

The Link Between Special Diets as Treatment for Adolescent IBD and Eating Disorders

Word Count: 5006

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The Link Between Special Diets as Treatment for Adolescent IBD and Eating Disorders**ABSTRACT**

IBD stands for Inflammatory Bowel Disease, an umbrella term for a group of inflammatory conditions that chronically affect the digestive tract (Grigorescu *et al.*, 2023). Previous research has found a link between Inflammatory Bowel Diseases and concurrent diagnoses of eating disorders. The interest and objective of this research study were stimulated by this finding from pre-existing literature: to assess the degree to which special dieting for the treatment of Inflammatory Bowel Disease in adolescents affects the development of an eating disorder.

Three methodology tools were employed to assess the prevalence of eating disorders amongst this population: a meta-analysis, a pre-validated quantitative questionnaire, and qualitative interviews.

It was concluded that eating disorders aren't strongly associated with special diets for the treatment of adolescent IBD patients. It was additionally concluded that patients individually choose special dieting as their treatment plan and thus are more resilient to eating behavior changes.

LITERATURE REVIEW

Search Strategies

To find reliable sources for this research, a comprehensive search was conducted using several databases using the limiting function of peer-reviewed to confirm reliability. Throughout research, keywords used included: diet, eating disorder, Anorexia, Bulimia, binge-eating, Inflammatory Bowel Disease (IBD), Crohn's, Ulcerative Colitis, adolescents, and comorbidity.

Definitions and Etiology

To ensure research is administered and evaluated properly, the definition of terms is an essential step in beginning research on the topic. Indistinct definitions may significantly reduce the comprehension of this research. Crohn's Disease (CD) is the chronic (long-term), relapsing, and progressive inflammation of the gastrointestinal tract (Roda *et al.*, 2020). Likewise, Ulcerative Colitis (UC) is the chronic destruction of the colon that causes permanent lesions. UC and CD are Inflammatory Bowel Diseases (IBD) and their etiology stems from no single criterion; IBD is largely presumed to result due to genetic susceptibility to disease and subjection to environmental factors (Lewis and Abreu, 2017).

The inflammatory burden and gut dysbiosis – disruption to the microbiome – of IBD is potentiated by the “Western” diet which includes foods low in fruits and vegetables, but high in protein and animal fat (Nakayuenyongsuk *et al.*, 2017). Research widely accepts that diet is the most prominent environmental factor affecting the intestinal microbiota. This shift to processed foods and food additives alters the host-gut microbiota (Nakayuenyongsuk *et al.*, 2017). When choosing between the terms' microbiome and microbiota, the microbiome references the genomes from all the microorganisms in the specific environment and microbiota denotes the individual microorganisms found within this environment. Due to the mentioned diet variation,

the global prevalence of IBD now affects “1 in 200 individuals in Western countries,” an ever-increasing statistic (Roda *et al.*, 2020). Especially, with a rising incidence in pediatric populations (Rosen *et al.*, 2015). The terms “pediatric patients” and “adolescent patients” will be used synonymously throughout the paper.

When discussing treatment options, several clinical and holistic treatments will be referenced. First-line therapies will be defined as clinical therapies recognized as best for preliminary treatment of IBD. Biologic therapies will be classified as treatments by means of properties made from living organisms (Johnston, 2007). The goal of management/treatment of IBD is to reduce triggers of symptoms, mainly, inflammation. In the best cases, remission may be achieved – a stage in which the disease is no longer active – but relapse may occur at any time (Chateau and Peyrin-Biroulet, 2020). The terms “management” and “treatment” will be defined synonymously throughout the paper.

Treatments

Treatment for IBD must be individualized to each patient depending on symptoms, genetic makeup, microbiome composition, and clinical and environmental information (Roda *et al.*, 2020). Most commonly, treatment for IBD begins using corticosteroids and immunomodulators (such as: azathioprine, methotrexate, 6-mercaptopurine) as first-line therapies. In the occasion in which these agents fail to stimulate remission, biologic therapies (biologics) are used. Tumor necrosis factor (TNF) antagonists are considered first-line biologics. Anti-TNF agents include infliximab, etanercept, golimumab, certolizumab and adalimumab. Infliximab is most commonly used as the first-line biologic for pediatric UC (Turner *et al.*, 2012). Though, studies have established that anti-TNF agents fail to induce remission in up to 30% of patients (Schwartz, 2021). Therefore, new holistic treatments have become an increasingly attractive

option in the treatment of IBD. Particularly, dieting as treatment for IBD has gained traction in the healing of the distrusted microbiome by eliminating factors (e.g. the “Western” diet) contributing to the gut dysbiosis diet (Schwartz, 2021). Special diets include but are not limited to: the Low FODMAP Diet, Gluten-Free Diet, Specific Carbohydrate Diet (SCD), Lactose-Free Diet, Dietary Fiber, Semi-Vegetarian (plant-based) Diet, Mediterranean Diet, High Protein Diet, Paleolithic Diet, Anti-Inflammatory Diet, Exclusive Enteral Nutrition (formula-based), and IgG4 Exclusion Diet (Serrano-Moreno *et al.*, 2022). These diets have proved successful in regulating inflammation markers, but hold risks of nutritional deficiencies (Nakayuenyongsuk *et al.*, 2017). Conversely, the aforementioned special diets are not effective in pediatric UC; they do not induce remission (Turner *et al.*, 2012). In the context of this study, the indicated treatments will be referenced, but readers should acknowledge there are other existing clinical and holistic treatments used for IBD management.

Comorbidity

In addition to IBD, patients commonly have a comorbid diagnosis with an eating disorder. Considering 95% of those with an eating disorder are between the ages of 12 and 25, a significant majority of IBD patients at risk are adolescents (“Eating disorder facts,” n.d.). Studies have shown that patients with IBD frequently restrict food intake and evade specific nutrients due to strong beliefs about risk factors of food to IBD and food triggered IBD symptoms. (Ilzarbe *et al.*, 2017). Such eating behavior changes are presumed to decrease pleasure in eating within this population. Moreover, patients have shown to use IBD symptomology to mitigate weight loss by “1) taking laxatives; 2) by taking products with lactose despite being intolerant to it; 3) by combining both previous methods; and 4) by using a stoma as a purging device” (Ilzarbe *et al.*, 2017). The reduction in quality of life in this populace further intensifies malnourishment

and social isolation (Ilzarbe *et al.*, 2017). Specifically, pediatric IBD patients are much more susceptible to psychiatric disorders due to the impact of chronic disease on the mental health of adolescents (Loftus *et al.*, 2011). Therefore, due to these various procedures, the prevalence of an eating disorder subsequent to diagnosis of IBD >60% (Hedman *et al.*, 2019).

Remaining Gap

While there is a fair amount of research conducted surrounding the comorbidity of IBD and eating disorders, or behaviors that may contribute to the development of an eating disorder, I did not find any research conducted on the etiology of eating disorders due to dieting as treatment for IBD. Furthermore, I did not find research nor hypotheses about the negative mental health effects of dieting as treatment for IBD. My research will strongly focus on the etiology of eating disorders and dieting and the changes in eating behaviors because of dieting for adolescent IBD treatment.

