

# National Prevalence of Functional Gastrointestinal Disorders in Jordanian Children

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**Introduction:** Functional gastrointestinal disorders are common in children. After the introduction of Rome criteria for diagnosis, assessment of prevalence of such disorders became an attainable goal. Since data from our part of the world are scarce, this study aimed at estimating the prevalence of functional gastrointestinal disorders in Jordanian children.

**Patients and Methods:** In a school-based cross-sectional study, recruited children between the age of 4 and 18 were asked to fill the Arabic version of the Questionnaire on Pediatric Gastrointestinal Symptoms-Rome III Version (QPGS-RIII). Patients were identified based on meeting the ROME III criteria.

**Results:** Of 2000 children that were recruited, 1587 (79.4%) returned completed questionnaires. Males accounted for 841 (53%) of participants. Mean age was 10.2 years (range, 4 to 18 years). A total of 815 (51.4%) of participants were younger group (4 to 10 years of age), mean  $\pm$  SD age of the two age groups was  $8.1 \pm 1.4$  and  $14.0 \pm 1.8$  years, respectively. Overall, 514 (32.4%) children met the criteria for having at least one FGID. The most common FGIDs in Jordanian children were functional constipation, followed by Aerophagia, abdominal migraine, and irritable bowel syndrome (prevalence estimates of 16.0%, 7.0%, 5.1%, and 3.6%, respectively). FGIDs were more common in younger girls and older boys but were not statistically significant. Concomitant presence of more than one FGID was observed in almost 15% and 22% of younger and older age groups, respectively.

**Conclusion:** Functional gastrointestinal disorders (FGIDs) are common in Jordanian school children. Functional constipation is the most common disorder. Further studies investigating the predisposing factors in our population are needed.

**Keywords:** children, Mediterranean, Arab, functional, gastrointestinal, constipation, aerophagia

## Introduction

Functional gastrointestinal disorders (FGIDs) represent a group of chronic or recurrent gastrointestinal symptoms with no underlying biochemical derangement or structural abnormality. Rome III criteria classify these disorders according to the presenting symptoms. The Rome Foundation has validated the use of diagnostic criteria for diagnosis and classification of FGIDs, which alleviates the need for an exhaustive investigative diagnosis-by-exclusion approach.<sup>1</sup>

Previous epidemiologic studies estimate that the prevalence of FGIDs among children is 12 to 29%.<sup>2,3</sup> Data from Jordan are limited to a previous small study of school children from south Jordan, which estimated that the prevalence of abdominal pain-predominant FGIDs was nearly 25%.<sup>4</sup> There is a need for a larger national study that includes a wider age range and all FGID subtypes. The combined efforts of

various working groups for the Mediterranean-European Area Project (MEAP) to investigate the epidemiology of FGIDs in nine countries gave us the opportunity to study the Jordanian population in greater detail.<sup>5</sup>

Results from MEAP showed that FGIDs affect 20.7% of children between 4 to 10 years of age, and nearly 26.6% of children between 11 and 18 years of age.<sup>5</sup> Pooling the data from thousands of children from the nine countries included in MEAP provided valuable epidemiological information. However, reporting data from individual countries can shed light on the unique features of the populations of each country that participated in MEAP.

The aim of this study was to provide a more in-depth description of the epidemiology of FGIDs in the population of Jordanian school children that was included in MEAP.

## Materials and Methods

### Study Population

A cross-sectional study of school children (kindergarten through high school) was conducted in the four most populous cities in Jordan, including the capital city of Amman, and two smaller cities to encompass all geographic regions of the country. The participating subjects composed of both urban and rural communities; except for Amman, the capital city; were most of the community is urban. Schools were randomly selected to represent the selected cities, and both public and private schools were included.

### Ethical Approval

The study was granted approval by the Ethics committee at Mutah University.

Permission was obtained from the administrators of each school before the research team visited to explain the study. For participating children, informed consent was obtained from parents for younger children (4 to 10 years of age), and from the participants themselves for older children (11 to 18 years of age). Older children were asked to complete the Arabic version of the self-report form of the Rome III Questionnaire on Pediatric Gastrointestinal Symptoms (QPGS-RIII).

