Clin Nutr Res. 2018 Jan;7(1):48-55
https://doi.org/10.7762/cnr.2018.7.1.48
pISSN 2287-3732·eISSN 2287-3740

cnr
CLINICAL NUTRITION RESEARCH

Original Article

Check for updates

Food Elimination Diet and Nutritional Deficiency in Patients with Inflammatory Bowel Disease

Hee-Sook Lim,[1] **Soon-Kyung Kim**,[2] **Su-Jin Hong**[3]

[1]Department of Food Sciences and Nutrition, Yeonsung University, Anyang 14011, Korea
[2]Department of Food Sciences and Nutrition, Soonchunhyang University, Asan 31538, Korea
[3]Digestive Disease Center and Research Institute, Department of Internal Medicine, Soonchunhyang University College of Medicine, Bucheon 14584, Korea

OPEN ACCESS

Received: Dec 29, 2017
Revised: Jan 20, 2018
Accepted: Jan 20, 2018

Correspondence to
Soon-Kyung Kim
Department of Food Sciences and Nutrition, Soonchunhyang University,
22 Soonchunhyang-ro, Sinchang-myeon, Asan 31538, Korea.
E-mail: soon56@sch.ac.kr

ORCID iDs
Hee-Sook Lim
https://orcid.org/0000-0003-0745-8906
Soon-Kyung Kim
https://orcid.org/0000-0001-9057-0792
Su-Jin Hong
https://orcid.org/0000-0003-2012-0360

Funding
This work was supported by the Soonchunhyang University Research Fund.

Conflict of Interest
The authors declare that they have no competing interests.

This paper was presented to the Korean Society of Clinical Nutrition in 2015 and was awarded the Best Poster Award.

ABSTRACT

Certain types of foods are common trigger for bowel symptoms such as abdominal discomfort or pain in patients with inflammatory bowel disease (IBD). But indiscriminate food exclusions from their diet can lead extensive nutritional deficiencies. The aim of this study was to investigate nutritional status, food restriction and nutrient intake status in IBD patients. A total 104 patients (food exclusion group: n = 49; food non-exclusion group: n = 55) participated in the survey. The contents were examined by 3 categories: 1) anthropometric and nutritional status; 2) diet beliefs and food restriction; and 3) nutrient intake. The malnutrition rate was significantly higher in the food exclusion group ($p = 0.007$) compared to food non-exclusion group. Fifty-nine percent of patients in the food exclusion group held dietary beliefs and reported modifying their intake according to their dietary belief. The most common restricted food was milk, dairy products (32.7%), raw fish (24.5%), deep-spicy foods (22.4%), and ramen (18.4%). The mean daily intake of calcium ($p = 0.002$), vitamin A ($p < 0.001$), and zinc ($p = 0.001$) were significantly lower in the food exclusion group. Considering malnutrition in IBD patients, nutrition education by trained dietitians is necessary for the patients to acquire disease-related knowledge and overall balanced nutrition as part of strategies in treating and preventing nutrition deficiencies.

Keywords: Inflammatory bowel diseases; Malnutrition; Attitude to health; Food intolerance

INTRODUCTION

Inflammatory bowel disease (IBD) is a chronic idiopathic inflammatory disease that is represented by ulcerative colitis and Crohn's disease. IBD is caused by a combination of genetic and environmental factors and the patients suffer from nausea, vomiting, loss of appetite, headaches, and diarrhea during treatment [1]. Moreover, it is reported that maintaining a good working status or daily life is difficult for the patients because of repeated relapse of their works. Such situation can lead anxiety, depression, or feeling of socially isolated in patients and compromise their quality of life [2,3]. The incidence of IBD due to dietary factors has increased specifically in patients with an increase in fat and protein intake and the lack of fruits and vegetables intake from the diet [4]. Studies have shown that when high levels of linoleic acid are consumed, a high intake of red and processed meat increases the risk of developing ulcerative colitis as well as relapse. The association between food

intake patterns and changes in intestinal bacteria has been emphasized in several studies [5-7]. Ulcerative colitis and Crohn's disease are associated with a 20%–75% loss of body weight and electrolyte imbalance [8]. Various factors are involved in causing nutritional deficiencies in individuals with IBD, including decreased oral intakes, metabolic disorders, increased nutritional requirements, drug interactions, and malabsorption [9]. In addition, nutritional disorders can occur due to prolonged periods and indiscriminate manner of food restriction for reducing discomfort from IBD symptoms.

