Prevalence of Functional Gastrointestinal Disorders in Schoolchildren in Ecuador

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ABSTRACT

The prevalence of functional gastrointestinal disorders (FGIDs) in children in Ecuador is unknown. We describe a survey study in 2 schools in Quito, Ecuador, using a Spanish translation of the Questionnaire on Pediatric Gastrointestinal Symptoms-Rome III Version (QPGS-RIII). A total of 417 children (51% boys) with a mean age of 12.0 years were included. FGIDs were present in 95 children (22.8%) and occurred in 25% of girls and in 20.7% of boys ($P = 0.296$). Functional defecation disorders were found in 12.0% of children, 9.4% had an abdominal pain-related FGID and 3.8% was diagnosed with a vomiting or aerophagia FGID.

Key Words: abdominal pain, children, constipation, Ecuador, functional gastrointestinal disorders

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What Is Known

- Functional gastrointestinal disorders occur commonly in children worldwide.
- The prevalence of functional gastrointestinal disorders varies between countries and regions.
- There have been few studies assessing the prevalence of functional gastrointestinal disorders in developing countries.

What Is New

- This is the first study that assesses the prevalence of functional gastrointestinal disorders in schoolchildren in Ecuador.
- This is the first study that compares the prevalence of functional gastrointestinal disorders in 2 nearby cities in 2 developing countries in Latin America.

Functional gastrointestinal disorders (FGIDs) are disorders of the digestive system in which symptoms cannot be explained by the presence of an organic abnormality. In children, FGIDs are diagnosed according to the pediatric Rome III criteria (1). The most prevalent FGIDs in children are abdominal pain-related FGIDs (AP-FGIDs) and functional defecation disorders (2–4). FGIDs in children form an important burden to families and society (2,3,5). Despite the high impact that FGIDs have, only few children with FGIDs seek medical help; for example, only 2% to 4% of American and Colombian schoolchildren seek care for chronic abdominal pain (6,7). This low ratio of consultation underscores the need to conduct population-based studies to obtain accurate epidemiological data.

The prevalence of FGIDs and patterns of consultation vary between countries and regions (8–10). Geography-related differences in genetics, socioeconomics, culture, climate, and dietary factors may partially explain these differences (8,10,11). Large population-based studies in different countries and regions may help to identify factors that are associated with these differences in prevalence. To date, however, most epidemiological studies on FGIDs in children are conducted in North America and Europe (3,12–14). The generalizability of these data to the developing world has not been studied extensively. In Latin America, the prevalence of FGIDs in schoolchildren, according to the Rome III criteria, has been assessed only in 1 study. This study was conducted in Pasto, a midsize city (400,000 inhabitants) in Colombia (6). The study showed a high prevalence of FGIDs, with 29% of schoolchildren having at least 1 FGID according to the Rome III criteria.

The aim of the present study was to assess the prevalence of FGIDs among schoolchildren in Quito, the capital city of Ecuador. We hypothesized that, similar to the results of the Colombian study, FGIDs would be highly prevalent among schoolchildren in Quito, Ecuador.

METHODS

This cross-sectional survey study was conducted by the Functional International Digestive Epidemiological Research Survey Group, a multinational research group founded by 2 of the authors (C.A.V., M.S.) to collect epidemiological information on gastrointestinal diseases in Latin America. The methods of this study were identical to those used in the previously mentioned population-based study that was conducted in Pasto, Colombia (6). The original design of this study was based on previous studies

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conducted in Pittsburgh and Chicago in the USA (7,15). For a detailed description of these methods, we refer the readership to these previous studies.

Parents of schoolchildren (8–15 years of age) from a public and a private school in Quito received information packages about the study via mail. These information packages contained an information letter with an invitation to participate, a screening questionnaires, and consent forms. These questionnaires included questions on the child's medical history, demographics, and family composition and were used to exclude children with a history of organic gastrointestinal diseases.

