



Functional gastrointestinal disorders in schoolchildren with chronic abdominal pain in a pediatric digestive endoscopy unit

Desórdenes gastrointestinales funcionales en escolares con dolor abdominal crónico en una unidad de endoscopia digestiva pediátrica

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Resumen

Introducción: La indicación de una endoscopia de vías digestivas altas (EVDA) en niños con dolor abdominal crónico (DAC) tiene poca evidencia; sin embargo, se continúa solicitando en niños con desórdenes gastrointestinales funcionales (DGFs). **Objetivo:** Determinar la prevalencia y posibles asociaciones de DGFs en escolares de una Unidad de Endoscopia Digestiva Pediátrica mediante los Criterios de Roma III. **Materiales y métodos:** Estudio de prevalencia en 37 escolares. Fueron consideradas variables sociodemográficas, antropométricas y clínicas. El análisis estadístico incluyó estimación de la proporción de niños con DGFs y su correspondiente IC95%, estimación de porcentajes, promedios, desviaciones estándar y rangos, análisis univariado, posible presencia de asociación entre las variables; prueba exacta de Fisher, a dos colas, con un valor de significancia $p < 0,05$. **Resultados:** La edad media fue de $11,3 \pm 2,1$ años, siendo un 62,2% mujeres, con una prevalencia de DGFs del 73%, presentando más de la mitad de ellos, dolor abdominal funcional (DAF) y síndrome de intestino irritable (SII). No hubo diferencias significativas en cuanto a las variables sociodemográficas, antropométricas y clínicas. **Conclusiones:** En niños a quienes se les realiza una EVDA dentro del estudio de su DAC, la prevalencia de DGFs es alta, siendo los más frecuentes el DAF y el SII.

Palabras clave: Endoscopia; enfermedades gastrointestinales; dolor abdominal; prevalencia; niño. (Fuente: DeCS, Bireme).

Abstract

Introduction: The indication of an upper digestive tract endoscopy (UDTE) in children with chronic abdominal pain (CAP) has little evidence. However, this test continues to be requested in children with functional gastrointestinal disorders (FGIDs). **Objective:** To determine the prevalence and possible associations of FGIDs in children of a Pediatric Digestive Endoscopy Unit using the Rome III Criteria. **Materials and methods:** A prevalence study of 37 schoolchildren. Sociodemographic, anthropometric and clinical variables were assessed. The statistical analysis included estimation of the proportion of children with FGIDs and its corresponding 95% CI. Other assessments included estimation of percentages, averages, standard deviations, ranges, univariate analysis, possible occurrence of associations between the variable, and a two-tailed Fisher's exact test with a significance set at $p < 0.05$. **Results:** The mean age of child participants was 11.3 ± 2.1 years and 62.2% of them were female. The prevalence of FGIDs was 73%, more than half of them presenting functional abdominal pain (FAP) and irritable bowel syndrome (IBS). There were no significant differences in terms of sociodemographic, anthropometric and clinical variables. **Conclusions:** The prevalence of FGIDs is high in children with CAP who undergo UDTE as part of the study of this disorder, being FAP and IBS the most frequent.

Key words: Endoscopy; gastrointestinal diseases; abdominal pain; prevalence; child. (Source: DeCS, Bireme).

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Introduction

According to the American Academy of Pediatrics (AAP) and the North American Society for Pediatric Gastroenterology (NASPGHAN), there is little evidence regarding the recommendation of an upper digestive tract endoscopy (UDTE) in children with chronic abdominal pain (CAP)⁽¹⁾. Despite these concerns, pediatricians continue to refer patients with functional gastrointestinal disorders (FGIDs) to the pediatric gastroenterologist with the expectation of gathering more clinical evidence, particularly endoscopic studies, which usually appear normal and rarely change the proposed initial management^(2,3).

The absence of an organic condition offers peace of mind to both parents and children with FGIDs and is part of the clinical management that is focused on in the "unspecific effect". This process involves the participation of the physician-patient-family triad, which generates assurance in everyone and improves treatment results^(4,5).

Since 2016, the Rome IV criteria for Irritable Bowel Syndrome⁽⁶⁾, similarly to the Rome III criteria⁽⁷⁾, provide a symptom-based guide to identify FGIDs in school children and adolescents that involves: functional disorders (FD) caused by nausea and vomiting (cyclic vomiting syndrome, functional vomiting and nausea, rumination syndrome, and aerophagia), FD due to abdominal pain (functional dyspepsia, irritable bowel syndrome, abdominal migraine, and functional abdominal pain – not otherwise specified), and FD due to defecation (functional constipation and non-retentive fecal incontinence).