Thus, nutrition goals for patients with IBD need to be coordinated so that patients can better manage themselves with the aim of maintaining or improving a balanced nutritional status through appropriate provision of nutrients according to their treatment conditions [10]. However, nutrition studies conducted for Korean patients with IBD are very rare. This study was performed to assess the nutritional status of patients with IBD and to analyze whether the diet or nutritional imbalance varies depending on food restriction. Our findings will serve basic data to future clinical nutrition research for IBD patients.

MATERIALS AND METHODS

Study subjects

The study subjects were patients with confirmed IBD who visited the digestive division of Soonchunhyang University Hospital in Gyeonggi-do. The first 112 patients participated but only the final 104 results were used for the study; results from 8 patients were excluded due to denial or missing data. The participants were fully informed of the purpose, need, and method of this study and asked for their consent. The research design and protocol were approved by Institutional Review Board of Soonchunhyang University (approval number: 2015-BM-002-01). Based on the study purpose, the subjects were classified into 2 groups (food exclusion group, n = 49; food non-exclusion group, n = 55) through interviews with a clinical dietitian.

Variable measurements and definitions

Subjects' body mass index (BMI) was calculated using height and weight. We obtained data about the disease diagnosis period (< 1, 1–3, ≥ 3 years) and IBD classification (Crohn's disease or ulcerative colitis). Disease activity reflected the medical record information as well as confirmation from the physician. The patients' nutritional status was assessed by a clinical dietitian using a subjective global assessment method and nutritional status was classified as adequate, mild or moderate malnutrition, or severe malnutrition.

After the diagnosis, beliefs and attitude related to the patients' usual diet were investigated. The questions were based on previous research journal and were reviewed by the researchers [11,12]. 'Do you think you are important to meals in the beginning and during the period of IBD diagnosis?', 'Do you have a dietary modification?', 'Do you think that diet could play a role in causing disease relapse?', 'Do you think you should avoid food to prevent disease relapse?', 'In case of relapse, what diet do you believe can improve disease symptoms?', 'Do you received nutrition education and management?', 'Do you want a nutritional education and professional management?' Dietary habits assessed were about drinking, smoking, exercise, regularity of meals, eating speed, and frequency of eating out. In order to examine the degree of restriction of food intake, a questionnaire was analyzed for a list of foods that are usually restricted in the diet. In order to evaluate nutrient intake, 3-day food record

https://doi.org/10.7762/cnr.2018.7.1.48

method was conducted and the data was analyzed using the computer-aided nutritional analysis program (CAN-Pro 4.0; Korean Nutrition Society, Seoul, Korea).

Statistics analysis

Statistical processing and analysis for all data collected from the investigation were performed by using the SPSS program (ver. 18.0; SPSS Inc., Chicago, IL, USA). To identify factors differing between the groups, the independent t-test was used for continuous variables including nutrient factors and the equal-variance, χ^2 test, or Fisher's exact test for categorical variables. For all analyses, $p < 0.050$ was considered statistically significant.

RESULTS

The characteristics of the 104 patients can be found in **Table 1**. The total number of subjects in the food exclusion group was 49 (47.1%) and the mean age was 39.4 years. The mean age of the food non-exclusion group was significantly lower than that of the food exclusion group ($p = 0.016$). The mean BMI of all subjects was 23.6 kg/m^2 and the diagnosis period was < 1 year in 23.1%, 1–3 years in 36.5%, and ≥ 3 years in 40.4% of all subjects. The type of IBD was Crohn's disease in 58.7% and ulcerative colitis in 41.3%. For current disease activity 27.9% of patients were categorized as active stage and there was no significant difference between the 2 groups.