RESEARCH QUESTION AND HYPOTHESIS

My research question was as follows:

1. To what extent do special dieting treatments for the management of Crohn's and Colitis heighten the probability of developing an eating disorder in pediatric patients?

My hypothesis for the question was as follows:

1. Pediatric patients with IBD and actively using dieting as treatment for IBD will suffer from eating disorders more often than the general population.

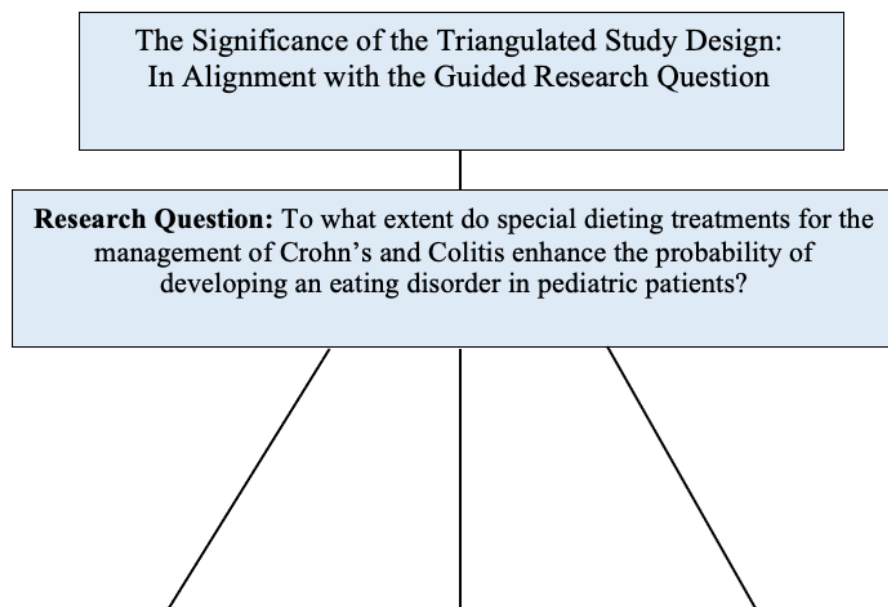
METHODOLOGY

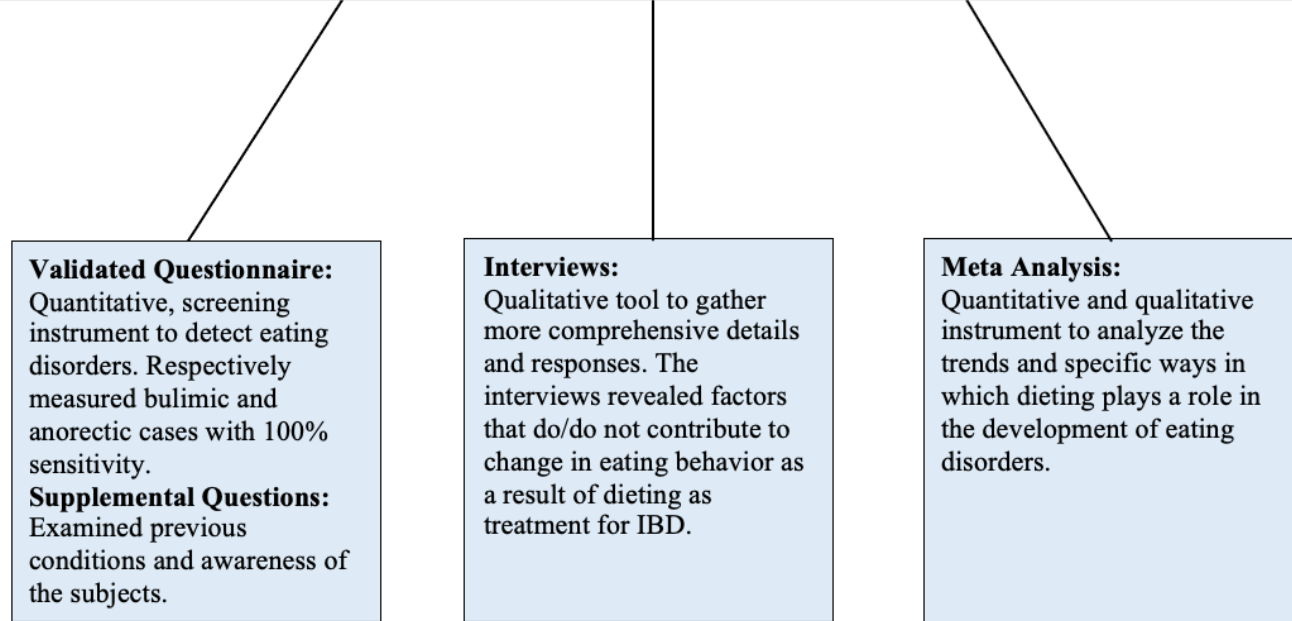
Study Design

This study analyzes the comorbidity of eating disorders and IBD, predominantly, investigating the contribution of dieting as treatment for IBD to the psychological features of an eating disorder. The aim of this research is to broaden the knowledge on the limitations of holistic treatment and, thus, broaden patient knowledge. It is of paramount importance that the decline in psychological health is mitigated, potentially through the termination of holistic treatment to pediatric patients previously susceptible to eating disorders.

A three-part, mixed-methods design in the study was conducted. This design permitted for a qualitative and quantitative analysis of developmental changes in eating behavior. The study was correspondingly triangulated. The three methods applied for data-gathering were: qualitative interviews, a pre-validated quantitative questionnaire, and a meta-analysis (Figure 1). Pre-existing literature demonstrated correlation between IBD and eating disorders but showed no evidence of etiology. Accordingly, the mixed-methods design in the study was crucial for optimization and comprehensive understanding of the phenomenon (Vedel *et al.*, 2019).

Figure 1: *Triangulated Research Approach in Alliance with the Research Question*





Subjects

The subjects which participated in the pre-validated questionnaire were individuals aged 12-25. This particular demographic of participants was chosen due to interim final regulations: dependent insurance coverage becomes unavailable the day before a child's 26th birthday (Press, 2011). 7 participants were diagnosed with CD and 9 participants were diagnosed with UC. 0 individuals were diagnosed with an eating disorder subsequent to IBD diagnosis, and 0 individuals was diagnosed with an eating disorder prior to IBD diagnosis; 16 individuals were solely diagnosed with IBD. Each subject had used or is currently using a special dieting treatment. These subjects provided the greatest insight pertaining to the commonality of change in eating behavior. This sample group was chosen for the purpose of gathering primary data sources; the group that participated in the pre-validated survey was able to respond to specific questions directly pertaining to the study. Furthermore, patients obtain knowledge regarding their own illness experience.

