

Prevalence of Functional Gastrointestinal Disorders in Colombian School Children

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Objectives To determine prevalence for functional gastrointestinal disorders (FGIDs) in Colombian school children using the Questionnaire on Pediatric Gastrointestinal Symptoms–Rome III Version (QPGS-III) and to determine possible risk factors.

Study design The QPGS-III was translated into Spanish then reverse translated by a team of bilingual physicians. Focus groups of Colombian children were conducted to assure understanding of the Spanish version. Children at 1 public school and 2 private schools in Pasto, Colombia were invited to participate in a prevalence study using the translated questionnaire.

Results A total of 373 children (95 private school, 278 public school), with mean age 9.9 years completed the QPGS-III. Twenty-nine percent of children were diagnosed with FGIDs. FGIDs were more common in females (OR, 1.63; 95% CI, 1.04-2.56). Functional constipation (14%) was the most common FGID. Irritable bowel syndrome was the most common abdominal pain-related FGID (5.4%). Abdominal migraine (1%) and cyclic vomiting syndrome (0.3%) were the least common FGIDs.

Conclusion FGIDs are common in Colombian school children. (*J Pediatr* 2014;164:542-5).

The incidence and prevalence of common disorders is known to vary substantially from one world region to another. Multiple studies have investigated the epidemiology of gastrointestinal disorders in children of North America and Europe.¹⁻⁵ Functional gastrointestinal disorders (FGIDs) are common, chronic, frequently disabling conditions defined by symptom-based criteria and the lack of identifiable structural or biochemical abnormalities. No population-based studies have evaluated the prevalence of FGIDs in South American school-age children. Knowledge of the epidemiologic regional differences may help to understand the various factors involved in pathogenesis of FGIDs and the motivations for medical consultation in each geographic area.

FGIDs are defined using validated standardized questionnaires (diagnostic criteria and questionnaires available online at www.romecriteria.org). FGIDs result from the interplay of genetic, biological, psychological, social, and environmental factors. Ethnicity, race, climate, society, and culture may affect the epidemiology of FGIDs. Social or cultural differences guiding a child's interaction with peers and family could influence the illness experience and coping mechanisms. Children that experience gastrointestinal infections, whose frequency and type vary regionally, risk developing abdominal pain and FGIDs.⁶ Changes in the intestinal microbiota, which also varies by region,⁷ are present in patients with irritable bowel syndrome (IBS).^{8,9} Different socioeconomic and geographic factors may affect consultation patterns. Studies in US children have shown that although 38% of children report abdominal pain each week, only 2%-3% of school children seek medical attention.¹⁰ This raises concerns that some children may be suffering pain in the absence of medical care. In addition, the low ratio of consultation questions the accuracy of the epidemiologic data obtained when studies are conducted at the doctor's office. The sample of patients in such studies may not represent the population of children with abdominal pain. To avoid selection bias, investigators have recommended conducting population-based studies surveying a large number of children. Still, population-based studies on the epidemiology of FGIDs are rarely conducted because of the logistical difficulties and high costs. These difficulties also explain why most epidemiologic studies are conducted in affluent and developed countries. It could be argued that access to epidemiologic data is particularly important in countries with limited budgetary and qualified human resources, the same countries where epidemiologic research is less common. A better understanding of the epidemiology of common conditions in countries with budgetary constraints would be instrumental for health planning and allocation of funding. Obtaining regional epidemiologic data on common conditions may also have global implications. Individuals frequently emigrate from less affluent countries to developed nations. A better understanding of disorders affecting different immigrant groups may provide valuable information to improve their healthcare. We conducted an epidemiologic study in school-age

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The authors declare no conflicts of interest.

Portions of the study were presented at the North American Society of Pediatric Gastroenterology, Hepatology, and Nutrition meetings, October 22, 2011 in Orlando, FL and October 20, 2012 in Salt Lake City, UT.

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FGID	Functional gastrointestinal disorder
IBS	Irritable bowel syndrome
QPGS-III	Questionnaire on Pediatric Gastrointestinal Symptoms–Rome III Version

Colombian children. We applied standardized diagnostic criteria to investigate the prevalence of FGIDs in children of different backgrounds.

