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Dietary patterns, beliefs and behaviors among individuals with inflammatory bowel disease: a cross-sectional study

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Abstract

Background: Inflammatory bowel disease (IBD) refers to a group of incurable, gastrointestinal diseases, common among young adults. The purpose of this study was to describe dietary intake, self-modifications, and beliefs among adults ages 18–35 with IBD and to compare those with active versus inactive disease. National guidelines for daily intake include: 34g of fiber for males and 28g of fiber for females, 3oz of whole grains, 1,000mg of calcium, <10% of added sugars, 3 cups of dairy, 2.5 cups of vegetables, and 2 cups of fruit.

Methods: Individuals with a diagnosis of IBD were recruited online using convenience sampling (N=147). Data included a dietary screening questionnaire, self-directed diet modifications, dietary beliefs questionnaire, and demographics. Chi-square and t-tests were used to compare those with active versus inactive disease.

Results: The sample was predominantly female (90%) and diagnosed with Crohn's disease (64%). Daily intake for females was 9.7 gm fiber, 0.3 oz whole grains, 683.8 gm calcium, 1.1 cups

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Authors Role:

KK drafted the manuscript. KK, GW, and BG designed the study. KK and BP analyzed the data. KK, BP, DJ, GW, and BG interpreted the data, provided substantial revisions, and reviewed the final manuscript.

Conflicts of Interest

The authors report no conflicts of interest.

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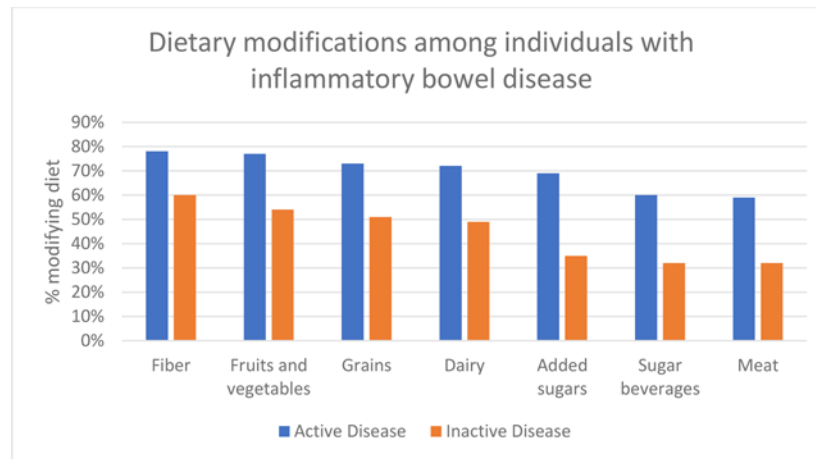
Transparency Declaration

The lead author affirms that this manuscript is an honest, accurate, and transparent account of the study being reported. The reporting of this work is compliant with STROBE guidelines. The lead author affirms that no important aspects of the study have been omitted and that any discrepancies from the study as planned have been explained.

vegetables, and 0.5 cups fruit. Daily intake for males was 14.2 gm fiber, 0.4 oz whole grains, 882.9 gm calcium, 1.4 cups vegetables, and 0.5 cups fruit. Participants most often modified fiber (73%), fruits and vegetables (71%), grains (67%), and dairy (66%) due to their IBD. 83% believed that modifying their diet could reduce IBD symptoms.

Conclusions: Both men and women with IBD struggle to meet the national guidelines for intake of fiber, whole grains, fruits, and vegetables. The majority reported modifying their dietary intake due to IBD and expressed belief that diet could reduce symptoms.

Graphical Abstract



The purpose of this study was describe dietary intake, self-modifications, and beliefs among adults ages 18–35 with inflammatory bowel disease and to compare those with active versus inactive disease. Individuals with inflammatory bowel disease commonly modified their diet, especially individuals who had active disease. The majority are modifying their diet without the guidance of a dietitian or nutritionist.

Keywords

inflammatory bowel disease; ulcerative colitis; Crohn's disease; diet

Introduction

Inflammatory Bowel Disease (IBD) refers to a group of chronic inflammatory diseases of the gastrointestinal system. IBD is a heterogeneous disease which is typically classified into ulcerative colitis and Crohn's disease. The disease course varies with individuals experiencing periods of active disease and remission. IBD is a growing public health concern as the incidence has been increasing worldwide ⁽¹⁾. IBD is associated with gastrointestinal symptoms (e.g., abdominal cramps, abdominal pain, and diarrhea) and inflammation of the gastrointestinal tract ^(2,3). Since IBD affects the GI system, patients often question how modifying their diet may influence IBD symptoms ^(4–6). Some studies have shown the benefits of diet modification, through altering food intake, on symptom reduction and quality of life in IBD patients ^(5,7–9). In fact, children with Crohn's disease on 8-weeks of exclusive enteral nutrition, a nutritionally complete liquid diet, demonstrated