The subjects which participated in the qualitative interviews were all doctors residing in the United States. 5 physicians were recruited. This purposeful sampling approach was utilized to attain a diverse sample of primary care physicians who exemplified a broad spectrum of

perceptions and experiences. These healthcare providers will further be able to translate patient needs into evidence for research.

Research Instruments

This study's questionnaire was formulated based on the "5-Item SCOFF questionnaire" from Morgan, Reid, and Lacey (2000).

Table 1: *Original Questionnaire with Criteria to Score (Morgan et al., 2000)*

The SCOFF questions*

Do you make yourself **S**ick because you feel uncomfortably full?

Do you worry you have lost **C**ontrol over how much you eat?

Have you recently lost more than **O**ne stone in a 3 month period?

Do you believe yourself to be **F**at when others say you are too thin?

Would you say that **F**ood dominates your life?

*One point for every "yes"; a score of ≥ 2 indicates a likely case of anorexia nervosa or bulimia

SCOFF addresses the key features of both bulimia nervosa and anorexia nervosa. A threshold of two or more "yes" answers offered 100% sensitivity for bulimia and anorexia, in combination and separately. The SCOFF questionnaire has a false-positive rate of 12.5%, although, it is a satisfactory changeover for high sensitivity (Morgan *et al.*, 2000). Thus far, numerous validation studies have suggested SCOFF as an indorsed screening tool (Kutz *et al.*, 2019). Table 1 depicts the SCOFF questionnaire. The sum of the points determines the likelihood of an eating disorder

diagnosis. The study mirrored the original framework of the SCOFF questionnaire. One point was awarded if the responses to the questionnaire were in alignment with the coded answer (generated by Morgan *et al.*, 2000). An overall point score of ≥ 2 is considered a “likely case of anorexia nervosa or bulimia.” The questionnaire acted as the quantitative measure for assessing developmental change in eating behavior. The questionnaire’s original design was intended for and effective at screening for and detecting eating disorders. The purpose of the SCOFF instrument in this research was to detect eating disorders as a result of special dieting for management of IBD. Modifications were not made to the questionnaire.

A few supplemental questions were added to the questionnaire (Table 2). These questions were used to determine pre-existing conditions and other data relevant to the purpose of the study (Appendix F).

Table 2: *Supplemental Questions Added to the Validated Questionnaire*

Question 1	Question 2	Question 3	Question 4
What is your diagnosis?	What is your date of birth?	Prior to this questionnaire, were you diagnosed with an eating disorder <u>subsequent to or prior</u> to your IBD diagnosis? If so, please specify which.	Prior to this questionnaire, which special dieting treatment did you use for the management of IBD? How long did you use this treatment?

Note: There was a supplementary question: requesting voluntary consent (voluntary consent form).

Procedures

Subjects for the questionnaire were compiled via Facebook groups: *IBD Support and Solutions for Crohn's and Ulcerative Colitis*, *Ulcerative Colitis*, *Crohn's Disease*, and *Crohn's Teens Crushing It!*. Upon agreement to participate in the study, subjects completed the questionnaire and supplemental questions anonymously (Appendix A). 16 subjects participated. To ensure confidentiality, the confidentiality form (Appendix B) informed participants that names of people would not be disclosed. Subjects agreed to the informed consent form and voluntary consent form (Appendix C)

Physicians which participated in the qualitative interview were contacted via email (Appendix D). Interview questions were created based on Harvard's guide: *Strategies for Qualitative Interviews* (n.d.). Upon agreement to participate in the study, physicians completed the written interview sheet questions (Appendix E). To ensure confidentiality, the confidentiality form informed physicians that names would not be disclosed (Appendix B). Physicians agreed to the informed consent form and voluntary consent form (Appendix C). They shared information according to HIPAA regulations. Following interviews, responses were thematically analyzed.

The meta-analysis was correspondingly completed.

Delimitations

Delimitations were determined prior to the conduction of study in order to limit the subject pool. Foremost, only pediatric patients currently diagnosed with CD or UC were subjects for the study; adults with CD or UC and pediatric patients with a presumptive diagnosis were excluded. Secondly, only pediatric patients currently using or had used dieting as treatment for IBD (discounting whether it was the first-line treatment) were contacted as participants.

RESULTS

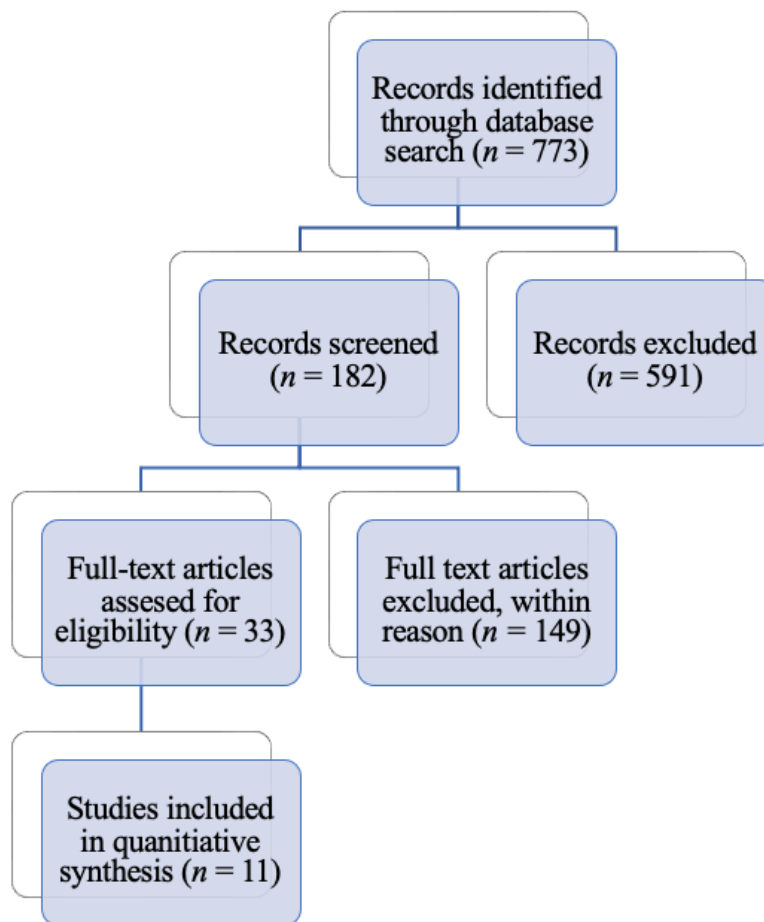
Meta-Analysis

This research applied a mixed-method approach with several precepts of a correlational study. Its aim was not to establish a cause-and-effect relationship, but instead to determine the direction of the relationship based on a synthesis of available studies. The research characterized the nature of adolescent-specific issues with the most popular special diets for IBD. However, this segment of my research did not focus on special diets in conjunction with IBD; it rather analyzed the general adolescent population that practiced these diets. The meta-analysis will provide rules-of-thumb to assess consistency within this study (Weed, 2000). This analysis was a mixed-method measure, and it triangulated the study.