Methods

The study was conducted in February 2010 and included the largest public school and the 2 largest private schools in Pasto, Colombia. The investigators selected Pasto (population 400 000) to conduct the epidemiologic study because of its small to medium size. The size of the city was thought to be small enough to achieve participation of a large proportion of the children living in the city and large enough to assure diversity. Pasto's proximity to the border with Ecuador provides a mixed population with a large proportion of migrant workers from Ecuador. The mixed population assured inclusion of children from 2 countries. The city also has a large indigenous population. Colombia covers the northern as well as the southern hemispheres. Pasto is located at latitude and longitude of 01° 12N, 77° 16W. Its proximity to the equator assures temperature stability. Prior studies show prevalence of FGIDs is affected by seasonal variance.^{11,12} Conducting the study in Pasto allows prospective follow-up (ongoing) of children throughout the year to better understand the effect of school-related stress and climate on prevalence. To assure ethnic, racial, and socioeconomic diversity, we selected both private and public schools as study sites.

Families of all fourth to sixth grade children were sent a package including an invitation and consent forms for their children to participate in an epidemiologic study. Children from consenting families were included if they provided assent and had no history of organic medical conditions.

The Questionnaire on Pediatric Gastrointestinal Symptoms–Rome III Version (QPGS-III) is a validated questionnaire designed to diagnose FGIDs in children.¹³ Questions review gastrointestinal symptom location, frequency, and severity as well as related disability and somatic symptoms. For this study, the QPGS-III was translated from English to Spanish by a medical student and 2 pediatric gastroenterologists from Colombia and the US fluent in both languages.^{14,15} To verify the translation, the English and new Spanish version of the QPGS-III were analyzed for accuracy and fidelity of translation by a bilingual independent reviewer who was not involved in the study. To assure children's comprehension, wording in the questionnaire was adapted to local language by interviewing 35 school children (age 11-13 years) in Pasto and Cali, Colombia (population 2 232 158). All children agreed on the final version and manifested comprehension of the questions in the QPGS-III. School children participating in the study had an instructional session on questionnaire completion. Demographic information (race, marital status of parents, size of household) and information on gastrointestinal family history and the participant's past medical history were obtained from the parents. To evaluate the possibility of transcriptional errors, 10% of the records were reviewed and compared with the original forms. The

study was approved by the principal of each school and by the Institutional Review Board and Human Subjects Committee of Universidad del Valle of Cali, Colombia.

Statistical Analyses

Prevalence data was pooled from all schools for initial analysis. Data was analyzed using 2-sided Student *t*, χ^2 , and Fisher exact test where appropriate (Stata 10 software; StataCorp, College Station, Texas). To evaluate possible risk factors for FGIDs, univariate and multivariate analysis and calculation of ORs was performed between each of the exposure variables of interest (sex, race, school type, and family characteristics) and the effect variable (presence or absence of FGIDs). *P* values of less than .05 were considered statistically significant.

Results

Invitations to participate were sent to the homes of 488 children (approximately 3.5% of all fourth to sixth grade school children in the city of Pasto, Colombia) ([Figure](#); available at www.jpeds.com). Review of the initial questionnaires revealed that 33 children did not meet criteria to participate in the study (Hirschsprung disease, esophageal atresia, gastroesophageal reflux disease, hiatal hernia, gastritis, short bowel syndrome, hypothyroidism, or vesicoureteral reflux) and were excluded. There was no significant difference in age or sex between children who participated in the study and those that were excluded from the study.

Participants had a mean age 10.0 years (median 10, IQR 2) and 50.7% were female. Children were Hispanic white 34%, Hispanic black 4%, and multiracial 62%. Parents of participants were divorced or separated in 24% of cases. Of the 108 children with FGIDs who met Rome III criteria for a FGID (29%), mean age was 10.1 years (median 10, IQR 1) and 59.3% were female. Age and proportion of sex, race, school type, family structure, and family history were compared in children with and without FGIDs ([Table I](#)). Multivariate analysis did not reveal any significant variables contributing to FGID prevalence. Disorders of constipation and fecal incontinence were the most common group of disorders (15.5%) followed by abdominal pain-related FGIDs (10.8%; [Table II](#)). Disorders of vomiting and aerophagia were the least common group of disorders (0.3%). Functional constipation (14%) was the most common diagnosis overall and IBS was the most common abdominal pain-related disorder (5.4%). Abdominal migraine was diagnosed in only 4 children (1.0%).