greater likelihood of remission compared to children who do not use exclusive enteral nutrition⁽¹⁰⁾. While studies demonstrate the effectiveness of dietary interventions (i.e., Specific Carbohydrate Diet or low Fermentable Oligo-, Di-, Mono-saccharides And Polyols [FODMAP] diet) in reducing symptoms, few studies have demonstrated changes in markers of inflammation^(11–16). Although dietary recommendations have been published for adults with IBD, recommendations primarily report insufficient evidence to recommend dietary changes and are based on expert opinions^(17, 18). Therefore, providers have been hesitant to provide specific recommendations due to the complex role of diet in IBD and the lack of a dietary gold standard^(5,19).

Even without clear dietary recommendations, individuals with IBD anecdotally report diet modifications. Adults with IBD are interested in diet since patients believe modifying their diet could decrease IBD symptoms and improve health^(20–23). Yet, dietary information is reported as the least adequately addressed topic among individuals recently diagnosed and with longstanding disease (>10 years)^(24,25). Furthermore, even though diet modification is commonly reported in clinical settings, few studies have characterized dietary intake (i.e., grams of fiber, cups of fruits and vegetables) among adults with IBD⁽²⁶⁾. Characterization of dietary intake is the first step towards better understanding nutrient deficiencies and developing personalized dietary recommendations for patients.

This study describes the current dietary intake, modifications, and beliefs among adults ages 18–35 with IBD and compares dietary modifications between individuals with active and inactive disease. Dietary research among individuals with IBD is limited and primarily focuses on patients beliefs about specific types of food^(20,22,23,). Since dietary modification is common, there is a need to describe the current dietary intake and modifications among individuals with IBD in the United States. Dietary intake will be compared to the United States Department of Agriculture (USDA) recommendations. These recommendations indicate 34g of fiber for males and 28g of fiber for females, 3oz of whole grains, 1,000mg of calcium, <10% of added sugars, 3 cups of dairy, 2.5 cups of vegetables, and 2 cups of fruit⁽²⁷⁾.

This study addresses three research questions:

1. Among individuals with IBD, does dietary intake (fiber, whole grains, calcium, sugar, dairy, vegetables, and fruit) differ between those with active and inactive disease?
2. Are individuals with active IBD more likely to modify their diet than individuals with inactive IBD?
3. Do dietary beliefs differ between individuals with active and inactive IBD?

Methods

Study Design

A cross-sectional study design was conducted to describe the current dietary intake, modifications, and beliefs among adults ages 18–35 with IBD. This study was approved by the Michigan State University Institutional Review Board.

Participants

Individuals were recruited through ResearchMatch, Facebook, or referral from a friend between January and February 2018. Individuals were screened for participation if they had a diagnosis of ulcerative colitis or Crohn's disease and were between the ages of 18–35. Inclusion criteria were: currently prescribed medication to manage their IBD, living in the United States, understand written English, and have access to the internet. Those hospitalized within the past month or currently pregnant were excluded.

Procedures

All data was collected using Qualtrics. Those interested in participating reviewed an online consent form describing the purpose of the study, study procedures, and voluntary participation. Participants first completed required screening questions to assess for eligibility. These questions were automatically scored, and those meeting inclusion/exclusion criteria continued to the survey.

Measures

Participant Characteristics.—Participants were asked about their age, gender, and marital status. Participants reported type of IBD (ulcerative colitis or Crohn's disease), time since diagnosis, and current medications type (aminosalicylates, biologics, corticosteroids, and/or immunomodulators). Disease activity was assessed using the Manitoba Inflammatory Bowel Disease Index (MIBDI), where participants report their disease activity on a six-point scale ranging from “constantly active, giving me symptoms every day” or “I was well in the past 6 months, what I consider a remission or absence of disease.” A cut-off of 1–4 for active disease and 5–6 for inactive disease was used based on existing literature (28).

Dietary Intake.—Dietary Intake was assessed by the 26-item National Health and Nutrition Examination Survey (NHANES) and National Cancer Institute dietary screener questionnaire. Participants reported the frequency of food and drink consumption over the past month as the number of times per day, week, or month. Estimates for intake of food and nutrient groups were calculated using publicly available scoring algorithms (29). The algorithms were developed based on 24-hour dietary recalls (30) and account for participant age and sex. Food and nutrient groups include per day measures of: fiber (gm), calcium (mg), whole grains (ounce equivalents), total added sugars (tsp equivalents), dairy (cup equivalents), fruits and vegetables (cup equivalents), and added sugars from sugar-sweetened beverages (tsp equivalents).