This analysis was conducted based on Sen and Yildirim's guide (2022). A collection of diverse studies published in peer-reviewed journals were selected primarily on relevance. Eleven of the most recent journals published in the search engines *ProQuest* and *EBSCO* were selected. Choosing the latest contemporary research allowed me to emulate the progression of medical research as of March 2023. Articles were eligible for inclusion if they satisfied the following criteria: 1) published in English and on humans; 2) one or more of the following were referenced: eating disorder, disordered eating, and food avoidance; 3) conducted on humans 25≥ years of age. The process diagram indicated reason for rejection of studies (Figure 2). The systematic search was carried out by using the keywords which included: "adolescents," "limitations," "eating disorder," "exclusive enteral nutrition," "IBD-AID," "anti-inflammatory diet," "CD-treat," "Crohn's disease exclusion diet," "auto-immune protocol," "specific carbohydrate diet," "Mediterranean diet," "low FODMAP," "Semi-vegetarian," "Paleo,"

“Paleolithic diet,” and “Ulcerative Colitis exclusion diet.” After identifying articles eligible for the inclusion criteria, the full article text was obtained.

Figure 2: *Results of Search Eligible for Study in Accordance with PRISMA Statement (Moher et al., 2009)*



Strauss' (2010) deductive coding process was used for the completion of three coding iterations (Table 3). See Appendix G to see the justification for codes. These themes arose in various research papers that were analyzed. If the theme emerged, it was shown as indicated in Table 4.

Table 3: *Deductive Coding Process of Indicated Risks (Strauss, 2010)*

Name of Code	Code Description	Example of Code
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Eating Disorder	There is an indication that special dieting heightens the probability of developing an ED in adolescents.	Diet is correlated with eating behavior changes.
Disordered eating	There is an indication of disturbed and unhealthy eating patterns due to dieting.	Diet is correlated with disrupted eating behavior.
Food avoidance	There is an indication that dieting causes malnourishment due to the deliberate restraint of certain foods.	Diet is correlated with refrained eating.

Abbreviations: ED = eating disorder.

Table 4 shows the frequency of the indicated risks by special dieting in adolescents in accordance with the coding iterations. Eight out of eleven diets (72.7%) of the diets indicated food avoidance as a risk; one out of eleven diets (9%) indicated disordered eating as a risk; and one out of eleven diets (9%) indicated eating disorders as a risk. Food avoidance poses as the biggest threat to adolescents practicing these diets but eating disorders and disordered eating do not pose a threat. The Specific Carbohydrate Diet and Low-Fodmap Diet showed the most risk; the Specific Carbohydrate Diet indicated eating disorders and food avoidance as limitations and the Low-FODMAP diet indicated disordered eating and food avoidance. The Anti-inflammatory diet, Mediterranean diet, and Semi-vegetarian diet posed the least threat as they did not indicate any risk.

Table 4: *Frequency of Indicated Risks by Special Dieting in Adolescents*

Study	Diet	Eating Disorder	Disordered Eating	Food Avoidance
Peters <i>et al.</i> , 2022	Exclusive Enteral Nutrition (EEN)	Not indicated	Not indicated	Indicated
de Castro <i>et al.</i> , 2020	Anti-inflammatory diet (IBD-AID)	Not indicated	Not indicated	Not indicated
Pigneur & Ruemmele, 2019	CD-TREAT diet	Not indicated	Not indicated	Indicated
Núñez-Sánchez <i>et al.</i> , 2022	Crohn's Disease Exclusion Diet (CDED)	Not indicated	Not indicated	Indicated
Saha <i>et al.</i> , 2022	Autoimmune protocol diet (AIP)	Not indicated	Not indicated	Indicated
Roncoroni <i>et al.</i> , 2022	Specific Carbohydrate Diet (SCD)	Indicated	Not indicated	Indicated
Melguizo-Ibáñez <i>et al.</i> , 2022	Mediterranean diet	Not indicated	Not indicated	Not indicated
Alkalay, 2021	Low-FODMAP diet	Not indicated	Indicated	Indicated
Craig <i>et al.</i> , 2021	Semi-vegetarian	Not indicated	Not indicated	Not indicated
Panufnik <i>et al.</i> , 2022	Ulcerative Colitis exclusion diet (UCED)	Not indicated	Not indicated	Indicated
Cucinotta <i>et al.</i> , 2021	Paleolithic diet	Not indicated	Not indicated	Indicated

Survey

The questionnaire (Appendix A) was distributed through Microsoft Forms and was completed by 16 participants. Subjects completed the supplemental questions and the SCOFF questionnaire. The mean age of participants was 18.5 (SD = 2.98). Participants who were older than 25 or did not use a special dieting treatment for the management of IBD were removed from the results. Participants were asked for their previous diagnosis' in relation to IBD and eating disorders. Once each response was collected, they were transferred into Microsoft Excel. Then, the data was analyzed and processed using various data tools in Excel. The full responses per participant are in Appendix H. The tables below relate the number of "yes" responses on the SCOFF questionnaire per respondent. $2 \geq$ "yes" responses to the SCOFF questionnaire indicate a likely case of an eating disorder. Table 5 demonstrates the relationship between "yes" responses to the SCOFF with diagnosis. Table 6 demonstrates the relationship between "yes" responses to the SCOFF with special diets.

Table 5: *Significance and P-value per Diagnosis*

	Phi Coefficient	Cramer's V	P-Value
Crohn's Disease	-0.241	0.201	0.587
Ulcerative Colitis	0.449	0.381	0.178

For Crohn's Disease, the Phi Coefficient and Cramer's V indicate a weak, negative association between Crohn's Disease and "yes" responses. The p-value, 0.587, indicates that the association between the variables is not statistically significant at the 0.05 level.

For Ulcerative Colitis, the Phi Coefficient and Cramer's V indicate a moderate, positive association between Ulcerative Colitis and "yes" responses. However, the p-value, 0.178, indicates that the association is not statistically significant at the 0.05 level.

Table 6: *Significance and P-value per Diet*

	Correlation Coefficient	P-Value
SCD	0.310	0.516
EEN	1.000	0.317
Anti-Inflammatory Diet	1.000	0.317
Gluten-Free	0.310	0.516
Keto Diet	0.717	0.168
Paleo Diet	0.000	1.000
Low-Calorie Diet	1.000	0.168
Lactose-Free Diet	-0.104	0.721
Low Residue Diet	-0.104	0.721
Low Fodmap Diet	-0.104	0.721

Note: Multiple participants used two or more diets.

Based on the table, the diets that have a strong positive correlation are the EEN, Anti-Inflammatory, Keto, and Low-Calorie diets. The SCD and Gluten-Free diets have a weak positive correlation. The Low-Fodmap, Lactose-Free, and Low Residue diets have a weak negative correlation. The Paleo diet has no correlation. The p-values for the diets suggest that the correlations are not statistically significant at the 0.05 level. This means that they could have occurred by chance.