The objective of this study is to use the Spanish version of the Rome III criteria to determine the prevalence of FGIDs and their possible associations with UDTE results in school children being treated for CAP.

Materials and methods

This study was carried out between March to October 2016 in a Pediatric Digestive Endoscopy Unit of Cali, Colombia. Parents and/or legal guardians and children older than 8 years of age previously signed an informed consent in order to participate in the study. All children were given the Spanish version of the Pediatric Gastrointestinal Symptoms-Rome III (QPGS-III) Questionnaire to identify FGIDs, which has been validated and used by the FINDERS group (Functional International Digestive Epidemiological Research Survey).

Due to the date when this study was developed, the Rome III Criteria in Spanish was taken into account, which are used to identify FGIDs based on absence of inflammation or an accompanying anatomical, metabolic or neoplastic process. In contrast, the Rome IV Criteria, in some cases, includes the possibility that functional aspects may be concomitantly present with an organic disorder.

Children between 8 to 10 years of age were guided by one of the researchers, whereas those who were older than 10 years of age answered on their own. Sociodemographic (age, gender, only child, divorced/separated parents, and intrafamily FGIDs), anthropometric (weight, height, body mass index, and age-based height), and clinical (endoscopy macroscopic findings in upper digestive tract) variables were included. To assess the possibility of transcription errors, 10% of the digitized data was reviewed and compared to the original paper formats.

According to the Anthroplus software of the World Health Organization, children were classified as eutrophic (between -2 to +1 standard deviation, SD) or malnourished (obesity = > +2 SD; overweight = between +1 to +2 SD; and undernourished = > -2 SD) according to the body mass index. Similarly, they were classified as eutrophic (between -2 to +3 SD) or having an altered height (shorth height = between -2 to -3 SD; severely short height = > -3 SD; and tall height = > +3 SD), based on their height/age.

The macroscopic findings of the upper digestive tract endoscopy were taken from the endoscopist's report and they were classified as esophagitis, gastritis and/or duodenitis based on the observed inflammation.

Statistical analysis

The data were analyzed through two-tailed *student t*, X^2 , and *Fisher's exact* test (*Stata 15 software; StataCorp, College Station, Texas*). In order to assess possible risk factors for FGIDs, univariate and bivariate analyses as well as ORs calculation were carried out for each variable of interest (sociodemographic, family, anthropometric, and macroscopic findings in the upper digestive tract endoscopy) and the effect variable (presence or absence of FGIDs), the value of $p < 0.05$ being considered as statistically significant.

Ethical considerations

This study was approved by the 04-013 Act of 2012 of the Ethics Committee of the Universidad del Valle, Cali, Colombia. According to Resolution 8430 of 1993 of the Colombian Ministry of Health, this work is classified as risk free.

Results

Sociodemographic data

This study included 37 children aged 11.3±2.1 years old (range between 8 to 16 years). 70.3% of the school children were between 8 to 12 years old; 62.2% were female, 27.7% were only children, 62.2% had divorced/separated parents, and 18.9% had family history of FGIDs. 46% of school children suffered malnutrition (8.1% obesity, 24.3% overweight, 8.1% undernourishment, and 5.4% severe undernourishment), whereas 18.9% had altered height (2.7% short height, 8.1% severe short height, and 8.1% tall height).

Endoscopy data

Abnormal macroscopic findings were found in the UDTE of 30 school children (81.1%): 70.3% gastritis, 37.8% esophagitis, and 24.3% duodenitis. Also, combinations of abnormal macroscopic findings were observed as follows: 4 with esophagitis+gastritis+duodenitis; 9 with esophagitis+gastritis; 2 with gastritis+duodenitis; 1 with esophagitis only; 11 with gastritis only; and 3 with duodenitis only.

FGIDs prevalence

UPTE was recommended to the children in the study in order to evaluate their CAP, of which 27 (73%) showed some degree of FGIDs (average age 11±2.1 years and 66.7% were female children). The most affected group was children with abdominal pain associated with FGIDs (70.3%). There were no cases of functional abdominal pain syndrome, non-retentive fecal incontinence, or vomiting/aerophagia group (Table 1).

