



# Self-Perceived Food Intolerances Are Common and Associated with Clinical Severity in Childhood Irritable Bowel Syndrome



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## ABSTRACT

**Background** Adults with irritable bowel syndrome (IBS) frequently identify foods as exacerbating their gastrointestinal symptoms. In children with IBS, the prevalence of perceived food intolerances and their impact are unknown.

**Objective** Our aim was to determine the prevalence of self-perceived food intolerances and the relationship of these intolerances to abdominal pain, psychosocial distress, and quality of life in children with IBS.

**Design** We conducted a cross-sectional study. Questionnaire and prospective diary data were collected from 2008 to 2014 by trained research coordinators.

**Participants/setting** Participants were children 7 to 18 years old (pediatric Rome III IBS, n=154; age-sex matched healthy children, n=32) in Houston, TX.

**Measures** Perceived food intolerances and avoided foods were captured using the Childhood Food and Symptom Association Questionnaire. IBS severity was assessed by a  $\geq 7$ -day pain diary and validated psychosocial questionnaires assessing quality of life, somatization, functional disability, depression, and anxiety.

**Statistical analyses performed** We used descriptive Spearman bivariate correlation,  $\chi^2$ , and Poisson log-linear generalized model with Wald  $\chi^2$  statistics.

**Results** A greater proportion of children with IBS (143 of 154 [92.9%]) vs healthy children (20 of 32 [62.5%]) identified at least one self-perceived food intolerance ( $\chi^2=22.5$ ;  $P<0.001$ ). Children with IBS identified a greater number (median=4 [25% to 75% quartile=2 to 6]) of perceived symptom-inducing foods than healthy children (median=2 [25% to 75% quartile=0 to 4];  $\chi^2=28.6$ ;  $P<0.001$ ). Children with IBS avoided more foods (median=2 [25% to 75% quartile=1 to 4]) than healthy children (median=0 [25% to 75% quartile=0 to 2.75];  $\chi^2=20.8$ ;  $P<0.001$ ). The number of self-perceived food intolerances was weakly associated ( $r$  value range= -0.17 to 0.21) with pain frequency, pain severity, somatization, anxiety, functional disability, and decreased quality of life.

**Conclusions** Children with IBS have a high prevalence of self-perceived food intolerances. The number of these intolerances is weakly associated with measures of IBS severity.

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**I**RRITABLE BOWEL SYNDROME (IBS) IS A PREVALENT functional gastrointestinal (GI) disorder affecting up to 20% of school-aged children.<sup>1</sup> Factors that play a role in the clinical phenotype expressed include visceral hyperalgesia, gut microbiome, psychosocial distress (eg,

anxiety), and diet.<sup>2-4</sup> Up to 84% of adults with IBS identify foods within their diet that exacerbate GI symptoms.<sup>5,6</sup> This is higher than the self-perceived food intolerance prevalence of up to 34% in the general population.<sup>7,8</sup>

The number of perceived food intolerances in adults with IBS is associated with more severe GI symptoms.<sup>6,9</sup> Self-reported food intolerances in adults are also associated with psychosocial distress, such as somatization, anxiety, and decreased quality of life, although these associations have not been identified consistently.<sup>6,10</sup> Sex can also play a role, as women with IBS are more likely to identify food intolerances compared with men.<sup>6,10</sup>

In children with IBS, there is a dearth of information regarding self-perceived food intolerances and their clinical impact. A small mixed-methods study in children with several functional GI disorders found that self-perceived

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food intolerances qualitatively impacted several areas of quality of life negatively.<sup>11</sup> Another study in Finnish 10- and 11-year-olds with functional GI disorders found that a majority of parents identified their child as having a food-induced GI symptom.<sup>12</sup> Neither study evaluated the relationship of intolerances to child-reported psychosocial distress and/or GI symptoms. Given the possibility that self-perceived food intolerances can have a major influence on the clinical severity of childhood IBS, further elucidating the prevalence and role of self-perceived food intolerances is clinically important.

Given this unexplored but clinically important area, the primary objective of this study was to determine the prevalence of self-perceived food intolerances in children with IBS. In addition, the study secondarily sought to determine whether there was a relationship between the number of self-perceived food intolerances and the severity of GI symptoms (eg, abdominal pain), psychosocial distress (eg, somatization), and quality of life.