Written Interview

In order to collect data on the personal experiences of physicians and to test my hypothesis, I conducted written interviews as the third part of my study. Interviews were particularly useful for this research because it allowed me to gather physician opinions on the effectiveness of special dieting for the management of IBD. This allowed me to acquire rich and detailed perspectives of those who have direct experience with the study. Since my aim was to investigate the impact of past experiences on the development of new conditions, I needed to collect accounts of these events in an anecdotal form. Each interview aimed to ascertain which experiences physicians have confronted in their practice in relation to comorbid eating disorders and IBD. The questions were designed with the help of Harvard's guide: *Strategies for Qualitative Interviews* (n.d.); they were open-ended in order to allow interviewees the opportunity to justify their answers. The written interviews were conducted on Microsoft Forms after being emailed out. See Appendix I for the complete questionnaire responses.

After the written interviews were conducted, the study moved to the second step of analysis: a qualitative thematic analysis. Thematic analysis is an analytical approach that identifies the relationships between common themes in a set of gathered data (Thomas, 2010). The overall goal of this process was to determine whether the type of treatment IBD patients practiced could affect the development of an eating disorder. After identifying relevant common perspectives, the common perspectives were analyzed for how they could contribute to a correlation between special diets and eating disorders. The interviews were thematically analyzed using Lochmiller's guide (2021). Two recurring themes emerged based on conceptual assumptions that guided this study (Table 7).

Table 7: *Definitions of Themes*

Theme	Definition
Nutritional Concerns	Impacts of special diets for the treatment of IBD on nutritional status and nutrient deficiencies
Psychological Impact	Impacts of special diets for the treatment of IBD on body image, quality of life, and mental disorders

These themes were then examined through a thematic analysis. These two recurring themes shed light on the extent to which special dieting for the treatment of adolescent IBD may influence the development of an eating disorder.

Recurring Theme 1: Nutritional Concerns

Nutritional concerns were profusely mentioned. Mainly, malnutrition, involuntary aversion to food, extreme restriction of intake of foods, food avoidances, and food aversion. As described in the table, nutritional concerns are defined as the impact on nutritional deficiencies and status by special diets. Anonymous Respondent #4 stated that special diets for the management of IBD “can result in extreme restriction of intake of foods which can result in malnutrition.” Anonymous respondents #1, #2, #3, and #4 mentioned the compulsory aversion to food which patients with IBD commonly form. Specifically, respondents underlined the heightening of this aversion in the youth demographic. In turn, “patients restrict their diet and may become malnourished” states Anonymous Respondent #1. However, with mindful dietary intake this can be abridged (Anonymous Respondent #3). There was a general consensus between respondents which that IBD, inherently, creates healthy or unhealthy dietary changes in patients in order to curb symptoms. Anonymous Respondent #3 described this nature: “Patients with IBD can develop an involuntary aversion to food due to their symptoms of abdominal pain, diarrhea, and perianal pain on defecation if they have fistulae.” This nature was agreed to be

heightened in youth because adolescents “are still in their formative years for the development of eating habits” (Anonymous Respondent #1). Respondents believe that the nature of IBD can create nutritional concerns because of symptoms. On the other hand, dieting may create changes on eating behavior, especially due to the vulnerability of the adolescent mind.

Recurring Theme 2: Psychological Impact

Most commonly, respondents determined that patients with IBD are more prone to developing Avoidant-Restrictive Food Intake Disorder (AFRID). However, due to the lack of empirical data, respondents suggested that they could not determine whether this connection was present between special dieting treatments and eating disorders. Anonymous respondents #1, #2, and #4 determined that adolescents with IBD are more prone to eating disorders because of youth vulnerability. Anonymous Respondent #2 stated,

I believe that youth in general are more at risk for eating disorders than any other age demographic and are very vulnerable due to puberty, social stressors, social media, and body image issues. This is exacerbated by having a GI diagnosis such as IBD, which can cause you to have a disordered relationship with food.

Anonymous Respondent #3 had a similar narrative. They decided it was unclear if adolescents with IBD were more susceptible to eating disorders than adults with IBD but may suffer from body image issues more commonly because of “rapid weight gain while on steroids or rapid weight loss when having a disease flare.” All respondents concluded that special dieting treatments do not heighten the probability of developing an eating disorder in adolescent IBD patients, but adolescent patients do tend to be more at risk. Anonymous Respondent #1 described special dieting treatments as “a way of life,”

I actually don't think that special diets like SCD enhance the probability of an eating disorder. For most patients, they are choosing SCD as a way of life for themselves. These patients are already self-selected to be open minded to these diets and to be up for the challenge of using a diet-based approach to manage disease. One exception would be EEN (exclusive formula use to help get an IBD flare under control). These patients are often quite sick and are essentially "compelled" in to drinking formula in order to feel better. These patients often struggle to trust their gut again or to enjoy food in the same way.

Respondents further concluded that there is no difference in susceptibility of developing an eating disorder in adolescent and adult patients using special dieting as treatment for IBD. All respondents have not or rarely saw patients on special dieting treatments develop eating disorders more often than patients not practicing a special dieting treatment. However, anonymous respondents #1 and #2 believe that dieting as a general means to lose weight does heighten the probability of developing eating disorder. This is because dieting can “easily morph into becoming compulsive about the things you eat” (Anonymous Respondent #2). Anonymous respondents #3, #4, and #5 believe that mindful dieting has not been correlated to eating disorders.

DISCUSSION

This study was designed to examine the extent to which adolescent patients using special diets for the management of IBD develop an elevated risk of progressing an eating disorder.

Findings

Upon evaluating the results acquired by the three methods, it can be concluded that special diets for the treatment of adolescent IBD are not strongly associated with the

development of an eating disorder. This is proven by all anonymous respondents from the written interviews claiming that special diets for the treatment of IBD do not enhance the probability of developing an eating disorder. All respondents also agreed that this probability does not heighten between the adult and adolescent populations. However, special dieting treatments may lead to “eating compulsions or aversions” (Anonymous Respondent #2).

As depicted by Table 5, the likelihood ($\geq$ “yes” responses to the SCOFF questionnaire) of an eating disorder was not associated with Crohn’s Disease or Ulcerative Colitis. Table 6, however, displayed a strong positive correlation between the likelihood of an eating disorder and EEN, Anti-Inflammatory, Keto, and Low-Calorie diets. Although the p-values still determined that this correlation may have been by chance. So, when triangulating the data, it did become apparent that this correlation was by chance. The EEN diet indicated only the risk of food avoidance, and the Anti-Inflammatory diet did not indicate any risk (Table 4). The only diet which indicated the risk of developing an eating disorder was the SCD (Table 4). The results of the survey proved otherwise because the SCD only had a weak correlation with the likelihood of an eating disorder. The Keto and Low-Calorie diets were not included in Table 4; this was a limitation of my study. These findings underscore the significance of employing multiple methods of data collection in this study. Had the research relied solely on one method (e.g. survey), the prevalence would have been over-reported.