The Arabic version of the questionnaires was developed and validated according to the ROME foundation translation guidelines and the foundation direct supervision by the first author. The ROME foundation adopted the Arabic version and made it available through its website.<sup>6</sup>

The questionnaire was distributed in the classrooms in an examination-like setting to ensure confidentiality and privacy. Children were given unlimited time to complete the questionnaire, and a member of the research team was available to answer any questions during completion of the questionnaire. Parents of younger children were asked to complete the Arabic version of the parent-report form of the QPGS-RIII at home and to return it with their children the following day.

### Statistical Methods

SPSS Package Version 17 (IBM, Armonk, NY, USA) was used. Results were summarized as mean with range. Categorical data were analyzed using the Fisher's exact test, and continuous data were analyzed using a two-sided *t*-test. Values of  $P < 0.05$  were considered significant.

## Results

Of 2000 children that were recruited, 1587 (79.4%) returned completed questionnaires. Males accounted for 841 (53%) of participants. Mean age was 10.2 years (range, 4 to 18 years). According to age group, 815 (51.4%) of participants were younger children (4 to 10 years of age), and 772 (48.6%) were older children (11 to 18 years of age). Mean  $\pm$  SD age of younger and older children was  $8.1 \pm 1.4$  and  $14.0 \pm 1.8$  years, respectively. Overall, 514 (32.4%) children met the criteria for having at least one FGID. The most common FGIDs in Jordanian children were functional constipation, followed by aerophagia, abdominal migraine, and irritable bowel syndrome (prevalence estimates of 16.0%, 7.0%, 5.1%, and 3.6%, respectively).

Age-group differences:

The overall prevalence of FGIDs in older children (40%) was significantly higher than that in younger children (25%) (Table 1;  $P < 0.005$ ). Similar age-group differences were noted for most of the disorders, but were only significant for functional constipation, abdominal migraine, cyclic vomiting, irritable bowel syndrome, and aerophagia.

### Gender Differences

Among younger children, the overall prevalence of FGIDs was higher in females (54.4%) than in males (45.6%), although this difference was not significant (Table 2). Conversely, among older children, the overall prevalence of FGIDs was significantly higher in males (56.8%) than in females (43.2%) (Table 3). Functional constipation was

**Table 1** Prevalence of Functional Gastrointestinal Disorders Among Jordanian School Children, by Age Group

Disorder	Age Group		P-value
	4 to 10 Years Old No. Cases/ No. Respondents (%)	11 to 18 Years Old No. Cases/ No. Respondents (%)	
Cyclic vomiting	7/701 (1)	18/667 (2.7)	0.0192
Rumination	3/723 (0.4)	2/616 (0.3)	0.808
Aerophagia	32/701 (4.6)	62/650 (9.5)	0.004
Functional dyspepsia	1/810 (0.1)	5/762 (0.6)	0.109
Irritable bowel syndrome	20/772 (2.6)	34/725 (4.69)	0.0306
Abdominal migraine	23/658 (3.5)	47/713 (6.59)	0.0096
Functional abdominal pain (lower)	8/808 (0.99)	8/753 (1.06)	0.8908
Functional abdominal pain (upper)	5/808 (0.62)	9/762 (1.18)	0.2384
Functional abdominal pain syndrome (lower)	1/658 (0.15)	3/753 (0.4)	0.3813
Functional abdominal pain syndrome (upper)	2/811 (0.24)	1/762 (0.1)	0.6136
Functional constipation	96/713 (13.4)	120/633 (18.96)	0.0148
Fecal incontinence	6/757 (0.79)	1/630 (0.16)	0.972
Presence of two disorders in the same child	15.5%	22.3%	0.0580
Presence of three or more disorders in the same child	3%	7%	0.0570
Total	204/815 (25)	310/772 (40)	<0.001

**Table 2** Prevalence of Functional Gastrointestinal Disorders Among Jordanian School Children in Younger Age Group (4 to 10 Years of Age), by Gender

Disorder (No. of Cases)	Gender		P-value
	Male No. of Cases (%)	Female No. of Cases (%)	
Cyclic vomiting (7)	4 (57.1)	3 (42.9)	0.717
Rumination (3)	2 (66.7)	1 (33.3)	0.602
Aerophagia (32)	14 (43.8)	18 (56.2)	0.485
Functional dyspepsia (1)	1 (100)	0 (0)	–
Irritable bowel syndrome (20)	11 (55)	9 (45)	0.658
Abdominal migraine (23)	11 (47.6)	12 (52.2)	0.835
Functional abdominal pain (lower) (8)	4 (50)	4 (50)	1.000
Functional abdominal pain (upper) (5)	1 (20)	4 (80)	0.169
Functional abdominal pain syndrome (lower) (1)	0 (0)	1 (100)	–
Functional abdominal pain syndrome (upper) (2)	0 (0)	2 (100)	–
Functional constipation (96)	42 (43.8)	54 (56.2)	0.224
Fecal incontinence (6)	3 (50)	3 (50)	1.000
Total	93 (45.6)	111 (54.4)	0.209

the only disorder for which there was significant difference in prevalence between genders, with a significantly higher prevalence in males than in females in the older age group.