## MATERIALS AND METHODS

### Participants

Participants included children aged 7 to 18 years meeting Rome III diagnostic criteria for pediatric IBS<sup>1</sup> who were part of ongoing dietary intervention studies from 2008 to 2014. All children with IBS had completed a physician visit within the past year of enrollment and had not been identified with an organic etiology for their symptoms. Only baseline (before any intervention) information was used for this current report. Children with IBS and healthy children were recruited from the Texas Children's Pediatric Associates general pediatrics practices and additional children with IBS from the Texas Children's Hospital pediatric gastroenterology program, as described previously.<sup>13</sup> The screening process included investigator review of the subject's medical record to ensure investigations of symptoms (eg, laboratory testing) were negative.<sup>13</sup>

Healthy children were recruited based on absence of chronic illness and GI complaints and matched by age and sex in a 5:1 ratio to those with IBS. Although the differences between healthy children and those with IBS were unknown, the 5:1 ratio was initially chosen based on the much higher anticipated number of food intolerances in those with IBS vs healthy children.

Demographic information was captured for all participants. The Baylor College of Medicine Institutional Review Board approved the study protocol. Parents provided written informed consent, and children gave their assent.

### Procedure

Study procedures were completed during a home visit or hospital visit for all children with IBS. Children completed all questionnaires in a room independent from their parent. For children who were 7 to 10 years of age, questionnaires were read by a research coordinator using a standardized protocol to ensure reading difficulties did not affect responses. Healthy children were interviewed over the phone in the same manner as would have occurred during a visit. Healthy children completed the Childhood Food and Symptom Association Questionnaire only. The comprehensive severity of IBS

was evaluated through the use of the prospective pain diary, as well as through the use of the questionnaires.

### Determination of Food Intolerances and Avoided Foods

Participants completed the Childhood Food and Symptom Association Questionnaire assessing whether any of 97 foods (eg, oranges) or food types (eg, barbeque food) exacerbated their GI symptoms.<sup>11</sup> The food symptom association questionnaire was originally created and initially validated to assess symptoms in children with functional GI disorders.<sup>11</sup> This questionnaire was read to the child by a coordinator outside the presence of a caregiver. If a food or food type was identified, the child was asked whether he or she avoided eating the identified food. The questionnaire further assessed what type of symptom was elicited. Foods and food types were subsequently categorized into one of eight groups for this study: fruits, vegetables, dairy, condiments, high protein, grains, beverages, and sweets (Figure 1).

### Pain Diary

Children with IBS were instructed on the completion of a daily pain diary for  $\geq 7$  days. Children rated abdominal pain for three intervals each day (morning, midday/afternoon, and evening/nighttime) using a numeric rating scale of 0 to 10, anchored with the phrases "no pain at all" and "the worst pain you can imagine."<sup>14</sup> This method of pain assessment has been validated in children and successfully used in children with IBS.<sup>15,16</sup> Parents were asked to remind children to complete the diaries daily and to allow children to independently rate abdominal pain without influencing their responses.<sup>17</sup> Responses for each day were called in to a telephone data-entry system. Research coordinators ensured compliance with completion of the pain diary by monitoring the phone call data entry and contacting families (at least once) when needed to ensure completion.

The pain severity scores were calculated as the mean pain rating during the course of the diary excluding ratings of "no pain" (ie, 0). Pain frequency was calculated as the number of ratings  $\geq 1$  during the course of the diary.

### Measures of Psychosocial Distress

The Children's Somatization Inventory includes 35 symptoms (eg, headache) that the child rates on a 5-point Likert scale (0=not at all to 4=a whole lot) how much the child was "bothered by each symptom" during the preceding 2 weeks.<sup>18</sup> The Children's Somatization Inventory has been successfully used and validated in children with functional GI disorders such as IBS.<sup>19,20</sup> Total scores for the Children's Somatization Inventory range between 0 and 140, with increasing scores indicating greater levels of somatization.

The Behavioral Assessment System for Children, Second Edition, is a questionnaire assessing a wide array of behavior and emotional dimensions of children, and has extensive support for reliability, content, and construct validity (including in children with functional GI disorders).<sup>21-23</sup> The child self-report questionnaires are available for children ages 6 to 21 years. The Anxiety and Depression T scores were used for this study. The child self-report scales are derived from established norms, with higher scorers having more anxiety or depression characteristics.<sup>21</sup>

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