Another finding is that the subjects, adolescent patients with IBD, are generally choosing special dieting as a course of treatment for themselves (Anonymous Respondent #1). Patients generally select themselves and remain open-minded to the challenge throughout the course of the diet (Anonymous Respondent #1). In the self-selected population, dieting is common, but eating disorders are not common (Anonymous Respondent #5). Dieting mindfully has also

proven not to be associated with an eating disorder (Anonymous Respondent #3). Collectively, individually choosing a mindful way of dieting for treatment would not contribute to an elevated risk of developing an eating disorder.

Fulfillment of Gaps in the Research

This research addressed numerous gaps in the pre-existing literature. First, the targeted subjects: adolescent aged 12-25 were not exclusively observed in any of the aforementioned studies. Second, examining a cause of eating disorders comorbid with IBD was not studied. Previous research did not examine any correlation between special dieting treatments and eating disorders. In this study, adolescent patients practicing special dieting treatments were studied. Thirdly, and the utmost significant, gap filled was the extent to which the use of special dieting treatments for adolescent patients with IBD heightens the probability of an eating disorder. Pre-existing research outlined the relation between the comorbidity of IBD and eating disorders, but not one study mentioned special dieting treatments impacting the risk of developing an eating disorder in adolescent patients. This gap formed the basis for this study.

Implications

The results of this study can spur physicians to intentionally prescribe the practice of a special dieting treatment to adolescents in confidence. Based on my study, there is no correlation between special dieting treatments and eating disorders; this means physicians can advocate for the treatment assuredly. As Anonymous Respondent #5 stated, “dieting is very common in this community, eating disorders are not.” In addition, the results of this study can inform the patients – using/not using special dieting treatments – about the safety of special diets for the treatment of IBD. The pre-existing research signifies that the comorbidity of IBD and eating disorders are linked to one another (Ilzarbe *et al.*, 2017). Therefore, this study can inform physicians -- and on

a broader scope, all adolescent patients with IBD – of the indifference of special diets for the treatment of IBD and eating disorders.

Limitations

As displayed, no subject in the survey was diagnosed with an eating disorder. This did not allow me to establish or disprove correlation between special dieting treatments and diagnosed eating disorders. Another limitation is that participants in the survey were not observed throughout the length of their treatment. This did not allow me to determine a change in attitude towards food in actual time. Since there was not an eating disorder specialist in my study or in my written interviews, the study did not determine concurrent diagnoses of eating disorders. Also, the meta-analysis did not include each diet mentioned in the survey. This did not allow readers to observe previous risks per diet in a patient. Lastly, the most major limitation of my study is that little research has been done on the comorbidity of IBD and eating disorders. The gut and brain have shown to be linked, but there is not enough data to prove the relationship between IBD and eating disorders.

Direction for Further Research

This study's small subject pool is catalyst to new areas of research. The subject pool should be expanded to include a diverse group of adolescent patients. The lack of patients with diagnosed eating disorders didn't allow for accurate conclusions on the correlation between eating disorders and patients practicing special dieting treatments. Future research should also observe the difference in risk for patients who were medically required to use special dieting treatments and those who were given the choice. Future research can also expand beyond post-treatment observations and observe patients prior and alongside the start of their special dieting treatment adjoining a dietician.

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Appendix A: Survey and Supplemental Questions

What is your diagnosis?

- ☐ Crohn's Disease
- ☐ Ulcerative Colitis
- ☐ Other: _____

What is your date of birth:

Specify: _____

Prior to this questionnaire, were you diagnosed with an eating disorder subsequent to or prior to your IBD diagnosis? If so, please specify which.

- ☐ I was not diagnosed with an eating disorder.
- ☐ I was diagnosed with an eating disorder before I got diagnosed with IBD.

Specify which eating disorder (i.e. Anorexia Nervosa): _____

- ☐ I was diagnosed with an eating disorder after I got diagnosed with IBD

Specify which eating disorder (i.e. Anorexia Nervosa): _____

Prior to this questionnaire, which special dieting treatment do you use for the management of IBD?

Specify: _____

Insert starting date of the special diet treatment: _____

The SCOFF Questions:

Do you make yourself sick because you feel uncomfortably full?

- ☐ Yes
- ☐ No

Do you worry you have lost control over how much you eat?

☐ Yes

☐ No

Have you recently lost more than one stone (14 pounds/6.35 kilograms) in a 3 month period?

☐ Yes

☐ No

Do you believe yourself to be fat when others say you are too thin?

☐ Yes

☐ No

Would you say that food dominates your life?

☐ Yes

☐ No

Appendix B: *Confidentiality Statement*

All the information that you provide will be unattached to your name to ensure that your private information is kept private. Your name and email will not be published. The information you provide me will be stored on my bio-metric protected computer.

Appendix C: *Voluntary Consent Form*

Taking part in this research is voluntary. If you choose to participate, you will be prompted to answer the question below.

Do you agree to the terms and conditions mentioned above:

☐ Yes

☐ No

Appendix D: *Physician Recruitment Email*

Dear Doctor,

My name is X, and I am a junior at X. I was diagnosed with Crohn's disease in the winter of 2020, when I was just 14. Now, I am determined to advance the research on Inflammatory Bowel Diseases and its treatments. It is of paramount importance that patients with IBD are aware of the limitations of treatments before use. Therefore, I began writing a research paper, discovering whether using special dieting treatments for the management of IBD enhances the probability of developing an eating disorder.

I was hoping you could participate in a written interview. Physician knowledge is immensely important, and is an important sector of my methodologies in my research. The written interview is seven questions and should not take much time. The interview gathers your opinions on the matter.

Please consider helping me advance my research.

Thank you in advance,

X

Appendix E: *Written Interview Questionnaire*

Please answer as honest and open as possible. Do not break HIPAA regulations (no patient names, revealing information, etc.).

Do you believe that patients with an Inflammatory Bowel Disease are more prone to developing an eating disorder? If so, or if not, please justify your answer.

Do you believe youth (ages 12-25) with an Inflammatory Bowel Disease are more prone [than adults with an Inflammatory Bowel Disease] to developing eating disorders? If so, or if not, please justify your answer.

Do you believe patients with an Inflammatory Bowel Disease may develop an eating disorder due to their IBD diagnosis? If so, or if not, please justify your answer.

Do you believe there are limitations to using special dieting treatments (i.e. Specific Carbohydrate Diet) for the management of IBD? If so, or if not, please state those limitations.

Do you believe dieting to lose weight enhances the probability of developing an eating disorder? If so, or if not, please justify your answer.

Do you believe special dieting treatments (i.e. Specific Carbohydrate Diet) for the management of IBD **enhance** the probability of developing an eating disorder? If so, or if not, please justify your answer.

Do you see patients with IBD and using special dieting treatments (i.e. Specific Carbohydrate Diet) develop eating disorders more often than patients with IBD and not using special dieting treatments? If so, or if not, please justify your answer.

