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ORIGINAL ARTICLE

Overlapping of functional gastrointestinal disorders in latinamericans schoolchildrens and adolescents

Superposición de desórdenes gastrointestinales funcionales en escolares y adolescentes latinoamericanos

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Abstract

Introduction: There are few studies on overlapping Functional Gastrointestinal Disorders (FGIDs). **Objective:** To describe the prevalence and possible risk factors in Latin American children (Latam) to present overlapping FGIDs. **Patients and Method:** Prevalence study in Latam schoolchildren between 8-18 years of age. Sociodemographic variables were included; the Rome III Criteria in Spanish were used, and overlapping FGIDs were considered when two, three or four and more FGIDs were presented in the same child. The statistical analysis included Student's T-test, chi-square test, Fisher's exact test, univariate and multivariate analysis, and calculation of ORs and 95% CI, being considered a significant $p < 0.05$. **Results:** 6,193 Latam children were analyzed (11.8 ± 2.2 years, 62.2% between 8-12 years of age, 50.4% girls, 68.0% public school), and 23.4% with a diagnosis of some kind of FGIDs. There was overlap of FGIDs in the same child, in 8.4% (5.5% with 2 FGIDs, 2.1% with 3 FGIDs and 0.9% with 4 or more FGIDs), the main overlaps were irritable bowel syndrome (IBS) + functional abdominal pain (FAP) (2.6%), and IBS + FAP + functional constipation (1.1%). There was predominance of the female gender. **Conclusion:** There is a low prevalence of overlapping FGIDs in Latam schoolchildren and adolescents, with a predominance in females and of very variable presentation.

Keywords: gastrointestinal diseases; prevalence; risk factors; child

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Introduction

Functional Gastrointestinal Disorders (FGIDs) in pediatrics according to the Rome IV Criteria have been defined as a diverse and variable combination of recurrent or chronic gastrointestinal symptoms that, after adequate medical evaluation, are not attributable to other medical conditions[1].

The prevalence of FGIDs according to the Rome III Criteria worldwide in children between four and 18 years of age ranges from 7.7% to 28.8%[2-6]; recently Robin et al, according to the Rome IV Criteria, described a prevalence of 25.0%[7] in 959 North American children.

Although the frequent overlapping of these FGIDs in the same patient is described[1], there is little literature on the main overlapping FGIDs and the characteristics of this group of children. The importance of studying this overlap in FGIDs lies in the fact that it will contribute to a better understanding of the physiopathology and pathogenesis of the biopsychosocial model of FGIDs in children, from the genetic, nutritional, environmental, psychosocial, cultural, socioeconomic and infectious, among others, and thus better define the epidemiology, symptoms, comorbidity and quality of life related to the health of children with FGIDs.

The objective of this study is to describe the prevalence and possible risk factors in Latin American (Latam) school children and adolescents of presenting overlapping FGIDs.

Patients and Methods

This non-experimental cross-sectional observational descriptive study of prevalence type was conducted from the FINDERS (Functional International Digestive Epidemiological Research Survey Group) database, a transnational research group made up of several members of the Latin American Society for Pediatric Gastroenterology, Hepatology and Nutrition (LASPGHAN).