The nutritional status was adequate for 65.4% of the patients in the food exclusion group while there was mild-moderate malnutrition in 22.4% and severe malnutrition in 12.2% of the patients. The respective rates in the food non-exclusion group were 76.4%, 18.2%, and 5.5%. The rate of malnutrition in the food exclusion group was significantly higher than the non-exclusion group ($p = 0.007$) (**Figure 1**).

As a result of the analysis of beliefs and attitudes toward diet, the rate of dietary intervention was 77.6% in the food exclusion group and 36.4% in the food non-exclusion group, and there was a significant difference between the 2 groups (**Table 2**). Total of 38 patients had a dietary

Table 1. Demographics and characteristics of the IBD patients

Characteristics	Total (n = 104)	Food exclusion group (n = 49)	Food non-exclusion group (n = 55)	p value
Age, yr	39.4 (16.1)	35.6 (13.5)	45.3 (17.9)	0.016
Sex				0.448
Male	60 (57.7)	27 (55.1)	33 (60.0)	
Female	44 (42.3)	22 (44.9)	22 (40.0)	
BMI, kg/m^2	23.6 ± 5.8	23.0 ± 6.0	24.7 ± 3.9	0.583*
Disease duration, yr				0.127
< 1	24 (23.1)	14 (28.6)	10 (18.2)	
1–3	38 (36.5)	18 (36.7)	20 (36.4)	
> 3	42 (40.4)	17 (34.7)	25 (45.5)	
Disease type				0.045
Crohn's disease	61 (58.7)	32 (65.3)	29 (52.7)	
Ulcerative colitis	43 (41.3)	17 (34.7)	26 (47.3)	
Disease activity				0.261
Inactive	75 (72.1)	34 (69.4)	41 (75.5)	
Active	29 (27.9)	15 (30.6)	14 (25.5)	

Data were reported as mean ± standard deviation or mean (standard deviation) for continuous variables and frequency (percentage) for categorical variables.
p values were calculated by χ^2 test.
IBD, inflammatory bowel disease; BMI, body mass index.
*p value was calculated by independent t-test.

https://doi.org/10.7762/cnr.2018.7.1.48

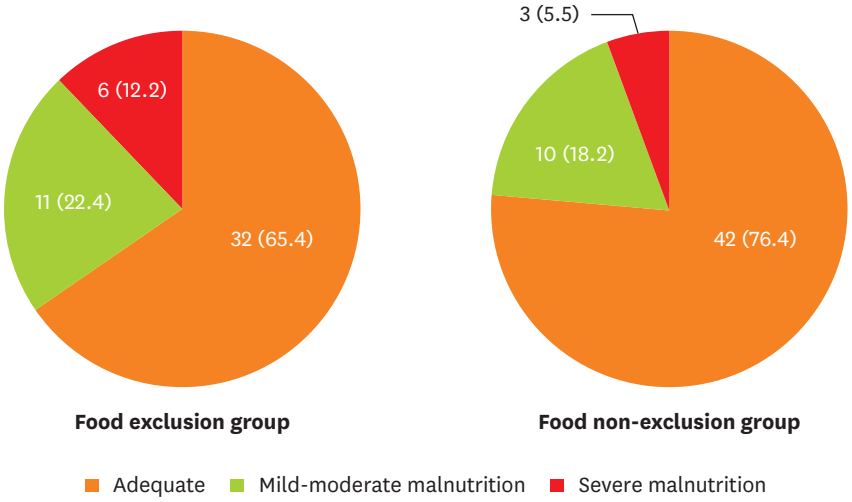

Figure 1. Comparison of nutritional status between groups. Data were reported as frequency (percentage) for categorical variables. p value for the significant difference between 2 groups is 0.007 and was calculated by χ^2 test.

modification by harmful food restriction (50.0%), harmful recipes restriction (21.0%), and adjusting the amount of meals (15.8%). In addition, 73.5% of those in the food exclusion group indicated that food should be avoided in order to prevent relapse of disease, as compared to 20.0% of those in the food non-exclusion group. The percentage of people who wanted nutrition education and management was 83.7% for the food exclusion group and 67.3% in the food non-exclusion group.