Appendix F: *Justification for Supplemental Questions*

Question 1: What is your diagnosis?

This question was supplemented because it categorized respondents. Correlation in the survey was based on diagnosis and treatment.

Question 2: What is your date of birth?

This question was supplemented for confirmation of subject age. The survey was restricted to exclusively include 12-25 year olds.

Question 3: Prior to this questionnaire, were you diagnosed with an eating disorder subsequent to or prior to your IBD diagnosis? If so, specify which.

This question was supplemented to determine whether patients may develop an eating disorder subsequent to their use of special dieting treatments. The two variables offered correlation between practice of special dieting treatments and the development of eating disorders.

Question 4: Prior to this questionnaire, which special dieting treatment did you use for the management of IBD? How long did you use this treatment?

This question was supplemented because it categorized patients. Correlation in the survey was based on diagnosis and treatment.

Appendix G: *Justification for Coding Iterations*

Name of Code	Justification
Eating Disorder	The code was used because the purpose of the study looked for correlation between two variables and eating disorders.
Disordered eating	The code was used of the study looked for correlation between two variables and eating disorders. Disordered eating is researched and not the purpose of the study. It was included to showcase variation between the terms.
Food avoidance	The code was used because the purpose of the study looked for correlation between two variables and eating disorders. A disorder in food avoidance (AFRID) is an eating disorder, therefore included in the study.

Appendix H: Survey Responses

What is your diagnosis?	What is your date of birth?	Prior to this questionnaire, were you diagnosed with an eating disorder subsequent to or prior to your diagnosis? If so, please specify which.	Specify which eating disorder (i.e. Anorexia Nervosa) you were diagnosed with:	Prior to this questionnaire, which special dieting treatment did you/do you use for the management of your Inflammatory Bowel Disease (i.e. Specific Carbohydrate Diet)?	Specify start date of use of the special dieting treatment:
Crohn's Disease	7/16/2006	I was not diagnosed with an eating disorder.		SCD and EEN	9/1/2021
Ulcerative Colitis	11/10/2001	I was not diagnosed with an eating disorder.		Anti-inflammatory diet	10/20/2022
Ulcerative Colitis	8/26/2007	I was not diagnosed with an eating disorder.		Specific carbohydrates diet and no gluten	8/19/2022
Crohn's Disease	4/23/2009	I was not diagnosed with an eating disorder.		Scd diet	1/1/2023
Ulcerative Colitis	2/16/2003	I was not diagnosed with an eating disorder.		Keto, Paleo, SCD, low calorie	12/20/2020
Crohn's Disease	6/14/2005	I was not diagnosed with an eating disorder.		Low Fodmap and Gluten free diet lactose free milk	9/9/2013
Ulcerative Colitis	8/5/1998	I was not diagnosed with an eating disorder.		Low Fodmap Diet	12/1/2022
Ulcerative Colitis	11/11/2002	I was not diagnosed with an eating disorder.		Gluten free and SCD	1/1/2023
Crohn's Disease	5/3/2004	I was not diagnosed with an eating disorder.		Low residue diet	10/1/2022
Ulcerative Colitis	8/31/2001	I was not diagnosed with an eating disorder.		Gluten Free	8/10/2022
Ulcerative Colitis	3/6/2003	I was not diagnosed with an eating disorder.		No lactose products and gluten free	9/14/2022
Crohn's Disease	4/26/2002	I was not diagnosed with an eating disorder.		Paleo	12/1/2017
Ulcerative Colitis	1/3/2003	I was not diagnosed with an eating disorder.		Ketogenic	7/3/2020
Crohn's Disease	9/19/2005	I was not diagnosed with an eating disorder.		I use SCD	6/5/2022
Ulcerative Colitis	10/11/2001	I was not diagnosed with an eating disorder.		Low Residue	10/13/2022
Crohn's Disease	5/17/2008	I was not diagnosed with an eating disorder.		Gluten Free Diet	7/19/2021

Do you make yourself sick because you feel uncomfortably full?	Do you worry you have lost control over how much you eat?	Have you recently lost more than one stone (14 pounds/6.35 kilograms) in a 3 month period?	Do you believe yourself to be fat when others say you are too thin?	Would you say that food dominates your life?	Yes Count
No	Yes	No	Yes	Yes	3
No	Yes	No	No	Yes	2
No	No	Yes	No	No	1
No	No	No	No	Yes	1
Yes	Yes	No	No	Yes	3
No	Yes	No	No	No	1
Yes	No	Yes	Yes	Yes	4
Yes	Yes	Yes	No	Yes	4
No	Yes	Yes	Yes		3
No	No	Yes	No	Yes	2
No	Yes	No	Yes	No	2
No	No	No	Yes	No	1
No	Yes	Yes	Yes	Yes	4
No	Yes	No	Yes	No	2
No	No	No	No	No	0
No	Yes	No	Yes	No	2

Appendix I: Interview Responses

Do you believe that patients with an Inflammatory Bowel Disease are more prone to developing an eating disorder? If so, or if not, please justify your answer.

<i>Anonymous Respondent #1</i>	Anecdotally, I feel quite confident that any chronic inflammation state of the gut can be a risk factor for the development of an eating disorder. But first, one must define an "eating disorder". I am using this term broadly to include 'disordered eating behavior'. So, while some of these patients may meet criteria for anorexia nervosa or Avoidant-Restrictive Food Intake Disorder (ARFID), some patients may be less pronounced or less straight forward. Second, gut inflammation can come in a few varieties. Allergic inflammation (eosinophilic esophagitis, eosinophilic gastritis) can precede the development of an eating disorder. So can infectious inflammation (<i>Helicobacter pylori</i> infection). Celiac disease is another great example. Lastly, IBD can definitely be a risk factor. Lastly, I would just say that while this is my personal experience as a physician, there is a small body of literature on the relationship between eating disorders and IBD. However the data are small and mixed.
<i>Anonymous Respondent #2</i>	Yes, research has shown that IBD patients can have a concurrent diagnosis of avoidant restrictive food intake disorder, which is listed in the DSM-V (diagnostic and statistical manual of mental disorders).
<i>Anonymous Respondent #3</i>	Patients with IBD can develop an involuntary aversion to food due to their symptoms of abdominal pain, diarrhea, and perianal pain on defecation if they have fistulae.
<i>Anonymous Respondent #4</i>	Yes. Patients link what they eat to their symptoms which can result in extreme restriction of intake of foods which can result in malnutrition and an eating disorder.
<i>Anonymous Respondent #5</i>	Yes; food avoidance, food intolerances

Do you believe youth (ages 12-25) with an Inflammatory Bowel Disease are more prone [than adults with an Inflammatory Bowel Disease] to developing eating disorders? If so, or if not, please justify your answer.

