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Adolescents with irritable bowel syndrome (IBS) report increased eating associated symptoms, changes in dietary composition, and altered eating behaviors: A pilot comparison study to healthy adolescents

Bonney Reed-Knight, PhD¹, Megan Squires, MPH/MSW², Denesh K. Chitkara, MD³, and Miranda A.L. van Tilburg, PhD²

¹Children's Healthcare of Atlanta and Emory University School of Medicine

²University of North Carolina, Center for Functional GI and Motility Disorders, Chapel Hill NC

³Saint Peter's University Hospital New Brunswick, NJ

Abstract

Background—About half of adult Irritable Bowel Syndrome (IBS) patients report symptoms with eating and disordered eating habits. However little is known about eating in adolescent IBS patients, a common age at which eating disorders develop. The aim of the study was to investigate if adolescents with IBS are more likely than healthy controls to experience eating associated symptoms, report disordered eating patterns, and show differences in diet composition.

Methods—A total of 99 adolescents between 15–21 years-of-age participated (n=48 IBS; n=51 healthy controls (HC)). All subjects completed three 24-hour dietary recalls and questionnaires on eating associated symptoms (EAS) and disordered eating.

Key Results—IBS patients were more likely to report eating associated symptoms than HC (91.7% vs 28%, p<0.001). Eating associated symptoms were controlled by avoiding the offending food (97.7%), not eating any food even when hungry (43.2%), or vomiting after eating (13.6%). Compared to HC, IBS patients reported reduced daily intake of overall calories (1828 vs 2139; p<.05), fat (65.4gr vs 81.4 gr, p<.05) and lactose (8.2gr vs 12.8gr, p<.01). No differences were found between IBS and HC in screening for disordered eating patterns or BMI, though IBS patients endorsed using potentially unhealthy eating behaviors in an attempt to control symptoms.

Send all correspondence to: Dr M.A.L. van Tilburg, University of North Carolina, Center for Functional GI and Motility Disorders, 130 Mason Farm Rd, CB7080, Chapel Hill NC 27599-7080, phone: +1 919 843 0688, tilburg@med.unc.edu.

Disclosures

The authors have no conflict of interest related to the current work.

Author Contributions

Dr. Reed-Knight was responsible for interpretation of the data and drafting of the manuscript.

Dr van Tilburg was primarily responsible for conception of the work and design of the study, analysis, and interpretation of data, as well as drafting of the manuscript.

Megan Squires was responsible for data acquisition and helped in data analysis and drafting of the manuscript.

Dr Chitkara was responsible for obtaining funding, conception of the work, and contributed to interpretation of the data and drafting of the manuscript.

All authors gave final approval of the manuscript.

Conclusions & Inferences—Eating associated symptoms are very common in adolescents with IBS and associated with changes in eating behaviors and dietary composition. They do not appear to change BMI and risk for eating disorders. More research is needed to guide adolescents with IBS in making appropriate dietary changes to control eating associated symptoms.

Keywords

Irritable Bowel Syndrome; Pain; Diet; Eating Disorder; Nutrition; Food avoidance; Lactose; Fructose; Fiber

Introduction

When confronted with abdominal pain or discomfort after a meal, it is not unreasonable to assume that it is caused by something recently eaten. Individuals with chronic abdominal pain therefore often alter their diets, including patients with Irritable Bowel Syndrome (IBS). Adverse reactions to food are common among adults diagnosed with IBS and 50–70% will change their diets to control symptoms (1–4). Adults with IBS report a number of foods that worsen symptoms, most commonly foods high in fat, carbohydrates, or hot spices as well as vegetables and caffeine (5, 6). In addition, patients may skip meals and forego eating for hours to days in an attempt to prevent symptoms (7–9). Over time this may result in inadequate nutrition and development of disordered eating patterns and habits associated with eating. There is some evidence to suggest that disordered eating behaviors are increased among adult IBS patients (9, 10), while other research has failed to find a relationship between diagnosis with IBS and disordered eating (11).