In part of the survey on eating habits and lifestyle (**Table 3**), there was a significant difference only in drinking and eating out between the 2 groups. Despite the fact that there was no difference in the ratio of men and women between the 2 groups, the food non-exclusion group had a high rate of alcohol consumption. The rates of regular exercise and eating regular meals was < 50%. The frequency of eating out was 1–3 times per month in the food exclusion group and 1–2 times per week in the food non-exclusion group.

Table 2. Diet beliefs and educational demand of the IBD patients

Questionnaires	Food exclusion group (n = 49)	Food non-exclusion group (n = 55)	p value
1) Do you think you are important to meals in the beginning and during the period of IBD diagnosis?	40 (81.6)	48 (87.3)	0.237
2) Do you have a dietary modification?	38 (77.6)	20 (36.4)	< 0.001
Adjustment of meal amount	6 (15.8)	2 (10.0)	0.148
Restriction of harmful food	19 (50.0)	7 (35.0)	-
Restriction of harmful recipe	8 (21.0)	7 (35.0)	-
Diet slowly	2 (5.3)	1 (5.0)	-
Etc.	3 (7.9)	3 (15.0)	-
3) Do you think that diet could play a role in causing disease recurrence?	25 (51.0)	28 (50.9)	0.516
4) Do you think that you should avoid some food to prevent disease recurrence?	36 (73.5)	11 (20.0)	< 0.001
5) In case of recurrence, what diet do you believe can improve disease symptoms?	31 (63.3)	30 (54.5)	0.062
6) Do you receive nutrition education and management?	8 (16.3)	10 (18.2)	0.728
7) Do you want a nutritional education and professional management?	41 (83.7)	37 (67.3)	0.028

Data were calculated based on answer 'yes.' Data were reported as frequency (percentage) for categorical variables and p values were calculated by χ^2 test.
IBD, inflammatory bowel disease.

https://doi.org/10.7762/cnr.2018.7.1.48

Table 3. Life habit and eating behavior of the IBD patients

Variables	Food exclusion group (n = 49)	Food non-exclusion group (n = 55)	p value
Alcohol consumption			0.002
Yes	16 (32.7)	36 (65.5)	
No	34 (69.4)	19 (34.5)	
Smoking			0.670
Yes	18 (36.7)	21 (38.2)	
No	31 (63.3)	34 (61.8)	
Regular exercise			0.117
Yes	19 (38.8)	27 (49.1)	
No	30 (61.2)	28 (50.9)	
Meal regularity			0.559
Regular	24 (49.0)	25 (45.5)	
Irregular	25 (51.0)	30 (54.5)	
Eating speed, min			0.308
< 10	8 (16.3)	15 (27.3)	
10–30	32 (65.3)	33 (60.0)	
> 30	9 (18.4)	7 (12.7)	
Eating out			0.010
> 3 times per wk	5 (10.2)	11 (20.0)	
1–2 times per wk	16 (32.7)	26 (47.3)	
1–3 times per mon	28 (57.1)	15 (27.2)	
< 1 time per mon	0 (0.0)	3 (5.5)	

Data were reported as frequency (percentage) for categorical variables and p values were calculated by χ^2 test.
IBD, inflammatory bowel disease.

In the food exclusion group, the most frequently restricted foods were milk and dairy products, raw fish, fatty meats, noodles, and deep-spicy foods (**Table 4**). Milk and dairy products, raw fish, deep-spicy foods, deep-fried foods, and fatty meat were restricted in high priority when the disease was activated.

As a result of nutrient intake analysis, there was no significant difference in energy, protein, fat, carbohydrate, or fiber between 2 groups (**Table 5**). Calcium, zinc, and vitamin A intake in the food exclusion group were significantly lower than those in the food non-exclusion group.