Dietary Modification.—After each item on the Dietary Screener Questionnaire, (7,30) participants responded to the following statement: “I alter my intake of [name of food] due to my IBD” on a Likert scale (0=never to 5=always). Responses were then categorized into subscales (fruit and vegetables, dairy, whole grains, added sugars, sugar-sweetened beverages, meat, and dietary fiber) based on the scoring algorithms. In addition, the most frequently modified individual foods were reported. Participants who reported never or rarely were categorized as no diet modification; participants responding sometimes, often, or always were categorized as modifying their diet.

Dietary Beliefs.—Dietary beliefs were assessed using investigator-developed questions, which were pre-tested prior to survey use. Participants were asked questions such as “Do you think that diet modification can reduce IBD symptoms?” and “Does your healthcare provider think that diet modification can reduce IBD symptoms?” Participants could respond “yes”, “no”, or “don’t know”. In addition, participants were asked if they could identify foods that made their symptoms better or worse and if they had ever seen or were currently seeing a dietitian/nutritionist for their IBD.

Statistical Analysis

Data were analyzed using STATA 15.1 and SAS 14.1. Demographic statistics were calculated using means and standard deviations for continuous variables, while counts and percentages for categorical variables. Dietary intake was calculated in SAS using scoring procedures published by the National Cancer Institute (29). Data were reported as means and standard deviations. Comparisons were made between individuals with active and inactive disease using t-tests.

Dietary modification was scored as a dichotomous variable and presented as the percentage of individuals modifying or not modifying their diet. χ^2 was used to assess the relationship between diet modification and disease activity. Dietary beliefs were presented as counts and percentages.

Results

Participant Characteristics

One-hundred and forty-seven individuals met inclusion criteria. The sample was predominantly female (90%), with a mean age of 28.8 (SD = 4.6), and diagnosed with Crohn’s disease (64%). The majority of participants were on a biologic medication (64.6%), and 38.1% took more than one medication type. Based on the MIBDI scale, 75% of the sample reported active disease (Table 1).

Dietary Intake

Dietary intake was reported for individuals who did not have missing data on the individual scale items. The estimated dietary intake for males (n=12) each day was 14.2 gm of fiber, 0.4 oz of whole grains, 882.9 gm of calcium, 1.4 cups of vegetables, and 0.5 cups of fruit. Estimated dietary intake for females (n=113) each day was 9.7 gm of fiber, 0.3 oz of whole grains, 683.8 gm of calcium, 1.1 cups of vegetables, and 0.5 cups of fruit. Females with active compared to inactive disease differed on predicted intake of fiber (p=0.006), calcium (p=0.013), and fruit and vegetable intake (all <0.01). See Table 2 for additional dietary intake information.

Dietary Modifications

Dietary modification was common within the sample with the majority of individuals (83%) modifying their diet due to IBD (Table 3). Participants most commonly reported modifying intake of fiber (73%), fruits and vegetables (71%), grains (67%), and dairy (66%). Dietary modification was greater among individuals with active disease compared to inactive disease

(all $p < 0.05$). The individual food items most frequently modified included: salad (72%), popcorn (72%), other vegetables (67%), fruit (66%), and pizza (62%).

Dietary Beliefs

Sixty-nine percent of participants reported that diet modification could reduce IBD symptoms (Table 4). Only 47.6% of participants reported their healthcare provider thought diet modification could reduce IBD symptoms. Twenty-five percent reported ever visiting a dietitian and/or nutritionist for their IBD and only 5% were currently seeing a dietitian and/or nutritionist. There were no differences in dietary beliefs based on disease activity.

Discussion

Among an online sample of primarily females ages 18–35 with IBD, food intakes based on a dietary screener questionnaire did not meet USDA recommendations ⁽²⁷⁾. Participants reported commonly modifying foods due to their IBD, with the most commonly modified foods being fiber, fruits and vegetables, and grains. Individuals were more likely to modify their diet during active disease.