IBS is common among adolescents (12) but little is known about eating associated symptoms in this age group. The effects of changes in eating may be of high relevance in this age group as eating disorders principally emerge during adolescence, and there are increased nutritional requirements for the growing body and brain. Thus, inadequate or disordered eating in an attempt to prevent pain or as a learned behavior following IBS onset may be of particular risk during the adolescent developmental period.

Dietary interventions to treat symptoms of IBS have shown some efficacy in adults, but studies in children and adolescents are largely missing (13). There are some studies among 4–18 year olds focused on adding or removing lactose or increasing fiber to treat IBS symptoms (13). A recent study of children with functional gastrointestinal disorders demonstrated good parent-child agreement on foods most likely to cause symptoms as well as frequency and severity of symptoms caused by specific foods (14). Though changes in dietary habits or food restrictions may begin as part of a medical regimen to control symptoms, there is evidence that disordered eating habits can emerge following prescribed changes (15).

The purpose of this study was to investigate if adolescents with IBS are more likely than healthy controls to experience eating associated symptoms, report disordered eating patterns, and show differences in diet composition including overall intake of nutrients as well as specific nutrients associated with gastrointestinal symptoms including fiber, lactose, and fructose.

Materials and Methods

Subjects

Patients diagnosed with IBS and healthy controls were enrolled in this study. All participants were between the ages of 15–21 years old. Subjects with IBS were recruited among patients receiving care in pediatric gastroenterology and student health clinics affiliated with the University of North Carolina academic health center. Patients were required to have a physician diagnosis of IBS and qualify for the Rome III criteria (16). A study coordinator in collaboration with the treating physician identified potential participants in clinic and introduced the study during the clinic visit. Study flyers were also distributed across the clinics.

Participants in the healthy control group were recruited from the local community through study flyers distributed in pediatric primary care clinics, schools, and libraries. In addition, recruitment emails were sent to listservs at the University of North Carolina distributed to all faculty and employees as well as local school systems.. Healthy controls were free of any diagnosis of a chronic gastrointestinal disorder, reported no more than one stomachache (outside of menstrual bleeding) or other pain (e.g., headache, limb pain etc.) per month in the past two months.

All recruitment and data collection procedures were approved by the Institutional Review Board of the University of North Carolina.

Measures

All participants were asked to complete phone surveys about eating associated symptoms, an eating disorder screening and three 24-hour dietary recalls.

Eating associated symptoms

We asked subjects whether they experience gastrointestinal symptoms when eating (Yes/No). Those who endorsed experiencing gastrointestinal symptoms when eating were asked to rate severity of specific symptoms on a 5 point scale ranging from *not at all (0)* to *intolerable (4)*. There was a total of 9 possible symptoms including diarrhea, urgency, bloating, pain, early satiety, lightheadedness, dizziness, nausea, and weight loss. Responses to each item were summed to obtain an index of eating associated symptoms. Those who endorsed experiencing symptoms were also asked:

1. How many days out of the last 7 they experienced eating associated symptoms.
2. Whether they experienced eating associated symptoms with fatty meals, dairy, vegetables, fruits, large meals, spicy meals, everything they ate, or some other food (Yes/No).
3. Whether they avoided eating associated symptoms by avoiding the offending food(s), not eating even when hungry, or vomiting after eating (Never, Sometimes, Often, Always).

Eating disorders screen

The Eating Disorders Examination Questionnaire (17) is a widely used standardized self-report measure of symptoms, concerns, and behaviors characteristic of eating disorders (e.g., related to concerns regarding shape and weight). It contains 36 items such as “Have you had a definite desire to have an empty stomach with the aim of influencing your weight or shape?”, “Have you felt fat?”, or “Over the past 28 days, how many times have you made yourself sick (vomit) as a means of controlling your shape or weight?” Items are scored on a 7 point scale ranging from *no times (0)* to *every time (6)*. A global score as well as four subscales are obtained (Dietary Restraint, Eating Concern, Weight Concern, and Shape Concern).