Table 4. Food items of food exclusion group (n = 49)

Food items	Always avoid	Avoid when disease is active
Multi-grain rice	2 (4.1)	5 (10.2)
Noodles	6 (12.2)	9 (18.4)
Bread	2 (4.1)	3 (6.1)
Popcorn, cookies	3 (6.1)	3 (6.1)
Beans	4 (8.2)	9 (18.4)
Lean meat	2 (4.1)	2 (4.1)
Fatty meat	8 (16.3)	21 (42.9)
Seafood	3 (6.1)	3 (6.1)
Raw fish	12 (24.5)	35 (71.4)
Salad and raw vegetables	1 (2.0)	1 (2.0)
Seaweeds	1 (2.0)	1 (2.0)
Nuts and seeds	5 (10.2)	6 (12.2)
Milk and dairy product	16 (32.7)	38 (77.6)
Tea or coffee	5 (10.2)	9 (18.4)
Fruits	0 (0.0)	3 (6.1)
Sugar, chocolate	5 (10.2)	7 (14.3)
Ramen	9 (18.4)	15 (30.6)
Pizza	5 (10.2)	14 (28.6)
Deep-spicy foods	11 (22.4)	26 (53.1)
Deep-fried foods	6 (12.2)	22 (44.9)

Data were reported as frequency (percentage) for categorical variables.

https://doi.org/10.7762/cnr.2018.7.1.48

Table 5. Nutrient intake status of the IBD patients

Variables	Total (n = 104)	Food exclusion group (n = 49)	Food non-exclusion group (n = 55)	p value
Energy, kcal	1,883.6 ± 550.3	1,894.6 ± 583.6	1,769.3 ± 465.1	0.663
Protein, g	62.5 ± 22.4	59.9 ± 16.5	66.4 ± 21.7	0.454
Fat, g	48.4 ± 20.9	46.3 ± 14.6	50.4 ± 20.9	0.223
Carbohydrate, g	250.4 ± 63.1	249.8 ± 107.6	262.9 ± 58.9	0.415
Fiber, g	8.8 ± 5.7	8.4 ± 5.5	9.5 ± 7.9	0.547
Calcium, mg	476.3 ± 252.9	403.2 ± 255.7	568.3 ± 135.0	0.002
Phosphorous, mg	984.5 ± 425.6	918.3 ± 239.9	1,076.0 ± 409.9	0.454
Iron, mg	10.8 ± 4.6	10.0 ± 2.5	11.4 ± 5.3	0.644
Sodium, mg	4,460.7 ± 1,239.3	4,219.5 ± 1,586.3	4,521.7 ± 1,047.7	0.510
Potassium, mg	2,395.6 ± 899.4	2,373.0 ± 661.2	2,500.5 ± 931.8	0.326
Zinc, mg	7.3 ± 2.8	6.1 ± 1.5	7.7 ± 3.3	0.001
Vitamin A, mgRE	765.6 ± 548.5	644.3 ± 333.9	851.5 ± 760.6	< 0.001
Vitamin B_1, mg	1.1 ± 0.7	1.0 ± 0.6	1.2 ± 0.4	0.409
Vitamin B_2, mg	1.4 ± 0.6	1.4 ± 0.5	1.5 ± 0.3	0.325
Vitamin B_6, mg	1.6 ± 0.7	1.5 ± 0.6	1.6 ± 0.9	0.549
Niacin, mgNE	16.0 ± 13.5	15.1 ± 6.5	16.9 ± 12.0	0.670
Vitamin C, mg	104.6 ± 35.8	99.7 ± 421	110.2 ± 29.4	0.187
Folate, μg	266.5 ± 58.2	255.4 ± 54.2	271.6 ± 82.8	0.201
Vitamin E, mg	13.6 ± 9.1	12.4 ± 5.2	13.1 ± 9.0	0.155

Data were reported as mean ± standard deviation for continuous and p value was calculated by independent t-test.
IBD, inflammatory bowel disease.

DISCUSSION

The deliberate diagnosis of ulcerative colitis and Crohn's disease is important for IBD. The ultimate goal of IBD treatment is to improve symptoms of acute episodes and to improve the quality of life and health of patients by treating patients well [13]. In recent years, the concept of remission has changed, and the empirical contents such as improvement of clinical symptom of the patient have been reflected as a new concept of 'deep remission' [14].