Children of parents who had given written consent received instructions regarding the study at school, where they also received age-appropriate assent forms. The instructions included an explanation on how to use the Spanish version of the QPGS-RIII (S-QPGS–RIII) (16), which was used to diagnose FGIDs. At the end of the instruction session, children were encouraged to ask for clarification on questions or wording they did not understand. Children completed the S-QPGS-RIII in class. A member of the research team was present to assure confidentiality and provide assistance in case children had difficulties completing the questionnaires.

The local institutional review board and school authorities approved this study.

STATISTICAL ANALYSES

Based on a conservative assumption, the needed sample size was estimated at 260 children. This was based on previous data from the study in Colombia that found a prevalence of FGIDs of 29% (6). For this calculation P was set at 0.05. The sample was adjusted for a possible attrition rate of 15%. This assumption was conservative, considering the study from our group in Colombia that showed a higher participation level.

Data were analyzed using 2-sided student t, χ^2, and Fisher exact test where appropriate (Stata 10 software; StataCorp, College Station, TX and IBM SPSS Statistics for Windows, Version 22.0; IBM Corp, Armonk, NY). $P < 0.05$ was considered statistically significant.

RESULTS

In total, 420 children were asked to participate; the parents of 3 of these children declined to participate and 417 children completed the questionnaires. They were recruited from 1 public school (n = 257) and 1 private school (n = 160). The mean age was 12.0 years (standard deviation 1.8). Children in private schools were significantly younger than children attending public schools (mean age 10.4 vs 13.0 years, $P < 0.001$). The sample was balanced in terms of sex, 51% were boys (n = 213). There was no difference in sex distribution between children attending private and public school ($P = 0.752$).

FGIDs were diagnosed in 95 (22.8%) of all schoolchildren. FGIDs occurred more frequently in girls (25.0%) than in boys (20.7%), but this difference was not statistically significant ($P = 0.296$). FGIDs were less prevalent in children attending public school (28/160; 17.5%) compared with those attending private schools (67/257; 24.9%), but this difference was also not significant ($P = 0.054$). There was no significant difference in mean age between children with and without FGID ($P = 0.755$).

Functional defecation disorders were found in 12.0% of children, 9.4% had an AP-FGID and 3.8% were diagnosed with a vomiting or aerophagia FGID (Table 1). Of all 95 children with FGIDs, 16 children (16.8%) had 2 or more FGIDs. Twelve children had 2 FGIDs, 8 of them had aerophagia in combination with functional constipation or irritable bowel syndrome, and the remaining 4 children fulfilled the criteria for abdominal migraine and irritable bowel syndrome. Four children had 3 FGIDs; 2 children had aerophagia, cyclic vomiting syndrome, and functional constipation and the other 2 were diagnosed as having aerophagia, abdominal migraine, and irritable bowel syndrome.

TABLE 1. Prevalence of functional gastrointestinal disorders in schoolchildren in Quito (Ecuador)

Country	Ecuador
City	Quito
Total: n (%)	417 (100)
FGIDs	95 (22.8)
Vomiting and aerophagia	16 (3.8)
Rumination syndrome	3 (0.7)
Cyclic vomiting syndrome	4 (1.0)
Aerophagia	11 (2.6)
AP-FGIDs	39 (9.4)
Functional dyspepsia	2 (0.5)
Irritable bowel syndrome	20 (4.8)
Abdominal migraine	10 (2.4)
Functional abdominal pain	10 (2.4)
Functional abdominal pain syndrome	3 (0.7)
Defecation disorders	50 (12.0)
Functional constipation	49 (11.8)
Nonretentive fecal incontinence	1 (0.2)

AP-FGIDs = abdominal pain-related functional gastrointestinal disorders; FGIDs = functional gastrointestinal disorders.