Dietary recall

Diet was assessed by three 24-hour dietary recalls using the Nutrition Data System for Research software (NDSR; www.ncc.umn.edu/products/ndsr.htm). The NDSR collects recall of diet in a standardized fashion by using a computer based software application (18). Participants were offered multiple opportunities to recall food intake (19). The NCC Food and Nutrient Database served as the source of food composition information in NDSR (20). This database includes over 18,000 foods including 7,000 brand name products. Ingredient choices and preparation methods provide more than 160,000 food variants. The USDA Nutrient Data Laboratory was the primary source of nutrient values and nutrient composition. These values were supplemented by food manufacturers' information and data available in the scientific literature. Standardized imputation procedures were applied to minimize missing values. For the current study we computed a daily average intake of total calories, carbohydrates, fats, proteins, fiber, fructose and lactose.

Every subject participated in a 24 hour food recall on two weekdays, and one weekend day. Calls were unannounced to diminish the tendency to adjust eating during the study period. If a subject did not answer the phone, no message was left, they would be attempted the following day until a contact was made. Subjects were not allowed to call back. Diet assessments were obtained within a period of one month. Interviews were conducted by interviewers from the *Diet, Physical Activity and Body Composition Core* of the *UNC Nutrition Obesity Research Center* and were blinded to the group (IBS vs control).

Body Mass Index (BMI)

BMI was calculated by using self-reported weight and height. Findings from The National Longitudinal Study of Adolescent Health, a nationally representative sample of over 15,000 youth have found extremely high correlations between self-reported and measured anthropometrics, including weight (.95), height (.94), and BMI (.92) (21). Results support the validity of self-reported weight and height for research purposes.

Data Analyses

IBS patients were compared to healthy controls with chi-square tests for categorical data and t-tests for continuous data. There were no missing data on the questionnaires as the interviewer was thorough and complete. For some participants dietary data could not be collected on all three days. Mean daily values were calculated based on the number of days

that were available for each case. Cases missing all three days of dietary data were not included in the analyses.

Results

Subjects

A total of 99 adolescents aged 15–21 years old participated in the study (n=48 IBS; n=51 healthy controls (HC)). See Table 1 for descriptive data. No differences were found in age and race between the two groups.

Eating associated symptoms

Eating associated symptoms were reported by 91.7% of IBS and 28% of healthy controls ($p < 0.001$). IBS patients reported more days per week with eating associated symptoms ($M = 3.43$, $SD = 2.16$) than healthy controls ($M = 0.86$, $SD = 1.23$, $p < 0.001$) and eating associated symptoms were more severe in the IBS group ($M = 11.7$) versus healthy controls ($M = 3.4$; $p < 0.001$). Table 2 shows which foods resulted in symptoms. Affected subjects tried to control eating associated symptoms by at least sometimes avoiding the offending food (97.9% IBS vs 15.7% healthy controls, $p < 0.001$), not eating any food even when hungry (41.7% IBS, 9.8% healthy controls, $p < 0.001$), or vomiting after eating (12.5% IBS vs 2%, $p < 0.05$).

Body Mass Index, disordered eating and diet composition

Body Mass Index did not differ across groups, ranging from 16.2 to 39.1 with a mean of 22.7 ($SD = 4.1$) for IBS patients and 22.9 ($SD = 3.8$) for healthy controls ($p > .05$). IBS patients did not differ from healthy controls on screening for disordered eating symptoms (see Table 3). Significant differences in general dietary composition were found (see Table 4). Compared to healthy controls, IBS patients ate fewer calories, total fats, saturated fats and lactose.

Discussion

Results of the current study demonstrated that more than 90% of adolescents with IBS experienced symptoms associated with eating occurring on average 3.4 days a week. Almost all adolescents with IBS, who experienced eating associated symptoms, altered their diets to prevent these symptoms. The most commonly avoided foods were fatty foods, dairy and carbohydrates. A recent small study among twenty-five youths (ages 11–17 years old) with functional gastrointestinal disorders also found that fatty food (deep-fried) and dairy (milk, pizza, cheese and ice cream) commonly were reported to induce symptoms (14). We observed that self-reported changes in diet lead to noticeable differences in nutrition content: IBS patients reported eating fewer total calories, fat, and lactose. These differences in nutrition content overlap with the kinds of foods IBS patients reported avoiding (i.e., fatty foods and dairy), adding validity to the self-report of dietary changes.