The rate of malnutrition in patients with IBD is very high and the immune system damage caused by malnutrition has been reported to have a negative effect on treatment response. In the case of Crohn's disease, nutritional support is needed as a primary treatment of disease, and comparative studies with steroid treatment have proved to be effective, but ulcerative colitis has not been recognized as an absolute necessity for primary treatment. However, there is a common opinion that secondary treatment is needed to treat malnutrition for both diseases [15,16]. For patients with IBD parenteral nutrition and the guideline for tube feeding and oral intake according to intestinal function is recommended. In case of resting period, the recurrence rate is low when a normal diet is added to a basal diet [17].

Patients with IBD have high rates of iron, calcium, vitamin B_{12}, and vitamin D deficiencies. One of the causes for malnutrition is a dietary adjustment to the patient's own experience and beliefs. The degree of dietary intolerance was similar between patients with Crohn's disease and ulcerative but studies have also identified food intolerance in artificial sweeteners, grains, dairy products, and yeast in IBD patients [18,19]. Recent changes in the concept of IBD treatment are not adequate to control patients' beliefs and experiences. Still, there is a concern about an adverse effect of the diet which is based on of patients' prolonged absolute belief. Individualized adjustments are therefore necessary to accommodate the patient's disease and condition. In this study, the food exclusion group had a higher rate of Crohn's disease patients and the belief that food control decreased recurrence of symptoms

https://doi.org/10.7762/cnr.2018.7.1.48

compared to food non-exclusion group. However, the intake of some nutrients was poor, and the rate of malnutrition was high in patients in the food exclusion group.

This study has a limitation. In this study the patients were not classified according to disease or activity and the nutrient intake of study patients was assessed regardless of adequate intake according to individual nutritional requirement. What is interesting is that the rate of receiving nutrition education or management is very low and the rate of requests is very high. According to an international study, about half of Crohn's disease patients who had weight loss experienced pleasure of eating according to the management of specialists and reported that those changes affected the recurrence of disease symptoms [20]. There are not many domestic or foreign studies evaluating this concept between nutrition and IBD management and this is an important area for future research. It is considered that dietary factors that should be treated in high priority for the social life of IBD patients.

CONCLUSION

In conclusion, we emphasize that appropriate nutritional interventions are necessary to provide information on beliefs, causes of action and clinical outcomes of patients with IBD.

REFERENCES

1. Goyal N, Rana A, Ahlawat A, Bijjem KR, Kumar P. Animal models of inflammatory bowel disease: a review. Inflammopharmacology 2014;22:219-33.
PUBMED | CROSSREF
2. Chan W, Shim HH, Lim MS, Sawadjaan FL, Isaac SP, Chuah SW, Leong R, Kong C. Symptoms of anxiety and depression are independently associated with inflammatory bowel disease-related disability. Dig Liver Dis 2017;49:1314-9.
PUBMED | CROSSREF
3. Bennebroek Evertsz' F, Sprangers MA, Sitnikova K, Stokkers PC, Ponsioen CY, Bartelsman JF, van Bodegraven AA, Fischer S, Depla AC, Mallant RC, Sanderman R, Burger H, Bockting CL. Effectiveness of cognitive-behavioral therapy on quality of life, anxiety, and depressive symptoms among patients with inflammatory bowel disease: a multicenter randomized controlled trial. J Consult Clin Psychol 2017;85:918-25.
PUBMED | CROSSREF
4. Sarbagili-Shabat C, Sigall-Boneh R, Levine A. Nutritional therapy in inflammatory bowel disease. Curr Opin Gastroenterol 2015;31:303-8.
PUBMED | CROSSREF
5. Bassaganya-Riera J, Hontecillas R. Dietary conjugated linoleic acid and n-3 polyunsaturated fatty acids in inflammatory bowel disease. Curr Opin Clin Nutr Metab Care 2010;13:569-73.
PUBMED | CROSSREF
6. Maconi G, Ardizzone S, Cucino C, Bezzio C, Russo AG, Bianchi Porro G. Pre-illness changes in dietary habits and diet as a risk factor for inflammatory bowel disease: a case-control study. World J Gastroenterol 2010;16:4297-304.
PUBMED | CROSSREF
7. Cohen AB, Lee D, Long MD, Kappelman MD, Martin CF, Sandler RS, Lewis JD. Dietary patterns and self-reported associations of diet with symptoms of inflammatory bowel disease. Dig Dis Sci 2013;58:1322-8.
PUBMED | CROSSREF
8. Knight-Sepulveda K, Kais S, Santaolalla R, Abreu MT. Diet and inflammatory bowel disease. Gastroenterol Hepatol (N Y) 2015;11:511-20.
PUBMED
9. Vidarsdottir JB, Johannsdottir SE, Thorsdottir I, Bjornsson E, Ramel A. A cross-sectional study on nutrient intake and -status in inflammatory bowel disease patients. Nutr J 2016;15:61.
PUBMED | CROSSREF