Data collection methods were the same in all participating countries (Colombia, Ecuador, El Salvador, Mexico, Panama, and Nicaragua)[8-13]. From each country, the main public and private schools that agreed to participate in this study were chosen; and within each school, Latam children between the ages of eight and 18 who signed an informed consent and whose parents and/or guardians signed an informed consent were included. The sociodemographic variables taken into account were age, gender, country of origin, and school. Children with organic gastrointestinal disorders such as gastroesophageal reflux disease, *Helicobacter pylori* gastritis, Hirschsprung's disease, cerebral palsy, vesicoureteral reflux, convulsive syndrome, heart disease, celiac disease, and inflammatory bowel disease were excluded due to known history. The Rome III Criteria through the Questionnaire on Pediatric Gastrointestinal Symptom for Children and Adolescents (QPGS-III), which has been validated and tested in Spanish[14], was used to identify FGIDs. Children between the ages of eight and ten did so in a guided manner with one of the principal investigators, and children between the ages of 11 and 18 did so by self-report. According to the Scoring Instructions for Child/Adolescent Self-Report Form for the Rome III Diagnostic Questionnaire on Pediatric Gastrointestinal Symptoms for Children and Adolescents[15], the diagnosis of functional abdominal pain (FAP) requires the exclusion of other FGIDs such as functional dyspepsia (FD), irritable bowel syndrome (IBS), and abdominal migraine (AM). However, for the purposes of this study and in the future to allow comparison of these results with the new classification of the Rome IV Criteria for the group of FGIDs related to abdominal pain, which describes two subtypes of FD (postprandial distress syndrome and epigastric pain syndrome); four subtypes of IBS (with diarrhea, with constipation, with diarrhea and constipation, and without diarrhea and without constipation) and groups in one single type the FAP not differently specified[1], all overlaps were taken into account.

The age groups considered were schoolchildren (between eight and 12 years of age) and adolescents (between 13 and 18 years of age); in addition whether they attend to a public or private school, and the FGIDs identified were FD, IBS, AM, FAP, FAP Syndrome (FAPS), functional constipation (FC), non-retentive fecal incontinence (NRFI), adolescent rumination syndrome (ARS), cyclic vomiting syndrome (CVS), and aerophagia (AE). For the purposes of this investigation, FAP and FAPS were considered as one entity (FAP). The overlap of FGIDs was considered when two, three or four and more FGIDs were presented in the same child.

The study was approved by the Ethics Committee of the Universidad del Valle de Cali, Colombia; the Ethics Committee in Clinical Research (CEIC) of the Benjamin Bloom National Children's Hospital of San Salvador, El Salvador; the Ethics Committee of the Universidad Central del Ecuador, Quito, Ecuador, and the Research Committee of the Hospital del Niño Dr. José Renán Esquivel of Panama City, Panama; as well as by the Rectors of the Educational Institutions of Managua, Nicaragua; Cuernavaca and Monterrey, Mexico.

Statistical analysis carried out with the Stata 15 software (StataCorp, College Station, TX) included the Student T-test for two means, Chi-square and Fisher's exact test. For the possible risk factors for overlapping

FGIDs, uni and multivariate analyses were conducted and the calculation of ORs was performed between the exposure of interest variable (gender, age, origin, school) and the effect variable (presence or absence of overlapping FGIDs). A p <0.05 was considered statistically significant.

Results

A total of 6,193 children were analyzed from Colombia (n = 4,394), Ecuador (n = 417), El Salvador (n = 399), Mexico (n = 362), Panama (n = 321), and Nicaragua (n = 300), aged 11.8±2.2 years (range 8-18 years), 62,2% schoolchildren between eight and 12 years old, 50.4% female, 68.0% attend to a public school, 23.4% with a diagnosis of at least one FGID, where the main FGID was the FC (11.7%), the IBS (4.9%), and the FAP (2.6%) (table 1).

Overlapping FGIDs were presented in the same child, in 8.4% out of the 6,193 studied Latam children (65.1% with two FGIDs; 24.7% with three FGIDs, and 10.2% with four or more FGIDs), where the main overlaps were the IBS+ FAP (2.6%), and the IBS+ FAP+FC (1.1%) (table 2).

There was predominance of the female gender and having some FGIDs (OR = 1.16 95%CI = 1.03-1.31 p = 0.0107); in the female gender and having two FGIDs (OR = 1.41 95%CI = 1.12-1.77 p = 0.0024), and in the female gender and having four or more FGIDs (OR = 2.16 95%CI = 1.18-4.11 p = 0.0075); and when analyzing the presence of two FGIDs, three FGIDs, and four or more FGIDs with age, gender, and school, no significant differences were found (p > 0.05) (table 3).