Individuals with IBD often do not obtain the necessary nutrients. For instance, the USDA recommended an intake of 34g of fiber for males and 28g of fiber for females per day ⁽²⁷⁾. Participants in the current study had a predicted fiber intake of 18g for males and 14g for females, which is similar to actual fiber intake in the general U.S. population (17g) ^(31,32). A Canadian study found significant micronutrient deficits (Vitamins C, D, thiamin, and niacin) among individuals with Crohn's disease compared to a representative sample of Canadians ⁽²⁶⁾. Increased dietary fiber intake was found in patients with Crohn's disease compared to the representative sample of Canadians ⁽²⁶⁾ whereas an Italian cohort found decreased dietary fiber, increased lipids, and increased calories among IBD patients compared to controls ⁽³³⁾. Differences in fiber intake may be due to the percentage of individuals following a low-residue or low-fiber diet. Such variations demonstrate a need to characterize the current dietary intake of individuals with IBD prior to providing dietary recommendations.

Dietary modification was common among the sample, with individuals in active disease more likely to modify their diet than individuals in inactive disease. Yet, during inactive disease, one-third to two-thirds of participants still engaged in some type of dietary modification. A Dutch study reported 76.5% of their sample of individuals with IBD omitted foods to reduce disease symptoms ⁽³⁴⁾. Specifically, participants felt that omitting foods reduced abdominal pain/cramps and diarrhea. Another study reported that 66.8% of IBD patients avoid certain food to prevent a relapse ⁽²³⁾. Individuals with IBD focus on eliminating foods that worsen symptoms and few individuals focus on incorporating foods that improve symptoms ⁽³⁵⁾. In the current sample, 41% of participants were able to identify foods that made their IBD better. This points to a possible need to reframe nutritional instructions.

Within this sample, 24.8% of individuals visited a dietitian or nutritionist and only 6% were currently receiving services from a dietitian or nutritionist. This is similar to findings within

a Dutch cohort in which 25.3% of individuals obtained nutrition information from a dietitian (34). Although few individuals have obtained guidance from a dietitian or nutritionist, the majority of participants in the current study reported modifying their diet. This is especially concerning, as recent research in an Italian cohort demonstrated an association between self-prescribed dietary restrictions and abnormal bone density (DXA) scans (36). Furthermore, individuals with IBD are at risk for nutrient deficiencies due to bowel malabsorption (37). Future research could target those with self-prescribed dietary modifications in the absence of a dietitian/nutritionist. Such modifications could have a social or emotional component, as well as physical discomfort. With advanced knowledge, more tailored interventions could be designed to address the rationale for self-prescribed changes. In the meantime, providers should encourage patients to enlist the help of a Registered dietitian/nutritionist that specializes in nutritional therapy for IBD in order to prevent nutritional deficits. A registered dietitian can help patients identify foods that affect their symptoms, prevent and help with recovery from malnutrition, nutrient deficiencies and the fear of eating that often accompanies IBD.

Limitations of this study include that the sample was recruited online using convenience sampling and may not be representative of individuals in clinic settings. Specifically, the small sample size of males limited understanding of the dietary intake specific to males. Future studies with a larger sample size can better characterize differences based on sex, disease activity, and other factors which may influence diet. While a validated dietary screener was used to predict food intake, the use of a three-day dietary intake would provide more detailed information on both micro and macronutrients.

Conclusions

This study addressed the pressing clinical challenge of patient dietary modification by providing new information on current dietary intake, modifications, and beliefs among individuals with IBD living in the United States. Findings indicated the majority of individuals are modifying their diet without the guidance of a dietitian or nutritionist. Participants had lower dietary intake of fiber, whole grains, fruits and vegetables than recommendations. Larger studies would be beneficial in assessing dietary intake for both men and women. If sex differences were found, tailored interventions could be designed and tested for their effectiveness in curbing symptoms and nutritional concerns. Longitudinal studies examining dietary intake over time may also provide additional insights into factors that influence dietary intake. This work provides the foundation for future work in the area of dietary intervention trials to determine the best diet composition for individuals with IBD, and perhaps unique components for men versus women.

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Table 1:

Demographics of Individuals with Inflammatory Bowel Diseases, ages 18–35

	<i>M</i>	<i>SD</i>
Age	28.8	4.6
Time since diagnosis (in years)	7.6	5.6
	<i>N</i>	%
Female sex	132	89.8
Single	79	53.7
Type of IBD		
Ulcerative Colitis	53	36
Crohn's Disease	94	64
Medication Type		
Aminosalicylates	51	34.5
Biologics	95	64.6
Corticosteroids	22	15.0
Immunomodulators	33	22.5
Manitoba IBD Index		
Active disease	110	74.8
Inactive disease	37	25.2

Note: some individuals were using multiple medications

Table 2:
Predicted dietary intake for males and females with inflammatory bowel disease

