



Prevalence of Functional Gastrointestinal Disorders in Infants and Toddlers

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Objectives To determine the prevalence of gastrointestinal symptoms suggestive of an infant/toddler functional gastrointestinal disorder (FGID) as reported by parents in a representative community sample.

Study design Mothers (n = 320) of children aged 0-3 years old were recruited in the US and completed a questionnaire about their child's and their own gastrointestinal symptoms.

Results By Rome criteria, 27% of infants/toddlers qualified for FGIDs. Infant regurgitation was the most common disorder in infants and functional constipation in toddlers. No age, sex, or race differences were found in FGID diagnoses. Compared with those who did not meet Rome criteria, toddlers with FGID had lower quality of life (M = 80.1 vs M = 90.3, $P < .001$), increased medical visits (M = 0.38 vs 0.14; $P < .05$), mental health visits (M = 0.29 vs 0.06; $P < .05$), and hospital stays (M = 0.35 vs 0.06; $P < .01$). A child was more likely to suffer from hard stools if the parent also reported hard stools ($P = .02$), but similar association was not found with loose stools.

Conclusions FGIDs are common in infants and toddlers and can be identified in the general population. They do not vary with sex and race. Quality of life is reduced in those with FGIDs. More research is needed into these largely neglected conditions as it may improve the lives of a significant number of young children. (*J Pediatr* 2015;166:684-9).

Since the publication of the first Rome criteria in 1999, the number of scientific publications on functional gastrointestinal disorders (FGIDs) in adults and children has increased rapidly,¹ but only a handful of studies related to infants and toddlers.²⁻⁷ Prevalence of most FGIDs in infants and toddlers is largely unknown. The 2 conditions for which most data exists are infant colic and regurgitation. Infant regurgitation is common and depends on the age of the infant. It peaks around 2-4 months of age (67%-87%), followed by a rapid decline and is only present in about 4%-8% of infants at 12 months of age.⁸⁻¹⁰ One study has included the stricter Rome criteria, and found infant regurgitation in 0.7% of 1020 infants by pediatrician report.¹¹ Estimates of prevalence rates for infant colic have ranged between 5% and 19% depending on the sampling method and definition.^{12,13} The purpose of the current study was to determine the prevalence of gastrointestinal symptoms suggestive of an infant/toddler FGID as reported by parents in a representative community sample.

Methods

Subjects were mothers of children aged 0-18 years recruited from respondents in all 50 states of the US, as well as Washington, DC, and Puerto Rico. Subjects were provided by Cint USA, Inc (www.cint.com) and consisted of individuals who have joined online panels to answer a variety of surveys (marketing, opinion polls, etc). Quota-based sampling was used to ensure equal sex composition for children and adequate representation of different age groups (infants, toddlers, children, and adolescents), and race/ethnic groups. This manuscript focuses only on parents of children 0-3 years old.

Mothers were approached to complete the survey about their child's symptoms because: (1) mothers are more likely to be the primary person to communicate with physician about their children's symptoms; (2) mothers are more often the primary caregiver and thus more likely to know about the child's symptoms; and (3) the overlap between parental and child symptoms has mostly been studied in mothers.

Data collection was completed during the first 2 weeks of June 2013. Parents were invited to complete a survey on 'child health.' No information was given that the survey purpose was to examine gastrointestinal symptoms, in order to avoid selection bias. All parents read an online consent form and electronically accepted study enrollment, after which they completed a secure online survey conducted with Qualtrics software. No identifying information was queried, so the survey was completely anonymous. If parents had more than 1 child, parents were asked to answer all questions only about the child whose name was first in an alphabetical order.

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

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Several control measures were taken to identify and exclude multiple entries and inconsistent reporting: (1) internet protocol address check allowed only 1 response from each computer device; (2) respondents who were not consistent on 3 Rome questions that were repeated or showed other evidence of indiscriminate responding, were eliminated; and (3) mothers who lived less than one-half of the time with their children were excluded, as well as mothers of children with inflammatory bowel disease and cancer. This study was approved by the Institutional Review Board of the University of North Carolina.