### Concomitant Presence of More Than One FGID

The prevalence of having two FGIDs was lower (15.5%) in younger children than in older children (22.3%),

although this difference was not significant ( $P = 0.058$ ). Similarly, the prevalence of having more than two disorders was lower in younger children than in older children, but the difference was not significant (3% versus 7%, respectively;  $P = 0.057$ ). In both age groups, the most common combination was Aerophagia and functional constipation, comprising more than one third of the combined disorders in both age groups.

**Table 3** Prevalence of Functional Gastrointestinal Disorders Among Jordanian School Children in Older Age Group (11 to 18 Years of Age), by Gender

Disorder (No. of Cases)	Gender		P-value
	Male No. of Cases (%)	Female No. of Cases (%)	
Cyclic vomiting (18)	12 (66.7)	6 (33.3)	0.144
Rumination (2)	0 (0)	2 (100)	–
Aerophagia (62)	35 (56.4)	27 (34.6)	0.0314
Functional dyspepsia (5)	4 (80.0)	1 (20.0)	0.168
Irritable bowel syndrome (34)	16 (47.0)	18 (53.0)	0.441
Abdominal migraine	23 (48.9)	24 (51.1)	0.832
Functional abdominal pain (lower) (8)	7 (87.5)	1 (12.5)	0.0149
Functional abdominal pain (upper) (9)	4 (44.4)	5 (55.6)	0.653
Functional abdominal pain syndrome (lower) (3)	1 (33.3)	2 (66.7)	0.459
Functional abdominal pain syndrome (upper) (1)	0 (0)	1 (100)	–
Functional constipation (120)	73 (60.8)	47 (39.2)	0.017
Fecal incontinence (1)	1 (100)	0 (0)	–
Total	176 (56.8)	134 (43.2)	0.016

## Discussion

Functional gastrointestinal disorders in children are a common health issue, affecting almost one-third of children in some communities.<sup>7</sup> Epidemiological studies to estimate the prevalence of FGIDs in communities can help determine the scope of the problem and provide data to health planners who manage resources in those communities, which is particularly useful in low-resource countries.<sup>8</sup>

Although questionnaire-based studies inherently lack the precision of clinical evaluation, they are an important method for investigating FGIDs, given the lack of screening or diagnostic tests for such disorders. In addition, validated symptom-based questionnaires that use Rome III criteria are available for identification of these disorders.<sup>3</sup>

Symptom-based questionnaires that use Rome III criteria have been used to conduct multiple FGID prevalence studies in various communities worldwide.<sup>8–10</sup> The results of these previous studies indicate that FGIDs occur worldwide and suggest that differences in the overall prevalence and prevalence of subtypes might result from population-based differences in genetic, environmental, dietary, social, and other factors.<sup>1</sup>

Previous reports from Latin America showed different rates of FGIDs in school children although of the geographical adjacency and Latin American background.<sup>8,11–14</sup> The estimation of FGID prevalence among children in the Mediterranean area and parts of Europe by MEAP represents the largest study of its kind and provides insights on the effect of gender and age on prevalence.<sup>5</sup>

The inclusion of Jordan in MEAP provided the chance for running the first nationwide estimate of the prevalence of FGIDs among Jordanian children. Although reporting the studied area as a group in the MEAP study,<sup>5</sup> providing the local data described the gender effect on each single disorder, specifications of concomitant presence of multiple disorders and comparison of our results with economically similar countries rather than high-resource communities.