The consumption of less fat is likely beneficial for overall health. The recommended upper limit for fat is 35 grams in this age group (22). Fat intake in our sample of adolescents with

IBS was nearly two times the recommended amount despite self-reported reductions in intake, and over two times the recommended amount in the healthy control group. Overall reduction in calories consumed for patients with IBS, albeit significant, apparently was not large enough to affect BMI, which was similar in both groups. This is inconsistent with findings from a previous study reporting increased risk for obesity in children with abdominal pain (23). However, our sample was largely of normal weight, so we did not have enough overweight adolescents to test for an obesity effect. In addition, in the study by Malaty and colleagues, an unvalidated food recall was used (23). In the current study, detailed nutrient content was obtained through daily recalls with well-validated measures which is a strength and likely increased sensitivity to small changes in diet.

We examined specific nutrient intake, with a focus on nutrients that have previously been suggested to play a role in IBS (24). We found significantly lower intake of lactose in youth with IBS compared to healthy controls, which coincides with the report of decreased intake of dairy. Lactose restriction in IBS patients has not strongly shown effectiveness for reducing symptoms (24), but may confer risks for bone growth and health. No differences were found in fiber consumption, but the role of fiber in alleviating IBS symptoms is not yet clear (24). In addition, a trend was found for fructose consumption to be higher in IBS patients than healthy controls. More research is needed before conclusions can be drawn, but results do appear to suggest that adolescents with IBS may inadvertently increase fructose consumption as other nutrients are excluded, which has the potential to aggravate ongoing symptoms and pain (25, 26). Findings suggest that youth with IBS may benefit from routine nutrition counseling to guide food decision choices, especially with regards to replacing calories lost secondary to dietary restrictions.

Additionally, no differences were found between groups in disordered eating symptoms in an attempt to influence shape or weight as measured by the Eating Disorders Examination Questionnaire. However, adolescents with IBS in our study reported engaging in disordered eating patterns to control eating associated symptoms. In fact, we found that more than 40% of IBS patients indicated that they skip meals and 12% vomit after eating to control their symptoms. The Eating Disorder Examination Questionnaire includes items to assess disordered eating *to influence shape or weight* and likely did not pick up disordered eating patterns *to control IBS symptoms*. Though patients engage in target behaviors for different reasons (losing weight vs symptom control), they remain concerning regardless due to the potential for negative health effects. Not only can these disordered eating patterns become of clinical significance, they have also been found to be associated with increased gut sensitivity and possible changes in motility, which may lead to further eating associated symptoms over time (27). In addition, altered eating practices that are initiated to control eating associated symptoms may place patients at risk to progress to disordered eating practices given the constant attention to food and the potential for positive reinforcement through weight loss. Practitioners working with adolescents with IBS should remain aware as to the potential risk of disordered eating, especially in patients practicing dietary restrictions to control symptoms (15).

As with all research, there are limitations to our findings. First, our sample was relatively small and we may have been underpowered to detect differences. There is a need for

replication of the current results in larger samples. Secondly, all data was collected based on self-report. IBS diagnosis was not confirmed by a study physician, but patients did need to qualify for Rome III criteria as reviewed by study personnel. In addition, the dietary recalls may have been hampered by recall errors and social desirability. However, participants were asked extremely specific questions about all food and beverage intake and the recalls were unsolicited to prevent participants from making dietary changes on recall days. Despite these limitations, little to no research has examined eating associated symptoms in adolescents and our data provide important initial insights into the prevalence and consequences of eating associated symptoms associated with IBS. Additionally, comparison to a control group of adolescents is a strength.

In conclusion, eating associated symptoms are extremely common in adolescents with IBS and associated with changes in eating habits and nutritional intake. More research is needed to examine if these changes are meaningful in affecting long-term overall health and/or chronicity of IBS symptoms. The current findings show a need for more studies in this patient population to understand the mechanisms of eating associated symptoms and guide dietary interventions in this population.

