Subtypes of Irritable Bowel Syndrome in Children and Adolescents

Mariella M. Self,[*,‡,§] Danita I. Czyzewski,[*,‡,§] Bruno P. Chumpitazi,[‡,§] Erica M. Weidler,[‡,§,||] and Robert J. Shulman[‡,§,||]

*Menninger Department of Psychiatry and Behavioral Sciences, and [‡]Department of Pediatrics, Baylor College of Medicine, Houston; [§]Texas Children's Hospital, Houston; and [||]U.S. Department of Agriculture/Agricultural Research Service Children's Nutrition Research Center, Houston, Texas

BACKGROUND & AIMS: **Pharmacologic treatments for irritable bowel syndrome (IBS) and medical management of symptoms are increasingly based on IBS subtype, so it is important to accurately differentiate patients. Few studies have classified subtypes of pediatric IBS, and conclusions have been challenged by methodologic limitations. We performed a prospective study to investigate the distribution of IBS subtypes among children and adolescents based on stool diary information, and compared subtypes according to demographic and pain characteristics.**

METHODS: **We studied 129 subjects, ages 7 to 18 years (mean age, 11.4 ± 2.8 y; 60.5% female; 69.0% white) who met Pediatric Rome III IBS criteria and were part of larger studies of children with functional gastrointestinal disorders, recruited from primary and tertiary care centers. Children completed daily pain and stool diaries for 2 weeks. Participants were assigned IBS subtypes based on their reported stool information per adult Rome III criteria. IBS subtypes were compared for demographic variables and pain characteristics.**

RESULTS: **IBS with constipation was the most common subtype of the disorder (58.1% of subjects), whereas mixed IBS was the least common (2.3% of subjects); 34.1% of subjects were unsubtyped IBS and 5.4% had IBS with diarrhea. The groups of different IBS subtypes did not differ significantly by sex, age, ethnicity, or pain characteristics.**

CONCLUSIONS: **In contrast to adults, in children, IBS with constipation and unsubtyped IBS are the most common subtypes, whereas IBS with diarrhea and mixed IBS are less common. Demographic and pain characteristics cannot distinguish subtypes.**

Keywords: Irritable Bowel Syndrome; IBS Subtypes; Children; Pediatric Functional GI Disorders.

In the current absence of a reliable and valid biomarker for irritable bowel syndrome (IBS), diagnosis is made according to symptom-based Rome III criteria.[1] Rome III criteria for adults use stool form to classify IBS patients into 4 subtypes: IBS with constipation (IBS-C), IBS with diarrhea (IBS-D), mixed type IBS (IBS-M), and unsubtyped IBS (IBS-U). Medical management of symptoms and clinical trials evaluating pharmacologic treatments for IBS increasingly are targeted to IBS subtype, underscoring the importance of reliably differentiating patients accordingly.[2–7]

In adults with IBS, the prevalence of subtypes varies by study, but in general subtype assignment by prospective diary data tends to yield a relatively even distribution among IBS-C, IBS-D, and IBS-U, with a smaller percentage of patients being classified as IBS-M.[8–13] Despite the importance of subtyping IBS from both a clinical and research perspective, few studies have described subtype classification in pediatric IBS, and only one small sample has been reported in a US population.

Two pediatric school-based Sri Lankan studies using self-report questionnaires described an approximately equal distribution of IBS-C, IBS-D, and IBS-M, but a lower prevalence of IBS-U.[14,15] Results from these studies were limited by the use of retrospective questionnaires, a method shown in adult and pediatric studies to be discordant with, and presumably less accurate than, prospective diaries of stool form.[8,10,13,16,17] Although our collaborative work investigating the intestinal microbiomes of children with IBS did use assignment of IBS subtype via prospective diary data, the sample contained only 22 children.[18] Thus, we sought to investigate IBS

Abbreviations used in this paper: BSFS, Bristol Stool Form Scale; GI, gastrointestinal; IBS, irritable bowel syndrome; IBS-C, irritable bowel syndrome with constipation; IBS-D, irritable bowel syndrome with diarrhea; IBS-M, mixed type irritable bowel syndrome; IBS-U, unsubtyped irritable bowel syndrome.

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subtype distribution in a significantly larger sample of children and adolescents based on prospective stool diary data and to compare subtype groups according to demographic and pain characteristics.