https://doi.org/10.7762/cnr.2018.7.1.48

10. Forbes A, Escher J, Hébuterne X, Kłęk S, Krznaric Z, Schneider S, Shamir R, Stardelova K, Wierdsma N, Wiskin AE, Bischoff SC. ESPEN guideline: Clinical nutrition in inflammatory bowel disease. Clin Nutr 2017;36:321-47.
PUBMED | CROSSREF

11. Limdi JK, Aggarwal D, McLaughlin JT. Dietary practices and beliefs in patients with inflammatory bowel disease. Inflamm Bowel Dis 2016;22:164-70.
PUBMED | CROSSREF

12. Vagianos K, Clara I, Carr R, Graff LA, Walker JR, Targownik LE, Lix LM, Rogala L, Miller N, Bernstein CN. What are adults with inflammatory bowel disease (IBD) eating? A closer look at the dietary habits of a population-based Canadian IBD Cohort. JPEN J Parenter Enteral Nutr 2016;40:405-11.
PUBMED | CROSSREF

13. Sandborn WJ, Hanauer S, Van Assche G, Panés J, Wilson S, Petersson J, Panaccione R. Treating beyond symptoms with a view to improving patient outcomes in inflammatory bowel diseases. J Crohns Colitis 2014;8:927-35.
PUBMED | CROSSREF

14. Vasudevan A, Gibson PR, van Langenberg DR. Time to clinical response and remission for therapeutics in inflammatory bowel diseases: what should the clinician expect, what should patients be told? World J Gastroenterol 2017;23:6385-402.
PUBMED | CROSSREF

15. Choi CH, Moon W, Kim YS, Kim ES, Lee BI, Jung Y, Yoon YS, Lee H, Park DI, Han DSIBD Study Group of the Korean Association for the Study of the Intestinal Diseases. Second Korean guideline for the management of ulcerative colitis. Korean J Gastroenterol 2017;69:1-28.
PUBMED | CROSSREF

16. Park JJ, Yang SK, Ye BD, Kim JW, Park DI, Yoon H, Im JP, Lee KM, Yoon SN, Lee HIBD Study Group of the Korean Association for the Study of the Intestinal Diseases. Second Korean guidelines for the management of Crohn's disease. Korean J Gastroenterol 2017;69:29-54.
PUBMED | CROSSREF

17. Rajendran N, Kumar D. Role of diet in the management of inflammatory bowel disease. World J Gastroenterol 2010;16:1442-8.
PUBMED | CROSSREF

18. Ballegaard M, Bjergstrøm A, Brøndum S, Hylander E, Jensen L, Ladefoged K. Self-reported food intolerance in chronic inflammatory bowel disease. Scand J Gastroenterol 1997;32:569-71.
PUBMED | CROSSREF

19. MacDermott RP. Treatment of irritable bowel syndrome in outpatients with inflammatory bowel disease using a food and beverage intolerance, food and beverage avoidance diet. Inflamm Bowel Dis 2007;13:91-6.
PUBMED | CROSSREF

20. Nguyen DL, Limketkai B, Medici V, Saire Mendoza M, Palmer L, Bechtold M. Nutritional strategies in the management of adult patients with inflammatory bowel disease: dietary considerations from active disease to disease remission. Curr Gastroenterol Rep 2016;18:55.
PUBMED | CROSSREF