<i>Anonymous Respondent #1</i>	Wow, this is a great question. I honestly do not know the data on this. I would have to guess that youth are more prone to an eating disorder because they are still in their formative years for the development of eating habits and are still developing their frontal lobes of their brain. Furthermore, the added pressures of peers, puberty, and rapid growth likely magnifies the effects of IBD on the development of an eating disorder.
<i>Anonymous Respondent #2</i>	I believe that youth in general are more at risk for eating disorders than any other age demographic and are very vulnerable due to puberty, social stressors, social media, and body image issues. This is exacerbated by having a GI diagnosis such as IBD, which can cause you to have a disordered relationship with food.

<i>Anonymous Respondent #3</i>	It is unclear if this age group is more prone to develop an eating disorder than adults. Young adults with IBD can suffer from body image issues though, when they have rapid weight gain while on steroids or rapid weight loss when having a disease flare.
<i>Anonymous Respondent #4</i>	I think eating disorders in general are more common to begin at that age group so I would think that subgroup of patients with IBD are at greater risk.
<i>Anonymous Respondent #5</i>	I do not treat those under 18, so do not know if this is more prevalent in this age group

Do you believe patients with an Inflammatory Bowel Disease may develop an eating disorder due to their IBD diagnosis? If so, or if not, please justify your answer.

<i>Anonymous Respondent #1</i>	This is the question of whether IBD is merely associated (or correlated) with eating disorders or whether IBD CAUSES (in some way) the development of an eating disorder. We are learning more and more about the "two way street" between the gut and the brain. We used to think that brain can trigger the gut (like what anxiety does to causing IBS and diarrhea). But we are starting to see in scientific research--both basic science and in animal studies--that perhaps the gut (and gut inflammation) can trigger brain changes. We see that IBD is associated with anxiety, depression, learning/concentration/sleep issues.....so there must be an important relationship here. But (as a data-driven person) there isn't a ton of empiric evidence to show a truly causal relationship. So, it's still up in the air as far as I'm concerned.
<i>Anonymous Respondent #2</i>	Yes, many IBD patients are prone to avoiding certain foods due to it being associated with symptoms such as abdominal pain or diarrhea. Over time, patients restrict their diet and may become malnourished and develop an aversion to food.
<i>Anonymous Respondent #3</i>	As per my research, and my discussion with patients, there's no clear evidence of a higher incidence or prevalence of eating disorders in the IBD population. However, developing a food aversion (see answer 1) may be common.
<i>Anonymous Respondent #4</i>	See response to question 1. Another factor that could result in this is side effects related to steroids, particularly the weight gain and moon facies which could result in disordered eating to lose weight.
<i>Anonymous Respondent #5</i>	I think they may develop it due to their experiences with symptoms after certain foods. This is not unique to IBD, it also occurs with IBS and celiac disease

Do you believe there are limitations to using special dieting treatments (i.e. Specific Carbohydrate Diet) for the management of IBD? If so, or if not, please state those limitations.

<i>Anonymous Respondent #1</i>	Yes, there are limitations. They don't work on everyone and they are hard to implement and adhere to. Simply put.
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<i>Anonymous Respondent #2</i>	Yes, the limitations are that the SCD is very strict and difficult to follow. It usually requires eating at home and having someone that can help you cook, or being able to cook food daily. It is expensive, because it requires purchasing certain fruits and vegetables and not eating packaged foods. It also is difficult because it may require making your own yogurt.
<i>Anonymous Respondent #3</i>	I practice adult IBD care and specific carbohydrate diet is not used in the management of adults.
<i>Anonymous Respondent #4</i>	These diets may make patients with Crohn's disease feel better but do not change the inflammatory burden and result in healing of the intestines. They should be used as an adjunct or in patients with mild Crohn's disease.
<i>Anonymous Respondent #5</i>	This Q is unclear; medical limitations, psychological limitations?

Do you believe dieting to lose weight enhances the probability of developing an eating disorder? If so, or if not, please justify your answer.

<i>Anonymous Respondent #1</i>	This is actually really out of my area of expertise and am not sure I have anything to say on this question. My guess is that the answer is yes. But I wouldn't be able to speculate as to why.
<i>Anonymous Respondent #2</i>	Yes, because dieting requires that you be very attuned to what you are eating and usually requires counting calories. It can easily morph into becoming compulsive about the things you eat.
<i>Anonymous Respondent #3</i>	Mindful dietary intake for intentional weight loss has not been shown to be associated with an eating disorder.
<i>Anonymous Respondent #4</i>	Not sure. I suspect that this depends on other variables for a given patient (concurrent Axis 1 and 2 disorders, SES status, etc).
<i>Anonymous Respondent #5</i>	No; dieting is very common in the community, eating disorders are not.

Do you believe special dieting treatments (i.e. Specific Carbohydrate Diet) for the management of IBD enhance the probability of developing an eating disorder? If so, or if not, please justify your answer.

<i>Anonymous Respondent #1</i>	I actually don't think that special diets like SCD enhance the probability of an eating disorder. For most patients, they are choosing SCD as a way of life for themselves. These patients are already self-selected to be open minded to these diets and to be up for the challenge of using a diet-based approach to manage disease. One exception would be EEN (exclusive formula use to help get an IBD flare under control). These patients are often quite sick and are essentially "compelled" in to drinking formula in order to feel better. These
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	patients often struggle to trust their gut again or to enjoy food in the same way.
<i>Anonymous Respondent #2</i>	I am not sure about this. I do think that it can make you compulsive about the foods you eat, and can certainly lead to eating compulsions or aversions.
<i>Anonymous Respondent #3</i>	I practice adult IBD care and specific carbohydrate diet is not used in the management of adults.
<i>Anonymous Respondent #4</i>	I don't think that the patients using an SCD diet are more likely to have disordered eating. They tend to be risk averse, naturopathic, and have higher SES.
<i>Anonymous Respondent #5</i>	No

Do you see patients with IBD and using special dieting treatments (i.e. Specific Carbohydrate Diet) develop eating disorders more often than patients with IBD and not using special dieting treatments? If so, or if not, please justify your answer.

<i>Anonymous Respondent #1</i>	I do not think there is a significant difference between these two groups in my practice. However this is likely because the use of SCD (and others) is quite limited and the rate of eating disorders in IBD are overall not extremely high. So the ability to detect a difference in a single person's practice is probably limited.
<i>Anonymous Respondent #2</i>	I have not personally diagnosed any patients with eating disorders formally, since this usually requires collaboration with a psychiatrist that is well-trained in diagnosing ARFID, anorexia, bulimia, etc.
<i>Anonymous Respondent #3</i>	I practice adult IBD care and specific carbohydrate diet is not used in the management of adults. We do not use any dietary interventions for the management of IBD.
<i>Anonymous Respondent #4</i>	I don't think so.
<i>Anonymous Respondent #5</i>	No. I see lots of patients trying special diets for IBD. I can only recall less than 5 patients with IBD being diagnosed with an eating disorder in the last 15 years. There may be undiagnosed eating disorders, but I doubt its a large proportion of our patients who try special diets.