Table 1. General characteristics of Latin American schoolchildren and adolescents. N = 6193

	Latin America	Colombia	Ecuador	El Salvador	Mexico	Panama	Nicaragua
Total	6.193	4.394	417	399	362	321	300
Age (years) (X SD)	11.8 2.2	11.9 2.3	12.0 1.8	11.8 1.6	11.5 2.0	10.3 1.8	12.0 2.5
Rank (years)	8 a 18	8 a 18	8 a 15	8 a 15	8 a 18	8 a 14	8 a 18
Schoolchildren (8-12 years) (n,%)	3854 (62.2)	2702 (61.5)	215 (51.6)	252 (63.2)	248 (68.5)	271 (84.4)	166 (55.3)
Adolescent (13-18 years) (n,%)	2339 (37.8)	1692 (38.5)	202 (48.4)	147 (36.8)	114 (31.5)	50 (15.6)	134 (44.7)
Sex (n,%)							
Female	3118 (50.4)	2115 (48.1)	204 (48.9)	235 (58.9)	194 (53.6)	196 (61.1)	174 (58.0)
Male	3075 (49.6)	2279 (51.9)	213 (51.1)	164 (41.1)	168 (46.4)	125 (38.9)	126 (42.0)
School (n,%)							
Public	4213 (68.0)	3546 (80.7)	258 (61.9)	201 (50.4)	83 (22.9)	111 (34.6)	0 (0.0)
Private	1980 (32.0)	848 (19.3)	159 (38.1)	198 (49.6)	279 (77.1)	210 (65.4)	300 (100.0)
FGIDs (n,%)							
Absent	4746 (76.6)	3354 (76.3)	322 (77.2)	318 (79.7)	263 (72.6)	229 (71.3)	260 (86.7)
Present	1447 (23.4)	1040 (23.7)	95 (22.8)	81 (20.3)	99 (27.4)	92 (28.7)	40 (13.3)
Vomiting and aerophagia (n,%)	86 (1.3)	71 (1.6)	6 (1.4)	3 (0.8)	1 (0.3)	2 (0.6)	3 (1.0)
Adolescent rumiation syndrome	21 (0.3)	17 (0.4)	3 (0.7)	1 (0.3)	0 (0.0)	0 (0.0)	0 (0.0)
Cyclic vomiting syndrome	21 (0.3)	17 (0.4)	2 (0.5)	0 (0.0)	1 (0.3)	1 (0.3)	0 (0.0)
Aerophagia	44 (0.7)	37 (0.8)	1 (0.2)	2 (0.5)	0 (0.0)	1 (0.3)	3 (1.0)
Abdominal pain-related FGIDs (n,%)	631 (10.2)	457 (10.5)	40 (10.1)	37 (9.4)	51 (14.2)	38 (12.2)	5 (1.7)
Functional dyspepsia	61 (1.0)	46 (1.1)	2 (0.5)	7 (1.8)	3 (0.8)	3 (0.9)	0 (0.0)
Irritable bowel syndrome	301 (4.9)	222 (5.1)	20 (4.8)	15 (3.8)	23 (6.4)	18 (5.6)	3 (1.0)
Abdominal migraine	107 (1.7)	76 (1.7)	4 (1.0)	3 (0.8)	19 (5.3)	5 (1.6)	0 (0.0)
Childhood FAP and Childhood FAPS	162 (2.6)	113 (2.6)	16 (3.8)	12 (3.0)	6 (1.7)	13 (4.1)	2 (0.7)
Constipation and incontinence (n,%)	730 (11.8)	512 (11.7)	47 (11.2)	41 (10.3)	47 (13.0)	51 (15.9)	32 (10.7)
Functional constipation	723 (11.7)	509 (11.6)	46 (11.0)	41 (10.3)	46 (12.7)	51 (15.9)	30 (10.0)
Nonretentive fecal incontinence	7 (0.1)	3 (0.1)	1 (0.2)	0 (0.0)	1 (0.3)	0 (0.0)	2 (0.7)

X = mean; SD = standard desviation; FGIDs = functional gastrointestinal disorders; FAP = functional abdominal pain; FAPS = functional abdominal pain syndrome.

