, associated with infrequent and/or painful defecation and faecal incontinence, causes significant physical and emotional distress and concern for children and their families, interfering with their health-related quality of life

(QOL) and causing an impact on health care cost (17). We didn't assessed the quality of life in children with chronic constipation, but in literature there are different studies on this topic, even if few consider the real physical and psychosocial impact of longstanding constipation in children (18).

In 2008, Clarke et al. performed a survey about the physical and psychosocial QOL in children with long-standing (≥ 2 years) slow transit constipation (STC) vs healthy controls and they showed that Pediatric Quality of Life Inventory (PedsQL) score was significantly lower in the STC group, as well as the parents of these children (19). Further studies will be needed to analyze the psychological aspect of constipation on children and their families.

In our series 45.9% of patients with FC underwent one or more imaging, in particular abdominal X-rays were performed in 36.4 % of them. This percentage is lower than the 70% rate reported by Miller et al (20). Despite this, even in our hospital, the rate of instrumental examinations performed in case of constipation, to exclude other causes, is high. This is attributable to the pediatrician's fear of missing surgical diagnoses and the difficulty of containing parental concern and frustration due to the recurrence of these disabling symptoms.

According the Evidence-Based Recommendations From ESPGHAN and NASPGHAN, the diagnosis of FC is based on history and physical examination; alarm signs and symptoms have to be considered to identify an underlying disease responsible for the constipation (21). Abdominal X-ray is not routinely recommended in the diagnosis of FC considering its low sensitivity and specificity (21,22). If the diagnosis of FC is uncertain and/or in the presence of alarm signs or symptoms, a digital examination of the anorectum is recommended to exclude underlying medical conditions.²¹

With regard to the therapeutic intervention, we found that only 6.7% of children with FC underwent an enema during the observation in the ED. However 45.2 % of this children were discharged with indication to perform the enema at home. We think that the execution of an enema could confirm the diagnosis of constipation, reducing the number of imaging performed. Indeed an enema gives immediate relief from pain to the child, representing an easy and risk-free

diagnostic and therapeutic test. PEG and enemas are equally effective for fecal disimpaction (21). An enema once per day for 3 to 6 days is recommended for children with fecal impaction, if PEG is not available (21).

The vast majority of children diagnosed with constipation were discharged home (93.9%, 434 patients) with specific therapy and only 6.5% of them were undergoing to an additional visit during the study period because of the persistence of the symptoms. This suggests that constipation is rarely life threatening and can be treated as an out-patient, rather than burdening the PED.

In conclusion, our study shows that a small but significant percentage of acute ED visits for abdominal pain are related to functional constipation, a medical condition that could be managed in the outpatient setting. The diagnostic evaluation of children with abdominal pain admitted to ED is varied, even if we also observed over-utilization of radiologic tests in our hospital. We want underline, according with the latest guidelines, that the diagnosis should be clinical, based only on medical history of patients and abdomen X-rays should not be performed routinely to limit the exposition of child to unnecessary radiations.

Considering the persistence and disabling of this medical condition we think that a structured diagnostic and therapeutic approach, with a scheduled follow-up, is necessary and it must be started already at the first evaluation in ED.

Conflict of Interest: Each author declares that he or she has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article.

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