Methods

Recruitment and Data Collection

Participants were 129 patients, ages 7 to 18 years, with IBS as defined by Pediatric Rome III criteria who were part of larger studies of physiological and psychological characteristics of children with functional gastrointestinal (GI) disorders or who were part of dietary treatment trials.[19] Only baseline data obtained prior to intervention were included. Participants were recruited from primary (n = 52) and tertiary care (n = 77) clinics in a large academically affiliated pediatric health care network. Potential participants had been identified through general pediatric and pediatric gastroenterology chart review with International Classification of Diseases, 9th revision, codes 789.0 (abdominal pain) or 564.1 (irritable bowel syndrome). Parents of potential participants were contacted by mail and, if interested in participating, screened by telephone for inclusion/exclusion criteria.

Children were excluded from participation if telephone or chart review screening showed organic GI illness (or it remained in the differential as a cause of the pain), a significant chronic health condition requiring daily medication or specialty follow-up care, decreased growth velocity, GI blood loss, unexplained fever, vomiting, chronic severe diarrhea, weight loss of 5% or more of their body weight within a 3-month period, current use of anti-inflammatory medications, medications that would alter GI transit time, or previous use of GI medication that provided complete symptomatic relief. Additional exclusion criteria included lack of fluency in English (because the other studies required completion of psychological questionnaires only available in English) and learning or developmental challenges preventing diary completion. Participants who passed inclusion/exclusion criteria and qualified as IBS via mother-report on a telephone screening based on Pediatric Rome III criteria[20] were considered eligible. The study was approved by the Baylor College of Medicine Institutional Review Board and parent consent and child assent were obtained.

Pain and Stool Diary

At a home visit parents and children were instructed on the completion of a daily pain and stool diary for 2 weeks. Parents were asked to remind children to complete the diaries daily but to allow children to independently rate abdominal pain and record stool occurrence and form without influencing their responses. Children rated abdominal pain for 3 intervals each day (morning, midday/afternoon, and evening/nighttime) using a numeric scale of 0 to 10, anchored with the phrases "no pain at all" and "the worst pain you can imagine."[21] Children also reported the degree of activity interference caused by pain using a 4-point scale, ranging from no interference to "could not participate because of pain." Children recorded the time of each stool and rated its consistency using the Bristol Stool Form Scale (BSFS).[22]

Statistical Analysis

Statistics were performed using SPSS version 20.0 (IBM Corp, Armonk, NY). Mean pain rating, maximum pain rating, and number of pain episodes (defined as pain rating $\geq$1) were calculated for each participant over the 2 weeks. An average interference rating for pain episodes also was calculated for each participant.

Participants were classified into IBS subtypes by applying the Rome III criteria to their reported stool forms from the diary. Specifically, the percentage of stools reflecting constipation (ie, rated as a 1 or 2 on the BSFS) or diarrhea (ie, rated as a 6 or 7 on the BSFS) was calculated for each participant. Participants were classified into IBS subtypes as follows: IBS-C (hard stools $\geq$25% and loose stools <25%), IBS-D (loose stools $\geq$25% and hard stools <25%), IBS-M (hard stools and loose stools $\geq$25%), and IBS-U (hard stools and loose stools <25%), as proposed by Longstreth et al.[1] The prevalence of each IBS subtype then was calculated.

Chi-square tests were performed to compare subtype groups according to sex and race/ethnicity. One-way analysis of variance was used to compare IBS subtypes on age, mean abdominal pain rating, maximum pain rating, number of pain episodes, and average pain interference. Data are shown as mean $\pm$ SD.

Results

The mean age of the participants was 11.4 $\pm$ 2.8 years (range, 7–18 y), with 60.5% being female. The overall race/ethnicity distribution was as follows: 69.0% white, 17.1% black, 10.1% Hispanic, 3.1% Asian, and .8% multiracial. Regarding insurance status, 80.6% were covered by private insurance and 16.3% had Medicaid.

Irritable Bowel Syndrome Subtypes

The 129 children and adolescents were subtyped as follows: 75 (58.1%) with IBS-C, 44 (34.1%) with IBS-U, 7 (5.4%) with IBS-D, and 3 (2.3%) with IBS-M.

Irritable Bowel Syndrome Subtypes by Demographic Characteristics

Including all 4 IBS subtypes, distribution did not differ significantly by sex (χ^2 [3, N = 129] = 3.32; P = .10) (Table 1). When omitting IBS-D and IBS-M subtypes owing