Comparison Between Quito (Ecuador) and Pasto (Colombia)

The prevalence of the 2 major FGID groups, AP-FGIDs, and functional defecation disorders was compared with the results from the previously mentioned Colombian study (6). Cumulatively, AP-FGIDs had a similar prevalence in both cities (10.4 % in Quito, 10.8 % in Pasto, $P = 0.248$). Defecation disorders occurred less frequently in Quito compared with Pasto (12.0 % vs 16.9 %), but this difference was not significant ($P = 0.053$).

DISCUSSION

The present study is the first study that assesses the prevalence of FGIDs in schoolchildren in Ecuador. It is the second study to report on the prevalence of FGIDs in schoolchildren in Latin America. This is also the first study designed to compare the prevalence of FGIDs in neighboring cities in 2 developing countries in Latin America. The present study was conducted after the recent recommendations of the Rome Foundation that advocate multicultural, multinational research to better define the epidemiology, symptoms, co-morbidity, and health-related quality of life in children with FGIDs (17).

Our survey study found that almost 23% of schoolchildren in Ecuador had an FGID according to the Rome III criteria. The most prevalent FGID was functional constipation, followed by irritable bowel syndrome (IBS). These results are similar to the results from the previous study from Pasto, Colombia (6).

An increased incidence of FGIDs, especially IBS, after gastrointestinal and nongastrointestinal infectious diseases has been reported; this is known as postinfectious FGIDs (18–21). An interesting finding in the present study is that the prevalence of AP-FGIDs was similar in both studies from Quito and Pasto. Quito is a much larger city than Pasto and there is a significant difference in population density between the 2 cities; Quito has 4567 inhabitants/km^2, whereas Pasto has 621 inhabitants/km^2. Even though a

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higher population density in cities of limited means may be associated with a higher infectious rate that could in turn result in a higher incidence of postinfectious IBS, we found a similar prevalence of IBS in both the samples. This effect may have been outweighed in our studies by a higher exposure to infections in both the groups. Present studies on postinfectious IBS in both adults and children have investigated the prevalence and incidence of post-infectious IBS after infection outbreaks in cohorts of subjects who usually had a history of a single infection, without analyzing the effect that repeated infections may have in the pathogenesis of postinfectious IBS (20,22–33). Most of these studies have been conducted in highly developed countries. Children from developing countries, such as Ecuador and Colombia, may be exposed to more infections and a higher load of microbial exposure since early in life, compared with children from developed countries. Moreover, it could be hypothesized that children who were exposed to early and high microbial exposure have an early immune challenge that may have affected how they react to future infections, which may also have an effect on the prevalence of postinfectious IBS.

The prevalence of FGIDs found in these studies resembles the prevalence found in a study in a tertiary care and a primary care office in Connecticut where the prevalence of FGIDs was 27% (28). This is interesting, because it is likely that there are important differences in genetics and environmental influences (such as diet, infectious patterns and agents, gut flora, family interaction, sociocultural milieu) between the children from Ecuador, Colombia, and the USA. It could be hypothesized that some of the factors that have been proposed in the multifactorial theories explaining FGIDs have a smaller effect than they are sometimes attributed or that the effect of each of these factors is outweighed and balanced either by unrecognized factors or by structures or pathways in the brain-gut axis that ''reign'' and reduce the overall effect of the remaining factors. Answering these questions goes beyond the scope of our study and is impeded by our study design, but this generates interesting new questions and hypotheses, which is one of the benefits of conducting international epidemiological studies like this.

There are limitations to our study. Based on this single-city study, we cannot determine whether the results of this sample can be extrapolated to Ecuador as a whole, therefore nationwide studies are needed. In clinical practice, diagnosing FGIDs is based on a thorough medical history and a complete physical examination by a physician, not on a questionnaire. Because the aim of this study was, however, to assess the prevalence of FGIDs in a population-based cohort of children, taking a medical history and performing a physical examination (with a digital rectal examination in some cases) was not feasible, nor ethically acceptable. Furthermore, the questionnaire was filled out by children ages 8 to 15 years whereas the English version of the QPGS-III is only validated for children 10 years and older and the Spanish translation was validated in children 11 years and older. This is a limitation of our study; however, children received elaborate instructions regarding the study. This level of support prior to and during the survey study is fairly unique and we consider this to be a strength of our study. These methods should also have decreased the risk of potential misunderstandings due to vocabulary differences between the 2 cities.