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Key Points

- Irritable bowel syndrome (IBS) is known to affect dietary behaviors in adults but little is known about adolescents. The effects of changes in eating associated with IBS may be of high relevance in this age group as eating disorders principally emerge during adolescence.
- Eating associated symptoms are more common in adolescents with IBS compared to healthy controls and associated with changes in eating habits and nutritional intake. No differences were found between IBS patients and healthy controls in screening for disordered eating symptoms and BMI, though IBS patients did endorse using potentially unhealthy eating behaviors in an attempt to control symptoms.
- Adolescents with IBS would likely benefit from greater nutritional counseling to address eating associated symptoms.

Table 1

Demographic characteristics of participant sample

		IBS (n = 48) n (%)	Healthy Control^a (n = 51) n (%)
Age		M = 18.40, SD = 2.05	M = 17.80, SD = 2.11
Gender	Male	11 (23%)	15 (30%)
	Female	37 (77%)	35 (69%)
Race	American Indian/Alaskan	1 (2%)	0 (0%)
	Asian	2 (4%)	2 (4%)
	Black	4 (8%)	6 (12%)
	White	38 (80%)	39 (77%)
	Other	3 (6%)	3 (6%)
Ethnicity	Hispanic	2 (4%)	4 (8%)
	Not Hispanic	46 (96%)	46 (92%)

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Table 2

Endorsement of eating associated symptoms and food avoidance in patients with IBS versus healthy controls

Eating associated symptoms with...	IBS	Healthy control	Odds Ratio	95% CI
Everything I eat	10.4%	0%	5.18 ^a	(.27 – 98.29)
Large meals	57.8%	1.0 %	15.74	(4.83 – 51.24)
Specific foods including *...	93.75%	27.45%	39.64	(10.58 – 148.49)
Fat	75.0 %	21.6 %	10.91	(4.29 – 27.76)
Carbohydrates	43.8 %	7.8 %	9.14	(2.84 – 29.43)
Dairy	52.1 %	9.8%	10.00	(3.39 – 29.53)
Fruit	16.7%	2.0%	10.00	(1.20 – 83.31)
Vegetables	25.0 %	0% *	35.27 ^a	(2.02 – 614.94)

* percentages for those who report symptoms with specific foods

^a Estimated by adding 0.5 to all cells given zero cell count for Healthy Controls experiencing symptoms

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Table 3

Eating disorder concerns in patients with IBS and healthy controls

	IBS M (SD)	Healthy Control M (SD)	t-value (df)	p-value
Global score	20.63 (17.82)	15.48 (16.29)	1.46 (92)	.15
Restraint	4.27 (4.23)	3.68 (4.25)	.68 (94)	.50
Shape concern	10.34 (9.99)	7.32 (8.28)	1.62 (94)	.11
Weight concern	4.29 (4.29)	2.98 (4.02)	1.55 (95)	.12
Eating concern	1.73 (2.62)	1.73 (1.67)	1.16 (94)	.25

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Table 4

Dietary composition in patients with IBS and healthy controls

	IBS M (SD)	Healthy Control M (SD)	t-value	p-value
Total calories (kcal)	1828.29 (572.16)	2139.42 (743.93)	2.21	0.03
Fat (grams)	65.47 (27.19)	81.39 (39.37)	2.21	0.03
<i>Cholesterol</i>	216.40 (127.36)	274.07 (165.76)	1.84	0.07
<i>Saturated fat</i>	21.20 (10.62)	27.05 (12.36)	2.40	0.02
<i>Omega 3</i>	1.64 (.86)	2.16 (2.02)	1.57	0.12
Carbohydrates (grams)	241.51 (79.66)	274.61 (84.01)	1.91	0.06
Protein (grams)	72.16 (25.94)	82.37 (30.23)	1.71	0.09
Fructose (grams)	29.74 (20.88)	23.51 (13.60)	1.69	0.09
Fiber (grams)	16.92 (9.13)	18.33 (7.47)	.80	0.42
Lactose (grams)	8.23 (7.25)	12.79 (8.48)	2.73	0.008