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## **An epidemiological study of functional gastrointestinal disorders in school going children and adolescents**

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### **Abstract**

The epidemiology of functional gastrointestinal disorders (FGIDs) in developed and developing countries involves a high prevalence of constipation and irritable bowel syndrome. This study examined the prevalence of functional gastrointestinal disorders in schoolchildren and adolescents. A cross-sectional study was performed on Colombian children between 8 and 17 years old. The Spanish version of the Questionnaire on Pediatric Gastrointestinal Symptoms-Rome III Version self-report form was answered by students from two schools. The prevalence of FGID was calculated and correlation tests were conducted among the variables analyzed. A total of 864 children with a mean age of  $12.5 \pm 2.5$  years were analyzed; 50.7% were female. Two hundred and fifty-nine children (30%) had at least one FGID, and of these, 163 were female (62.9%). Sixty-nine children had two or more FGIDs (8%). Functional constipation was the most prevalent disorder (13.2%), followed in order by abdominal migraine (8.3%), irritable bowel syndrome (6.9%), and aerophagia (3.1%). A significantly higher prevalence of FGID was observed in females ( $p=0.000$ ). No significant difference was observed between the age groups or type of school they attended. The overall prevalence of FGID in the sample was 30%, with functional constipation being the most common. These results are similar to those of other prevalence studies reported elsewhere.

**Keywords:** Constipation, developing countries, epidemiology, irritable bowel syndrome, schools

### **Introduction**

Functional gastrointestinal disorders (FGIDs) are entities, in which there is an alteration in the interaction between the brain and digestive tract without an organic cause to explain it. Multiple pathophysiological mechanisms have been de-scribed, such as motility disturbance, visceral hypersensitivity, altered mucosal and immune function, altered gut microbiota, and altered central nervous system processing. Functional gastrointestinal symptoms have been noted for centuries, the functional gastrointestinal disorders (FGIDs) emerged only over the past several decades. Our conceptual understanding of their origins and clinical features evolved from a dualistic and reductive perspective to a more comprehensive biopsychosocial model<sup>[1,2]</sup> and the scientific bases for symptom generation changed from being disorders of motility to the more inclusive disturbances of neuro-gastroenterology and brain-gut interactions<sup>[3]</sup>. This evolution has legitimized FGIDs to patients and health care providers and nurtured the science to better characterize these disorders and produce new drug discoveries and treatments. Statement of the research problem: the statement of the research problem is reported as under:

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**Table 1:** Characteristics of the Students Analyzed

Variable	Total (n=864)	With FGID (n=259)	Without FGID (n=605)	OR (95% CI)	p-value <sup>a</sup>
Gender				0.491 (0.364-0.662)	0.000
Male	426 (49.3)	96 (22.5)	330 (77.5)		
Female	438 (50.7)	163 (37.2)	275 (62.8)		
Age (years)				1.092 (0.816-1.462)	0.552
8-12	437 (50.6)	135 (30.9)	302 (69.1)		
13-17	427 (49.4)	124 (29.0)	303 (71.0)		
School type				0.733 (0.577-1.036)	0.085
Public	492 (56.9)	136 (27.6)	356 (72.4)		
Private	372 (43.1)	123 (33.1)	249 (66.9)		

Values are presented as n (%) unless otherwise indicated.

FGID, functional gastrointestinal disorder, OR, odds ratio, CI, confidence interval.

<sup>a</sup>Chi-square test.

**Table 2:** Frequency of Results of the Rome III Questionnaire

Results	Total (n=864)	Women (n=438)	Men (n=426)
Without FGID	605 (70)	275 (62.8)	330 (77.5)
With at least one FGID	259 (30)	163 (37.2)	96 (22.5)
One FGID	190 (22)	118 (26.9)	72 (17)
Two FGID	57 (6.6)	35 (8)	22 (5)
Three FGID	10 (1.2)	8 (1.8)	2 (0.5)
Four FGID	2 (0.2)	2 (0.5)	0
Values are presented as n (%).			
FGID, functional gastrointestinal disorders.			

**Table 3:** Distribution of Specific Diagnoses in Students with 1, 2, 3 or 4 Functional Gastrointestinal Disorder

One diagnoses (n=190)	Two diagnoses (n=57)	Three diagnoses (n=10)	Four diagnose (n=2)
IBS 30(3.5)	FC+APG 6(0.69)	FC+AM+APG 1 (0.1)	FD+FC+AM+APG 1 (0.1)
FD 10(1.2)	FC+AM 10(1.2)	FAP+FC+CVS 1 (0.1)	IBS+APG+CVS+ARS 1 (0.1)
FAP 13(1.5)	FD+AM 4(0.5)	FD+FC+APG 1 (0.1)	
FAPS 6(0.7)	IBS+AM 15(1.7)	FD+FC+AM 1 (0.1)	
AM 35(4)	IBS+APG 8(0.9)	FC+AM+ARS 1 (0.1)	
FC 84(9.4)	FD+APG 1(0.1)	AM+APG+CVS 1 (0.1)	
APG 1(0.1)	AM+APG 1(0.1)	IBS+AM+APG 2 (0.23)	
CVS 7(0.8)	FAPS+APG 1(0.1)	IBS+APG+CVS 2 (0.23)	
ARS 4(0.5)	Others 11(1.3)		

Values are presented as n (%).