Table 2. Overlapping functional gastrointestinal disorders in Latin american schoolchildren and adolescents. N = 6193

	Latin America	Colombia	Ecuador	El Salvador	Mexico	Panama	Nicaragua
Total	6193	4394	417	399	362	321	300
FGIDs-	4746 (76.6)	3354 (76.3)	322 (77.2)	318 (79.7)	263 (72.6)	229 (71.3)	260 (86.7)
FGIDs+	1447 (23.4)	1040 (23.7)	95 (22.8)	81 (20.3)	99 (27.4)	92 (28.7)	40 (13.3)
Without overlap	928 (15.0)	656 (14.9)	61 (14.6)	55 (13.8)	64 (17.7)	56 (17.4)	36 (12.0)
With overlap	519 (8.4)	384 (8.7)	34 (8.2)	26 (6.5)	35 (9.7)	36 (11.2)	4 (1.3)
With 2 FGIDs	338 (5.5)	252 (5.7)	22 (5.3)	22 (5.5)	17 (4.7)	22 (6.9)	3 (1.0)
ibs_fap	158 (2.6)	121 (2.8)	10 (2.4)	12 (3.0)	7 (1.9)	6 (1.9)	2 (0.7)
fd_fap	49 (0.8)	35 (0.8)	2 (0.5)	6 (1.5)	3 (0.8)	3 (0.9)	0 (0.0)
fc_ae	34 (0.5)	25 (0.6)	4 (1.0)	1 (0.3)	0 (0.0)	4 (1.2)	0 (0.0)
fap_fc	25 (0.4)	18 (0.4)	3 (0.7)	0 (0.0)	0 (0.0)	3 (0.9)	1 (0.3)
With 3 FGIDs	128 (2.1)	99 (2.3)	6 (1.4)	2 (0.5)	14 (3.9)	6 (1.9)	1 (0.3)
ibs_fap_fc	70 (1.1)	53 (1.2)	2 (0.5)	0 (0.0)	10 (2.8)	4 (1.2)	1 (0.3)
ibs_am_fap	16 (0.3)	11 (0.3)	2 (0.5)	1 (0.3)	2 (0.6)	0 (0.0)	0 (0.0)
fd_fap_fc	8 (0.1)	8 (0.2)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
ibs_fap_ae	6 (0.09)	4 (0.1)	1 (0.2)	1 (0.3)	0 (0.0)	0 (0.0)	0 (0.0)
With 4 or + FGIDsD	53 (0.9)	33 (0.8)	6 (1.4)	2 (0.5)	4 (1.1)	8 (2.5)	0 (0.0)
ibs_fap_fc_ae	14 (0.2)	11 (0.3)	1 (0.2)	0 (0.0)	0 (0.0)	2 (0.6)	0 (0.0)
ibs_am_fap_fc	13 (0.2)	6 (0.1)	2 (0.5)	0 (0.0)	3 (0.8)	2 (0.6)	0 (0.0)

FGIDs = functional gastrointestinal disorders; IBS = irritable bowel syndrome; FAP = functional abominal pain; FD = functional dyspepsia; FC = functional constipation; AE = aerophagia; AM = abdominal migraine.

Discussion

The lowest prevalence in these six Latam countries for presenting some FGIDs under the Rome III Criteria in Spanish was 13.3% in Nicaragua[13], and the highest prevalence was 28.7% in Panama[12], lower than that described by Gulewitsch et al which was 7.7% in 1,537 German children between six and ten years of age[2], and similar to that reported by Lewis et al in 949 interviewed mothers of North American children between four and 18 years of age which was 23.1%[3], by Scarpato et al in 13,750 Mediterranean European children aged 4-18 years which was 27.6%[4], by Bouzious et al in 1,658 Greek children aged 6-14 years which was 23.1%[5], and by Devanarayana et al in 427 Sri Lankan children aged 12-16 years which was 28.8%[6]. According to the Rome IV Criteria, Robin et al in 1,147 North American children between four and 18 years of age recently describe a 25.0%, prevalence to present some FGIDs, being the main FGIDs the FC (14.1%)[7], as well as this study, whose prevalence was between 10.0% and 15.9%, and the same as reported worldwide between 4.2% and 14.1%.