The present study highlighted some noteworthy patterns in the prevalence of FGIDs among Jordanian children. The availability of this data will facilitate health care plans. In addition, data from the Jordanian population provide insights into an ethnic population for which data are lacking in the literature. The overall prevalence of FGIDs in Jordanian children was 32.4%, which is somewhat higher than previously reported estimates from other developing countries, such as Ecuador (22.8%)<sup>8</sup> and Sri Lanka (28.7%).<sup>9</sup> A previous study in Egypt<sup>10</sup> that used the same questionnaires (Arabic version of the parent-report and self-report QPGS-RIII) and age group (4 to 18 years of age) as were used in the present study indicated that 25.7% of Egyptian children are affected by FGIDs. A study of school children in Colombia<sup>11</sup> reported a prevalence rate of 30%, which is similar to that of the present study. The lower prevalence in Ecuador,<sup>8</sup> Sri Lanka<sup>9</sup> and Egypt<sup>10</sup> might reflect the types of food and fiber content of the foods consumed in these countries. Difference between the present study and some of the previous studies with respect to the age groups

investigated may also explain some of the variations in prevalence estimates.

Functional constipation was the most prevalent FGID among children in our study population, which is consistent with findings from multiple studies in Latin America.<sup>8,11-14</sup> Interestingly, Lu et al<sup>14</sup> reported a similar prevalence of functional constipation (16%) in Panamanian children. Our results with respect to the prevalence of functional constipation were also in agreement with reports from other parts of the world such as the United States<sup>2</sup> and Greece.<sup>15</sup>

Aerophagia was the second most prevalent FGID in the present study, followed by abdominal migraine and irritable bowel syndrome. Although the same disorders were identified in previous studies<sup>8-15</sup> the frequency with which they occur varies.

In the present study, the prevalence of FGIDs was 40% in older children (11 to 18 years of age), compared with 25% in younger children (4 to 10 years of age), which was a significant difference. Most FGIDs occurred predominantly in older children, but the difference was significantly different only for the most common ones (ie, functional constipation, aerophagia, irritable bowel syndrome, abdominal migraine, and cyclic vomiting). Differences in the method used to complete the questionnaires (self-report versus parent-report) should be considered when interpreting these results. Results from MEAP also reported a higher prevalence of FGIDs in older children than in younger children.<sup>5</sup> Similarly, a study of children in El Salvador reported that older children have a higher prevalence of FGIDs.<sup>12</sup>

Comparing Jordanian prevalence rates with other developing countries different in race and food culture, while still numbers are comparable might point to the importance of socio-economical status over other factors in development of FGIDs in children.

Among older children in the present study, the overall prevalence of FGIDs was significantly higher in males than in females. A similar difference was reported in a study of Sri Lankan<sup>9</sup> adolescents, although the difference was not significant. Among younger children, the prevalence of some FGIDs was higher in females, but none of these differences were significant. For older Jordanian children, the prevalence of functional constipation was significantly higher in males than in females. Similar gender differences in the prevalence of functional constipation were reported by Lewis et al in American children<sup>2</sup> and Devanarayana et al in Sri Lankan children.<sup>9</sup> Conversely, among older children in the present study, the prevalence

of irritable bowel syndrome was higher in females than in males. Although this difference was not significant, it is consistent with findings from previous studies.<sup>10-15</sup>

In our study, a notable percentage of participating children met the criteria for having more than one FGID. Among younger children, 15.5% had two disorders and 3% had three or more disorders. These percentages were higher among older children (22.3% had two disorders and 7% had three or more disorders). These differences between age groups are similar to what has been reported in the literature.<sup>9-11</sup>

Our prevalence estimates for having more than one FGID are more than what is reported in the MEAP study, while lie between a prevalence of 6.6% in Colombian children<sup>11</sup> and 30.5% in Argentinian children.<sup>16</sup> Although our data could help strategic health planning, still carry some weaknesses. The study didn't address risk factors associated with development of FGIDs or the effect of FGIDs on the quality of life in Jordanian Children and further studies are needed. The study population represented most of the Jordanian children; unfortunately, underprivileged distant communities were underrepresented in this study.

In conclusion, FGIDs represent an important health issue in Jordanian children. Functional constipation was the most common disorder in both younger and older children, with a significantly higher prevalence in males than in females in the older age group. Diagnosis of one disorder should not prevent us from investigating other disorders. Further studies addressing the risk factors for development of FGIDs and its effect on the quality of life of affected children are necessary.

## Author Contributions

All authors made substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; took part in drafting the article or revising it critically for important intellectual content; agreed to submit to the current journal; gave final approval of the version to be published; and agree to be accountable for all aspects of the work.

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## Disclosure

The authors report no potential conflicts of interest for this work.



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