Discussion

We assessed the prevalence of FGIDs in South American children using the Rome III criteria. The high survey response rate and inclusion of the largest public school and 2 largest private schools in Pasto, Colombia suggests that the study results represent Pasto's pediatric population. The study was

Table I. Comparison of subjects (n = 373)

	FGID n = 108	No FGID n = 265	OR	CI 95%	P
Sex					
Male	44	140			
Female	64	125	1.63	1.04-2.56	.03
Race					
Mixed	69	161			
Hispanic white	36	92	0.91	0.57-1.50	.71
Hispanic black	3	12	0.58	0.16-2.13	.56
School					
Public	75	203			
Private	33	62	1.44	0.88-2.37	.15
Family					
Parents separated/divorced					
No	86	197			
Yes	22	68	0.74	0.43-1.28	.28
Only child					
No	80	186			
Yes	28	79	0.82	0.50-1.36	.45
FGIDs in household					
No	78	205			
Yes	30	60	1.31	0.79-2.19	.29

conducted in a midsize city close to Ecuador’s border (50 miles). With a large percentage of migrant workers in the city, it is expected that some of the children surveyed were born in Ecuador or have Ecuadorian parents. The racial composition of our sample was almost identical to the overall racial composition of Colombia noted in their 2005 census.¹⁶ Such a finding strengthens the external validity of our results.

In contrast with previous efforts focused on obtaining data about particular FGIDs using older versions of the Rome criteria,¹⁷ our study provides data on the prevalence of all FGIDs using the current version of the Rome criteria. A large school-based study published in South America found a 21% rate of constipation in children 10-14 years of age using the Rome II criteria in a Brazilian city.¹⁷ Studies have shown that the application of the Rome III in lieu of the Rome II criteria modifies the frequency of diagnosis of FGIDs in children.^{18,19} Differences in prevalence among the current study and the Brazilian study may reflect true differences in regional epidemiology (eg, related to differing culture, geography) or may result from the different versions of the criteria used in each study. Our findings are similar to those of school studies conducted in other continents using the Rome III criteria. We found a rate of constipation (14 000/100 000 at-risk children) that is similar to the prevalence rate found in schoolchildren in the Eastern Province of Sri Lanka.²⁰ Similarly, the prevalence of IBS (5400/100 000 at-risk) and abdominal migraine (1000/100 000 at-risk) found in our study were similar to those obtained in a study conducted in a semi-urban school in Sri Lanka using the Rome III criteria.²¹ The similarity in findings among children of different ethnicity, race, culture, climate, geographic location, microbiota, and environment is interesting, unexpected, and worth studying further. High prevalence rates suggest that dedication of health care resources and education efforts are warranted.

We found no effect of race, family composition, parent marital status, or history of FGIDs in the household on the prevalence of FGIDs. Our study showed a higher risk of developing FGIDs in females that corresponds to increased rates of IBS in adult females from Colombia²² and several other countries analyzed by meta-analysis.²³ In agreement with our findings, the adult Colombian study did not find an effect of marital status on the prevalence of IBS. Although, our study did not include questions on the socioeconomic characteristics of the families, it is likely that those would differ between families of children attending public and private schools. Neither the aforementioned meta-analysis nor the adult Colombian study found an effect of socioeconomic status on the prevalence of IBS. However, our study was not specifically powered to assess differences in prevalence between the private and public schools and we cannot exclude that a larger sample size would have shown a significant difference.