Some of the strengths of our study are the standardized methods, the large sample size, and the collection of data from both public and private schools, which limits the selection bias of our sample. Furthermore, the response rate in our study was extremely high. Although we did not evaluate why this was the case, we hypothesize that this may be related to the fact that children filled out the questionnaires in class, resulting in a minimal burden for the parents. In addition, this type of survey studies are far less commonly conducted in Ecuador compared with developed countries and instead of seeing it as a burden, parents and children may have been intrigued and interested by the study, leading to a high response rate.

In conclusion, with this survey study we found a high prevalence of FGIDs in children from Quito, Ecuador; 22.8% of schoolchildren fulfilled criteria for at least 1 FGID. Functional constipation was the most common FGID, followed by IBS. These results are similar to previously published data from a study conducted in neighboring country Colombia. The results of this study and other epidemiological studies raise interesting questions on the pathophysiology of FGIDs.

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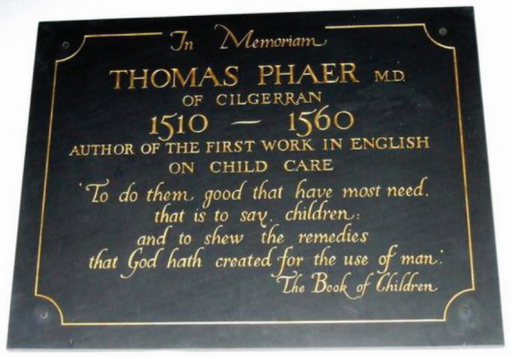
Thomas Phaer on Vomiting

Thomas Phaer (1510–1560), called by some the ''Father of English Pediatrics,'' in 1544 published, in English, a text exclusively devoted to diseases of children. It was named *The Boke of Children,* and in a chapter devoted to the stomach he describes the treatment of vomiting according to Rhazes (865–925). The passage is reproduced below exactly as written followed by a more liberal rendition with modern spellings.

> Rasis, solemn practicioner among phisicisions, affirmeth that he healed a greate multitude of his dysease onelye with the practyse followynge, which he taketh to be of great effecte in all lyke cases.
> Fyrst he maketh as it were an electuarye of pothecarye stuff, that is to saye, lignum aloes, mastyke, of everye one halfe a dramme, galles halfe a scruple, make a lectuarye with syrupe of roses and gallia muscata and sugre.
> Of thys he gave the children to eate a very lytle at ones and often. Afterwards he made a plastre thus: Rx. Mastke, aloes, sloes, galles, frankensence, and brent bread, of eche a like portion; make a plaistre with oyle and syrupe of roses to be layed on the childes stomake hote.[1]
>
> Thomas Phayer, *The Boke of Chyldren* (1544).

1. ''Rhazes, a serious practitioner among physicians, affirms that he healed many just by employing the following prescription. First he prepares a sweet concoction (*electuary*) of aloe and mastic, both at 1/16 oz (*a dram is 60 grains*), with 10 grains (*a scruple is 20 grains*) of fungal gall of the oak tree, with rose extract, gall wine and sugar. Of this he gives a small dose a first, followed by frequent doses. After, he makes a poultice of mastic, aloe, blackthorn plum (*sloes*), fungal gall, frankincense, and a dough of grass fungal spores (*brent bread*), all ingredients in equal parts and mixed with rose oil to be heated and placed over the child's stomach.''



Phaer memorial in Church of Cilberran, Wales. Wikimedia Commons.

—Submitted by Angel Rafael Colón

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