	USDA Recommendations	Males (N=12)		Females (N=113)		Females (N=82)		Females (N=30)		Active vs. Inactive disease	p-value
		M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)		
Fiber (gm)	34 M / 28 F	18.2 (3.3)	14.3 (2.8)	13.9 (2.4)	15.5 (3.3)	0.006					
Predicted intake of calcium (mg)	1,000	1129.3 (257.9)	853.3 (104.6)	838.8 (88.1)	894.5 (134.8)	0.013					
Whole grains (ounce equivalents)	3	0.92 (0.5)	0.6 (0.3)	0.6 (0.3)	0.7 (0.4)	0.16					
Total added sugars (tsp equivalents)	<10%	15.8 (2.5)	15.9 (5.3)	16.2 (5.7)	15.0 (4.1)	0.29					
Dairy (cup equivalents)	3	1.8 (0.7)	1.4 (0.4)	1.4 (0.3)	1.5 (0.5)	0.20					
Fruits and vegetables including legumes and French fries (cup equivalents)	4.5	2.7 (0.7)	2.2 (0.5)	2.1 (0.4)	2.4 (0.6)	0.003					
Vegetables including legumes and French fries (cup equivalents)	2.5	1.7 (0.5)	1.4 (0.2)	1.2 (0.2)	1.5 (0.3)	0.0001					
Fruits and vegetables including legumes and excluding French fries (cup equivalents)	4.5	2.5 (0.7)	2.1 (0.5)	2.0 (0.5)	2.3 (0.6)	0.01					
Vegetables including legumes and excluding French fries (cup equivalents)	2.5	1.6 (0.5)	1.2 (0.3)	1.2 (0.2)	1.4 (0.3)	0.0001					
Fruits (cup equivalents)	2	0.9 (0.4)	0.8 (0.3)	0.8 (0.3)	0.9 (0.3)	0.21					
Added sugars from sugar-sweetened beverages (tsp equivalents)	<10%	0.2 (0.1)	7.1 (4.7)	7.5 (4.9)	6.2 (3.8)	0.19					

Note: All are presented as predicted intake, per day; dietary analysis was performed on individuals with complete dietary intake responses

Table 3:

Dietary modifications among individuals with inflammatory bowel disease based on food subgroups

	Total Sample		Active Disease		Inactive Disease		p-value
	N	%	N	%	N	%	
Modify Fiber							0.026
Yes	108	73.5	86	78.2	22	59.5	
No	39	26.5	24	21.8	15	40.5	
Modify Fruits and Vegetables							0.007
Yes	105	71.4	85	77.3	20	54.1	
No	42	28.6	25	22.7	17	46.0	
Modify Grains							0.016
Yes	99	67.4	80	72.7	19	51.4	
No	48	32.7	30	27.3	18	48.7	
Modify Dairy							0.01
Yes	97	66.0	79	71.8	18	48.7	
No	50	34.0	31	28.2	19	51.4	
Modify Added Sugar							0.001
Yes	89	60.5	76	69.1	13	35.1	
No	58	39.5	34	31.0	24	64.9	
Modify Sugar Beverages							0.004
Yes	78	53.1	66	60.0	12	32.4	
No	69	46.9	44	40.0	25	67.6	
Modify Meat							0.005
Yes	77	52.4	65	59.1	12	32.4	
No	70	47.6	45	40.9	25	67.6	

Note: p-value comparing active vs. inactive disease.

Table 4:

Beliefs about diet among individuals with inflammatory bowel disease

	Total Sample		Active Disease		Inactive Disease		p-value
	N	%	N	%	N	%	
Have you seen a dietitian and/or nutritionist for your IBD?							0.72
Yes	36	24.5	27	24.6	9	24.3	
No	109	74.2	82	74.2	27	73.0	
Are you currently seeing a dietitian and/or nutritionist for your IBD?							0.98
Yes	9	6.2	7	6.4	2	5.4	
No	136	93.8	103	93.6	35	94.6	
Do YOU think that diet modification can reduce IBD symptoms?							0.6
Yes	102	69.4	78	70.9	24	64.9	
No	21	14.3	16	14.6	5	13.5	
Did not respond	24	16.3	16	14.6	8	21.6	
Does your healthcare provider think that diet modification can reduce IBD symptoms?							0.6
Yes	70	47.6	53	48.2	17	46.0	
No	39	26.5	27	24.6	12	32.4	
Did not respond	38	25.9	30	27.3	8	21.6	
Are you able to identify foods that make your IBD worse?							0.18
Yes	124	87.3	94	89.5	30	81.1	
No	18	12.7	11	10.5	7	18.9	
Are you able to identify foods that make your IBD better?							0.16
Yes	55	41.0	38	37.6	17	51.5	
No	79	59.0	63	62.4	16	48.5	

Note: p-value comparing active vs. inactive disease.