Rome Questionnaires

Currently, there is no validated diagnostic questionnaire for infant/toddler FGIDs although there is a validated questionnaire for child and adolescent FGIDs (Questionnaire on Pediatric Gastrointestinal Symptoms—Rome III Version [QPGS-RIII]).¹⁴⁻¹⁶ Therefore, we translated the Rome III infant and toddler diagnostic criteria into a series of questions about symptoms that would be easily understood by adults. Questionnaire items were constructed by the 3 of the authors and examined by 6 independent experts in FGID and questionnaire development including physicians, and psychologists for understandability and face validity. Most responses were either Likert-type scales or categorical responses. The resulting QPGS-RIII for infant/toddlers can be requested from the authors.

Mothers also completed the Functional Bowel Module of the Rome III questionnaire for adults,¹⁷ to assess their own symptoms. We only included the questions related to irritable bowel syndrome (IBS), functional dyspepsia, functional constipation, and functional diarrhea to limit participant burden.

Quality of Life

Quality of life was measured with the PedsQL4.0 Generic Core Scale, which encompasses physical, emotional, social, and school/day care functioning.¹⁸ Items were transformed to a scale of 0-100, with higher scores indicating better health related quality of life. Because the PedsQL4.0 Generic Core Scale is validated for children ages 2 years and up, data were collected for those children who were 2 and 3 years old.

Demographic and Health Questions

Questions included age, sex, and race/ethnicity of both mother and child, marital status, common health problems, use of common medications, number of school/work absences in the past 6 months, number of doctor's visits in past 6 months, household income, and state of residence.

Statistical Analyses

Descriptive analyses were conducted to provide results, presented in means with SDs and as percentages of the sample. T-tests provided comparisons between subgroups for continuous variables or χ^2 tests for categorical variables. There was no missing data because the Qualtrics system (<https://software.unc.edu/qualtrics/>) required all participants to complete each question before being able to complete the next question.

Results

A total of 1447 mothers completed the survey of which 320 respondents provided information about children 0-3 years old. A total of 264 (82.5%) were judged valid on all quality/validity checks and were included in data analysis. **Table I** contains the general characteristics of this sample. Most commonly endorsed physician diagnoses for mother were depression (11.7%), anxiety disorder (9.0%), heartburn/gastroesophageal reflux disease (9.0%), food allergies (6.0%), IBS (5.6%), and lactose intolerance (5.3%).

Rome Diagnoses

Tables II and **III** show Rome diagnoses and answer distribution of the 8 main symptoms. More than one-quarter of children (27.1%) qualified for at least 1 FGID. All 7 infant/toddler FGIDs occurred, with infant regurgitation as the most common disorder in infants and functional constipation in toddlers (**Table II**). Of the children with FGIDs, 79.2% qualified for only 1 FGID, 12.6% qualified for 2, and 8.2% qualified for 3 or more FGIDs. There was no significant difference between boys and girls in the number and kind of FGIDs. There were also no differences in the number and kind of FGID by ethnicity and race. We did not examine race differences for infants below the age of 1 year old as most race categories included less than 10 children.

Among mothers, 34.6% met criteria for at least one FGID, with IBS being the most common (**Table II**). Of mothers with FGIDs, 86.9% qualified for only 1 disorder, and 13.1% qualified for 2 FGIDs.

Medical Visits and Quality of Life

Quality of life data was available for 123 children aged 2 and 3 years. Overall, the mean quality of life score was comparable

Table I. Sample characteristics

	Child, mean (SD) or %	Mother, mean (SD) or %
Age	1.4 (1.2)	30.4 (6.2)
Sex (female)	47.7%	100%
Race/ethnicity		
Hispanic	26.7%	24.8%
Caucasian	56.8%	62.4%
African American	12.0%	11.7%
Asian	6.0%	9.0%
Mixed or nondisclosed	24.7%	14.2%
Cohabitation	Lives with mother, full-time, 99.2%	Married/cohabiting, 82.3%
Household income		
<\$25 000		22.2%
\$25 000-\$50 000		31.6%
\$50 000-100 000		31.6%
>\$100 000		9%
Parental education		
(some) high school		16.5%
(some) college		71.4%
(some) graduate school		12%
Quality of life	87.7 (15.3)	

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