The Rome IV Criteria in schoolchildren and adolescents dedicate only a couple of paragraphs to describe that different FGIDs often overlap in the same patient[1] and that studies have shown that there may be overlap of more than one FAP disorder in an individual patient[16], however, they do not relate the characteristics of these. In this study, the prevalence of presenting two, three, and four or more FGIDs in the same child was 5.5%; 2.1% and 0.9%, respectively. Scarpato et al[4], and Bouzios et al[5] report prevalences between 2.8%-6.0%; 0.4%-1.0%, and 0.1%-0.3%, respectively, of present two, three, and four or more FGIDs in the same child (table 4).

In this study there was no case of overlap between

Table 3. Risk factors in Latin american schoolchildren and adolescents with overlapping functional gastrointestinal disorders. N = 6193

	2 FGIDs	3 FGIDs	4 o + FGIDs	p
Total	338 (65.1)	128 (24.7)	53 (10.2)	
Age (years) (X SD)	11.8 2.3	11.6 2.3	11.5 2.1	
Rank (years)	8 a 18	8 a 18	8 a 16	
Schoolchildren (8-12 years) (n,%)	202 (59.8)	83 (64.8)	33 (62.3)	0.596
Adolescent (13-18 years) (n,%)	136 (40.2)	45 (35.2)	20 (37.7)	
Sex (n,%)				
Female	196 (58.0)	73 (57.0)	36 (67.9)	0.354
Male	142 (42.0)	55 (43.0)	17 (32.1)	
School (n,%)				
Public	221 (65.4)	81 (63.3)	35 (66.0)	0.899
Private	117 (34.6)	47 (36.7)	18 (34.0)	

FGIDs = functional gastrointestinal disorders; X = mean; SD = standard desviation.

Table 4. Comparison of prevalence in schoolchildren and adolescents with overlapping functional gastrointestinal disorders. N = 6193

	Velasco	Scarpato[4]		Bouzios[5]
	8-18 years N = 6193	4-10 years N = 6602	11-17 years N = 7148	6-17 years N = 1588
2 FGIDs	5.5%	2.8%	6.0%	3.3%
3 FGIDs	2.1%	0.4%	1.0%	0.4%
4 or + FGIDs	0.9%	0.1%	0.1%	0.3%

FGIDs=functional gastrointestinal disorders.

IBS with constipation (IBS-c) and FC, however, Rajindrajith et al[17] in 1,792 Sri Lankan adolescents, 54.6% female, describe a 56.0% of overlapping between IBS-c and FC. Similarly, in this study, no children with IBS and FD are reported, but Friesen et al[18] in 100 children between the ages of eight and 17 years (average age 13 years nine months), 76% female, report a 33% of overlapping between IBS and FD, with no variation in symptoms/syndromes by FD subtypes. In the results of the current research, there is no overlap between IBS and AM, however, Gulewitsch et al[2] identify 3.4% of this overlap.

The Pediatric Rome III Criteria[15] do not allow to classify the subtypes of FD as in this study, however, Turco et al[19], in 100 Italian children, median age ten years, range 4.3-16.8 years, reported a 36% overlap between FD of the subtype epigastric pain and FD of the postprandial distress type.

Few studies describe which FGIDs overlap. This study reports the following overlapping FGIDs, among others: AM+FC, FC+AE, AM+AE, and FC+ARS, also reported by Bouzious et al[5] and IBS+FAP, AM+FC, AM+CVS, IBS+AM+FAP, and IBS+AM+ARS, also identified by Helgeland et al[20], in 142 children in Norway, aged 9.4 ± 2.7 years, 63% girls.

Like Devanarayana et al[21], who found overlap of AE and other FGIDs in 23.9%, this study presented cases of children with AE+FAP, AE+FC, and AE+AM.