Table 1. Prevalence of FGIDs based on the Spanish version of the Rome III Criteria for school children who were indicated to have an UDTE for CAP in Cali, Colombia

	n	%
Total	37	100
Without FGIDs	10	27
With FGIDs	27	73
Abdominal pain related to FGIDs	26	70.3
Functional dyspepsia	4	10.8
Irritable bowel syndrome	9	24.3
Abdominal migraine	3	8.2
Functional abdominal pain	10	27
Constipation and incontinence	1	2.7
Functional constipation	1	2.7

Table 2. Association between the presence of FGIDs based on the Rome III Criteria and sociodemographic, anthropometric variables, and macroscopic findings in children with chronic abdominal who were also advised to have an UDTE

Variable	FGID + (n=27)	FGID - (n=10)	OR	95% CI	p value
Age (years)	11 ± 2.1	12.3 ± 1.7	-	-	0.9660
Age range (years)	8 - 16	10 - 15-	-	-	-
Age groups					
Adolescent (13-16 years)	7 (45.9)	4 (40)	1	-	-
School age (8-12 years)	20 (54.1)	6 (60)	1.90	0.29 - 11.03	0.4055
Gender					
Male	9 (33.3)	5 (50)	1	-	-
Female	18 (66.7)	5 (50)	2	0.35 - 11.18	0.3532
Separated / divorced parents					
No	10 (37)	4 (40)	1	-	-
Yes	17 (63)	6 (60)	1.13	0.18 - 6.22	0.8689
Only child					
No	18 (66.7)	8 (80)	1	-	-
Yes	9 (33.3)	2 (20)	2	0.29 - 22.79	0.4307
Familial functional gastrointestinal disorders					
No	21 (77.8)	9 (90)	1	-	-
Yes	6 (22.2)	1 (10)	2.57	0.24 - 131.20	0.3992
Nutritional status according to body mass index					
Eutrophic	20 (54.1)	7 (70)	1	-	-
Malnutrition	17 (45.9)	3 (30)	2.51	0.43 - 17.86	0.2362
Nutritional status according to age-based height					
Eutrophic	21 (77.8)	9 (90)	1	-	-
Altered height	6 (22.2)	1 (10)	2.57	0.24 - 131.20	0.3992
Macroscopic findings in upper digestive tract endoscopy					
Normal	4 (14.8)	3 (30)	1	-	-
Abnormal	23 (85.2)	7 (70)	2.46	0.28 - 18.38	0.2949
Esophagitis	10 (37)	4 (40)	0.88	0.16 - 5.35	0.8689
Gastritis	20 (74.1)	6 (60)	1.90	0.29 - 11.03	0.4055
Duodenitis	6 (22.2)	3 (30)	0.66	0.10 - 5.27	0.6243

FGIDs: Functional gastrointestinal disorders

Possible associations

Within the group of children who were advised to have UDTE to monitor their CAP, a greater possibility to have FGIDs was observed in the subgroup that included school children between 8 to 12 years of age, being female, having separated/divorced parents, being an only child, presenting intrafamilial FGIDs, being malnourished, having altered height, and having abnormal findings in UDTE (mainly gastritis). However, there were no statistically significant differences ($p>0.05$) (Table 2)

Discussion

FGIDs prevalence

Based on the Rome III criteria, the elevated prevalence of some FGIDs in this group of children (73%) is two times higher than that reported in various studies conducted in Spanish-speaking Latin American countries, where the prevalence fluctuates between 14.4% and 28.7%⁽⁸⁻¹⁴⁾. Indeed, according to the actual Roma IV, it's of 21.2%⁽¹⁵⁾, similar to that reported by Rouster *et al.* in a group of North American children attending outpatient pediatric gastroenterology consultations⁽¹⁶⁾. However, it is necessary to highlight that this interpretation takes into account that the majority of these studies have been conducted at the population level, with relatively healthy school children, instead of including those referred to a Pediatric Endoscopy Unit to treat CAP.

Similarly, Thakkar *et al.*⁽¹⁷⁾ studied North American children with CAP being monitored at a Pediatric Endoscopy Unit and reported a high prevalence (93.8%) that presented some FGIDs using the Rome III Criteria. They also reported 40.4% of children with functional dyspepsia, 27.4% with functional abdominal pain syndrome, 14.5% with irritable bowel syndrome, and 11% with abdominal migraine. Instead, we observed that the main FGID was functional abdominal pain (27%), followed closely by irritable bowel syndrome (24.3%).

Gupta *et al.*⁽¹⁸⁾ reported a low prevalence (11%) of some FGIDs in North American children evaluated for CAP. The fact that this study only included 12 children under 18 years of age who were not fully described limits a deeper comparative analysis.