IBS, irritable bowel syndrome, FC, functional constipation, APG, aerophagia, AM, abdominal migraine, FD, functional dyspepsia, FAP, functional abdominal pain, CVS, cyclic vomiting syndrome, ARS, adolescent rumination syndrome, FAPS, functional abdominal pain syndrome.

A comparison was made between the groups with a Chi-square test and Mann Whitney U test, when appropriate. The OR was calculated to evaluate the effect of potential risk factors, such as sex, age, and type of school, on the prevalence of FGID. P-values <0.05 were considered significant. Nine hundred twenty-four students were invited to participate in the study (537 from the public school and 387 from the private school), with an age range of eight to 17 years. Sixty students were excluded due to organic diseases, recent abdominal surgery, and ingestion of medications that could affect the gastrointestinal motility or because they not adequately answer the S-QPGS-III (39 students). No significant differences in age or sex were observed between those who were discarded and those who participated in the study. A total of 864 children with a mean age of 12.5±2.5 years (range of eight to 17 years) were analyzed; 50.7% were female. Four hundred and ninety-two children attended the public school and 372 attended the private school. Table 1 lists the characteristics of the subjects. Two hundred and fifty-nine children (30%) met. The mean age in this group was 12.3±2.7 years and 163 were women (62.9%). Sixty-nine (8%) children presented

with two or more FGID. Of the 259 students with a FGID, 190 (73.3%) had one diagnosis, 57 (22%) had two, 10 (3.9%) had three, and two (0.8%) had four. The most frequent combinations were irritable bowel syndrome + aerophagia, functional constipation + abdominal migraine, functional constipation + aerophagia, and irritable bowel syndrome + abdominal migraine. Table 2 lists the frequency of FGID in the study and Table 3 presents the distribution of the specific diagnoses in students with the most frequent combination of FGID. Functional constipation was the most prevalent disorder (13.2%), followed in order by abdominal migraine (8.3%), irritable bowel syndrome (6.9%), and aerophagia (3.1%). Table 4 lists the distribution of FGID. A significantly higher prevalence of FGID was observed in girls (37.2% vs. 22.5%, p=0.000). No significant differences in the prevalence of FGID were observed among students 12 years old or younger and more than 12 years old (30.9% vs. 29%, p=0.552). No significant differences in the prevalence of FGID were found among students in the private school compared to the public school (33.1% vs. 27.6%, p=0.085).

## Discussion

This is the second prevalence study of FGID carried out in a school and adolescent population in Colombia with a previous study conducted in the city of Pasto [3]. In this study, the overall prevalence of FGID was 30% with a predominance of functional constipation (13.2%), abdominal migraine (8.3%), irritable bowel syndrome (6.9%) and aerophagia (3.1%). Women had a significantly higher prevalence in the overall FGID and specifically in irritable bowel syndrome, abdominal migraine, aerophagia, and cyclic vomiting syndrome. No significant difference was observed in the prevalence of FGID at different ages or the type of school.

The results of the prevalence studies of FGID depend on the person who answers the questionnaire (patient or parents), instrument used (Rome II or Rome III), and if they are population studies (9.9-29%) [18] or were carried out in specialized clinics (87%) [19]. One of the objectives of population studies is to identify the differences that can help explain how environmental, dietary, genetic, and sociocultural factors influence diseases. Therefore, it is important to compare studies with others that have similar methodologies.

Similar results were obtained when the overall prevalence of FGIDs in this study was compared with other studies, e.g., the results of the study in the city of Pasto, Colombia (29%) [3] Panama (28.7%) [6], Mexico (27.3%) [5], Ecuador (22.8%) [2] and Sri Lanka (28.8%) [9]. Some similarity was noted when the prevalence of each disorder was analyzed separately in all studies in countries of Latin America; functional constipation was the most prevalent disorder followed by functional abdominal pain disorders [2-6]. Although functional abdominal pain disorders are more frequent in studies conducted in Asian countries. These findings could be explained by similar genetic, environmental, and sociocultural factors in these regions.

These results show a higher prevalence of aerophagia and abdominal migraine, the latter being the second most frequent disorder. These findings may have several explanations. With the change of the Rome II to Rome III criteria, the prevalence of abdominal migraine increased from 5.7% to 23% and so did the proportion of patients who had the criteria for two or more FGIDs (4.1% Rome II vs. 13% Rome III) [20]. This increase in prevalence was due partly to changes in the criteria of the symptoms associated with the episodes of abdominal.

The limitations of this study are that there was no gathering of other demographic and family data, which serves as potential risk factor for the development of FGID. The sample is limited only to the population of a region of the country, so the data cannot be generalized to the entire Colombian population and it should be considered a study at a national level. The diagnosis of the FGID was made by the interpretation of the S-QPGS-III answered by the children, avoiding an interrogation and complete physical examination to exclude other pathologies. In addition, the answers could have been subjective with the risk of errors in the results. The information from the parents was not considered. Finally, the S-QPGS-III was validated for children over 10 years of age, even though the translation into Spanish and validated for the study population has already been applied to other countries by the Functional International Digestive Epidemiological Research Survey group [2-6], with similar populations.

In conclusion, a high prevalence of FGID was found in Colombian children with a higher prevalence of functional constipation, irritable bowel syndrome, abdominal migraine, and aerophagia. Females had a significantly higher prevalence of FGID, without significant differences by age groups or by type of school. These results are similar to those presented in other Latin American countries. This study can be replicated in more regions of the country, with more complete sociodemographic information and the implementation of the Rome IV questionnaire.

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