The predominance of female gender in the overlap of FGIDs in the same child found in this study is also described by Bouzios et al[5] (OR = 1.28; 95%CI = 1.03-1.64; p = 0.035) and by Scarpato et al[4].

The strengths of the study include the large sample size, as well as the fact that it was conducted in both public and private schools in several cities in several Spanish-speaking Latin American countries. In addition, the same methodology proposed by FINDERS (Functional International Digestive Epidemiological Research Survey Group) was used in all countries, allowing for comparison.

Among the limitations of the study, although it includes several cities in several countries, the possibility that the results cannot be generalized to all of Latin America cannot be ruled out. In addition, we do not perform a systematic evaluation or anamnesis on the surveyed children, and simultaneous medical diagnoses that are not described in the study may be presented. Likewise, no other possible psychological, social, racial, ethnic, anthropometric, nutritional, infectious, and environmental risk factors, among others, were asked that could explain the biopsychosocial model of this entity. Finally, our data were obtained by self-reporting in the school environment, and there is no data from caregivers, which allows for some degree of bias.

In conclusion, there is a low prevalence of FGIDs in the same Latam schoolchild and adolescent, with predominance of the female gender, and a very variable presentation, which invites future studies to deepen more about the FGIDs overlapping in children and their better understanding.

Ethical responsibilities

Human Beings and animals protection: Disclosure the authors state that the procedures were followed according to the Declaration of Helsinki and the World Medical Association regarding human experimentation developed for the medical community.

Data confidentiality: The authors state that they have followed the protocols of their Center and Local regulations on the publication of patient data.

Rights to privacy and informed consent: The authors have obtained the informed consent of the patients and/or subjects referred to in the article. This document is in the possession of the correspondence author.

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Conflicts of Interest

Authors declare no conflict of interest regarding the present study.