UDTE and CAP

The role of UDTE in the study of children with CAP has always been questioned. Despite the fact that the guidelines from AAP, NASPGHAN, and some authors such as Di Lorenzo⁽¹⁹⁾ state that most children with CAP have some FGIDs and do not require any test to achieve this diagnosis, UDTE continues to be the main

recommendation for children with CAP⁽²⁰⁾. In addition, the Rome Criteria used to identify various FGIDs do not advise UDTE for their diagnosis⁽⁷⁾. The diagnostic accuracy of UDTE in children with abdominal pain fluctuates between 4.0%⁽²¹⁾ and 36-38%^(16,22,23).

The macroscopic analysis included in this research revealed that 85.2% of the patients had esophagitis, gastritis and/or duodenitis, which is similar to the results reported by Gómez *et al.*⁽²³⁾ who analyzed 113 cases of children between 5 to 18 years of age (61% girls), of whom 36% had abdominal pain. Using macroscopic approaches, they found gastritis in 70% of the patients, esophagitis in 9.7%, duodenitis in 6.2%, and normal result in 11.5% of the cases.

UDTE is recommended in children with abdominal pain, who, according to the Rome IV Criteria, have persistent pain in the upper or lower right quadrant, odynophagia, dysphagia, arthritis, persistent vomiting, perirectal disease, digestive bleeding, involuntary weight loss, nocturnal diarrhea, deceleration in the growth curve, family history of inflammatory bowel, celiac or peptic ulcer disease, delayed puberty, and unexplained fever⁽⁶⁾.

Wang *et al.*⁽²⁴⁾ studied children that underwent endoscopic procedures. Despite not having the histopathological report and having only the macroscopic report of the UDTE, they reported macro- and microscopic normality in 49% of patients, 35% of children with histological abnormality, and a higher prevalence of macroscopic abnormalities (44%) compared to microscopic ones (28%), which could give relevance to the macroscopic analysis used in our study.

Abdominal pain

Saps *et al.*⁽²⁵⁾ reported a 38% prevalence of abdominal pain in 237 healthy school children, of whom 2% sought medical care. Based on these findings, it is important to clarify the physiopathology of abdominal pain in the various FGIDs, which affects the decision process of health professionals to carry out studies such as UDTE in children, given that there is evidence linking psychological distress to chronic abdominal pain in children and adolescents⁽²⁶⁻²⁸⁾. Chronic abdominal pain is related to stressful events in life, including divorce, hospitalization, bullying, and child abuse⁽²⁹⁻³¹⁾.

Given that IBS is considered a disorder of the brain-intestine axis, it is thought that visceral hypersensitivity may be related to child psychological distress (e.g., anxiety, depression, impulsivity, anger)⁽³²⁾, and that early harmful events (e.g., surgery) are associated with an increased risk to develop IBS⁽³³⁾.

Multiple mechanisms responsible for the symptoms of functional dyspepsia, from a pathophysiological point of view, have been proposed, including physiological, structural, genetic, environmental and psychological factors. The three motor and functional mechanisms are: hypersensitivity, accommodation alteration and motility, the latter implying a slow gastric emptying^(34,35). Visceral hypersensitivity is defined as a greater perception of visceral sensation, e.g., when the duodenum has an increased sensitivity to duodenal acid and/or duodenal lipids⁽³⁵⁾.

Gastric accommodation, i.e., the capacity of the stomach to distend during a meal resulting in augmented gastric volume without generating an increase in gastric pressure⁽³⁵⁾, can be affected by anomalies of the vague reflex, an intrinsic inhibitory innervation by the myenteric plexus, or by a dysfunction of the smooth muscle of the proximal stomach. This may also trigger symptoms of early satiety or pain caused by increased intragastric pressure after a regular meal intake.

In the case of Functional Constipation, an increase in fecal accumulation in the rectum causes a motility decrease in the anterior intestine, resulting in anorexia, abdominal distension, and pain⁽⁶⁾.

Conclusions

FGIDs have a high prevalence among children who undergo UDTE as part of treatment of their CAP, the most frequent being functional abdominal pain and irritable bowel syndrome.

Recommendations

Future prospective studies with a probabilistic and multicenter sampling are required to correlate the macroscopic endoscopic findings with the histological ones in patients taken to EVDA with a diagnostic recommendation. It is necessary to estimate the frequency with which FGIDs diagnosed with the current Rome IV criteria coexist with other pathologies that, in turn, cause gastrointestinal symptoms, as well as the frequency with which organicity is identified with red flags by UDTE in patients with FGIDs.

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