Limitations of our study include the absence of information on socioeconomic status and history of gastrointestinal infection (a potential risk factor for FGIDs), as well as the exclusive collection of data from children. The study also selected a specific sample of school-children in Pasto, and results may not be representative throughout Colombia. For example, high childhood prevalence of *Helicobacter pylori* and intestinal parasite exposure exists throughout Colombia, but rates are variable between Pasto and cities with differing population density and geography.^{24,25}

The design of our study included a review of methods at the end of data collection and analysis to refine the protocol for subsequent investigations. The review of our questionnaire revealed that the reference to “other members of the household” was vague and could include household members that may not be related to the child. This question will be corrected for future investigations, and collection of data from parents will be added to the protocol. Our review of the methods proved the feasibility of conducting large multisite international research studies in children with FGIDs. This has been an important development that encouraged our group to enlarge the consortium to include other countries.

Table II. Prevalence of pediatric FGIDs

	n (%)	CI (95%)
Total	373	n/a
No FGIDs	265 (71.0)	66.2-75.4
FGIDs	108 (29.0)	24.6-33.8
Vomiting and aerophagia		
Cyclic vomiting syndrome	1 (0.3)	0.0-1.7
Abdominal pain-related FGIDs		
Functional dyspepsia	7 (1.7)	0.8-3.9
IBS	22 (5.4)	3.9-8.8
Abdominal migraine	4 (1.0)	0.3-2.8
Functional abdominal pain	11 (2.7)	1.6-5.2
Functional abdominal pain syndrome	1 (0.3)	0.0-1.7
Constipation and incontinence		
Functional constipation	57 (14.0)	12.0-19.3
Nonretentive fecal incontinence	6 (1.5)	0.7-3.6

n/a, not applicable.

The consortium now includes 4 countries from South, Central, and North America (Colombia, Ecuador, Panamá, México) that all have ongoing, interrelated research projects.

An important challenge confronted by our group at the time of planning this study was the lack of a Spanish version of the QPGS-III. The translation and adaptation of the original English version of the questionnaire to local children's wording is one of the strengths of our study. The Spanish version of the QPGS-III will soon be published and made available for other investigators to use. Our efforts follow the mandate of the World Gastroenterology Organization-Rome Foundation Joint Symposium of 2011 that underscored the need of "validation of study instruments such as questionnaires" for multinational trials.²⁶

Awareness of FGIDs as a possible cause of gastrointestinal symptoms may limit unnecessary diagnostic tests and direct treatment decisions. Consideration should be given to FGID directed utilization of health care resources and educational efforts. This school based study serves as a model for focused, feasible research on FGIDs in Latin America with aims to identify prevalence and specific risk factors. Improved understanding of FGID prevalence and etiology may guide prevention and treatment efforts. Future international studies should confirm the external validity of our findings. ■

The authors appreciate statistical support by Hongying Dai, PhD at Children's Mercy Hospitals and Clinics.

Submitted for publication Aug 1, 2013; last revision received Sep 16, 2013; accepted Oct 30, 2013.

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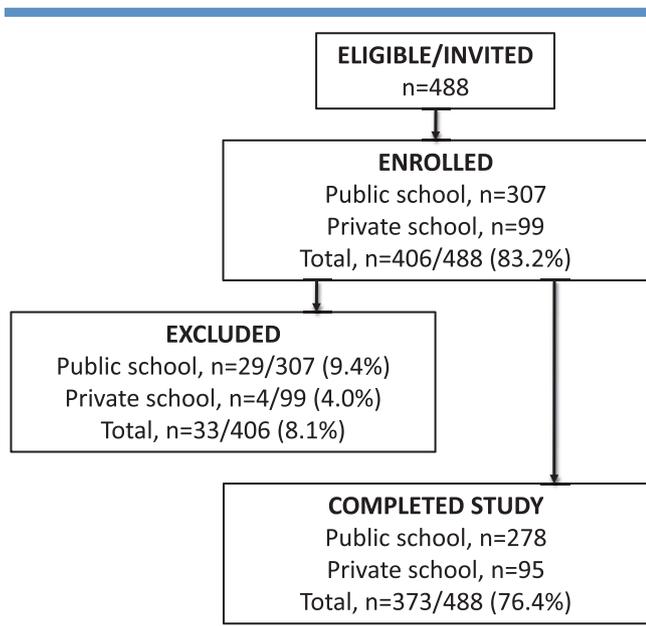


Figure. Flow diagram of subject recruitment and inclusion.