References

1. Hyams JS, Lorenzo CD, Saps M, Shulman RJ, Staiano A, van Tilgurg M. Childhood Functional Gastrointestinal Disorders : Child/Adolescent. Gastroenterology. 2016;150(5):1456-68. doi: 10.1053/j.gastro.2016.02.015.
2. Gulewitsch MD, Enck P, Schwille-kiuntke J, Weimer K, Schlarb AA. Rome III criteria in parents ' hands: pain-related functional gastrointestinal disorders in community children and associations with somatic complaints and mental health. Eur J Gastroenterol Hepatol. 2013;25(10):1223-9. doi: 10.1097/MEG.0b013e328364b55d.
3. Lewis ML, Palsson OS, Whitehead WE, van Tilburg MAL. Prevalence of Functional Gastrointestinal Disorders in Children and Adolescents. J Pediatr. 2016;177(10):39-43. doi: 10.1016/j.jpeds.2016.04.008%0A39.
4. Scarpato E, Kolacek S, Jojkic-Pavkov D, et al. Prevalence of Functional Gastrointestinal Disorders in Children and Adolescents in the Mediterranean Region of Europe. Clin Gastroenterol Hepatol. 2018;16(6):870-6. doi: 10.1016/j.cgh.2017.11.005.
5. Bouzios I, Chouliaras G, Chrousos GP, Roma E, Gemou-Engesaeth V. Functional gastrointestinal disorders in Greek Children based on ROME III criteria: identifying the child at risk. Neurogastroenterol Motil. 2017;29(3):1-8. doi: 10.1111/nmo.12951.
6. Devanarayana NM, Adhikari C, Pannala W, Rajindrajith S. Prevalence of functional gastrointestinal diseases in a cohort of Sri Lankan adolescents: Comparison between Rome II and Rome III criteria. J Trop Pediatr. 2011;57(1):34-9. doi: 10.1093/tropej/fmq039.
7. Robin SG, Keller C, Zwiener R, et al. Prevalence of Pediatric Functional Gastrointestinal Disorders Utilizing the Rome IV Criteria. J Pediatr. 2018;195(4):134-9. doi: 10.1016/j.jpeds.2017.12.012.
8. Saps M, Moreno-Gomez JE, Ramírez-Hernández CR, Rosen JM, Velasco-Benitez CA. A nationwide study on the prevalence of functional gastrointestinal disorders in school-children. Bol Med Hosp Infant Mex. 2017;74(6):407-12. doi: 10.1016/j.bmhimx.2017.05.005.
9. Játiva E, Velasco-Benítez CA, Koppen IJN, Játiva-Cabezas Z, Saps M. Prevalence of functional gastrointestinal disorders in schoolchildren in Ecuador. J Pediatr Gastroenterol Nutr. 2016;63(1):25-8. doi: 10.1097/MPG.0000000000001108.
10. Zablah R, Velasco-Benítez CA, Merlos I, Bonilla S, Saps M. Prevalence of functional gastrointestinal disorders in school-aged children in El Salvador. Rev Gastroenterol Mex. 2015;80(3):186-91. doi: 10.1016/j.rgmx.2015.03.008.
11. Dhroove G, Saps M, Garcia-Bueno C, Jiménez AL, Rodriguez-Reynosa LL, Velasco-Benítez CA. Prevalencia de trastornos gastrointestinales funcionales en escolares mexicanos. Rev Gastroenterol Mex. 2017;82(1):13-8. doi: 10.1016/j.rgmx.2016.05.003.
12. Lu PL, Saps M, Chanis RA, Velasco-Benítez CA. The prevalence of functional gastrointestinal disorders in children in Panama: A school-based study. Acta Paediatr Int J Paediatr. 2016;105(5):232-6. doi: 10.1111/apa.13379.
13. Mejía M, Velasco-Benítez CA, Díaz J. La prevalencia y las posibles asociaciones de los desórdenes gastrointestinales funcionales en escolares y adolescentes de colegios privados de Managua, Nicaragua. Acta Gastroenterol Latinoam. 2017;47(3):163-8.
14. Saps M, Nichols-Vinueza DX, Mintjens S, Pusatcioglu CK, Velasco-Benítez CA. Construct validity of the pediatric Rome III criteria. J Pediatr Gastroenterol Nutr. 2014;59(5):577-81. doi: 10.1097/MPG.0000000000000482.
15. Rasquin A, Di Lorenzo C, Forbes D, et al. Childhood functional gastrointestinal disorders: Child/adolescent. Gastroenterology. 2006;130(6):1527-37. doi: 10.1053/j.gastro.2005.08.063.
16. van Tilgurg M, Walker LS, Palsson OS, Kim SM, Spiegel BM, Spiller RC. Prevalence of Child/Adolescent Functional Gastrointestinal Disorders in a National U.S. Community Sample. Gastroenterology. 2014;146(5):143-4.
17. Rajindrajith S, Devanarayana NM, Benninga MA. Constipation and Constipation-predominant Irritable Bowel Syndrome: A Comparative Study Using Rome III Criteria. J Pediatr Gastroenterol Nutr. 2017;64(5):679-84. doi: 10.1097/MPG.0000000000001332.
18. Friesen CA, Rosen JM, Schurman J V. Prevalence of overlap syndromes and symptoms in pediatric functional dyspepsia. BMC Gastroenterol. 2016;16(1):1-7. doi: 10.1186/s12876-016-0495-3.
19. Turco R, Russo M, Martinelli M, et al. Do Distinct Functional Dyspepsia Subtypes Exist in Children? J Pediatr Gastroenterol Nutr. 2016;62(3):387-92. doi: 10.1097/MPG.0000000000000944.
20. Helgeland ÃH, Flagstad G, Grøtta J, Vandvik PO, Kristensen H, Markestad T. Diagnosing Pediatric Functional Abdominal Pain in Children (4-15 Years Old) According to the Rome III Criteria: Results From a Norwegian Prospective Study. J Pediatr Gastroenterol. 2009;49(7):309-15. doi: 10.1097/MPG.0b013e31818de3ab.
21. Devanarayana NM, Rajindrajith S. Aerophagia Among Sri Lankan Schoolchildren: J Pediatr Gastroenterol Nutr. 2012;54(4):516-20. doi: 10.1097/MPG.0b013e318236051d.