Nutrition in Patients With Inflammatory Bowel Disease (IBD)

Contents

Nutritional Deficiencies in Patients With IBD

Diet and Nutrition in Patients With IBD

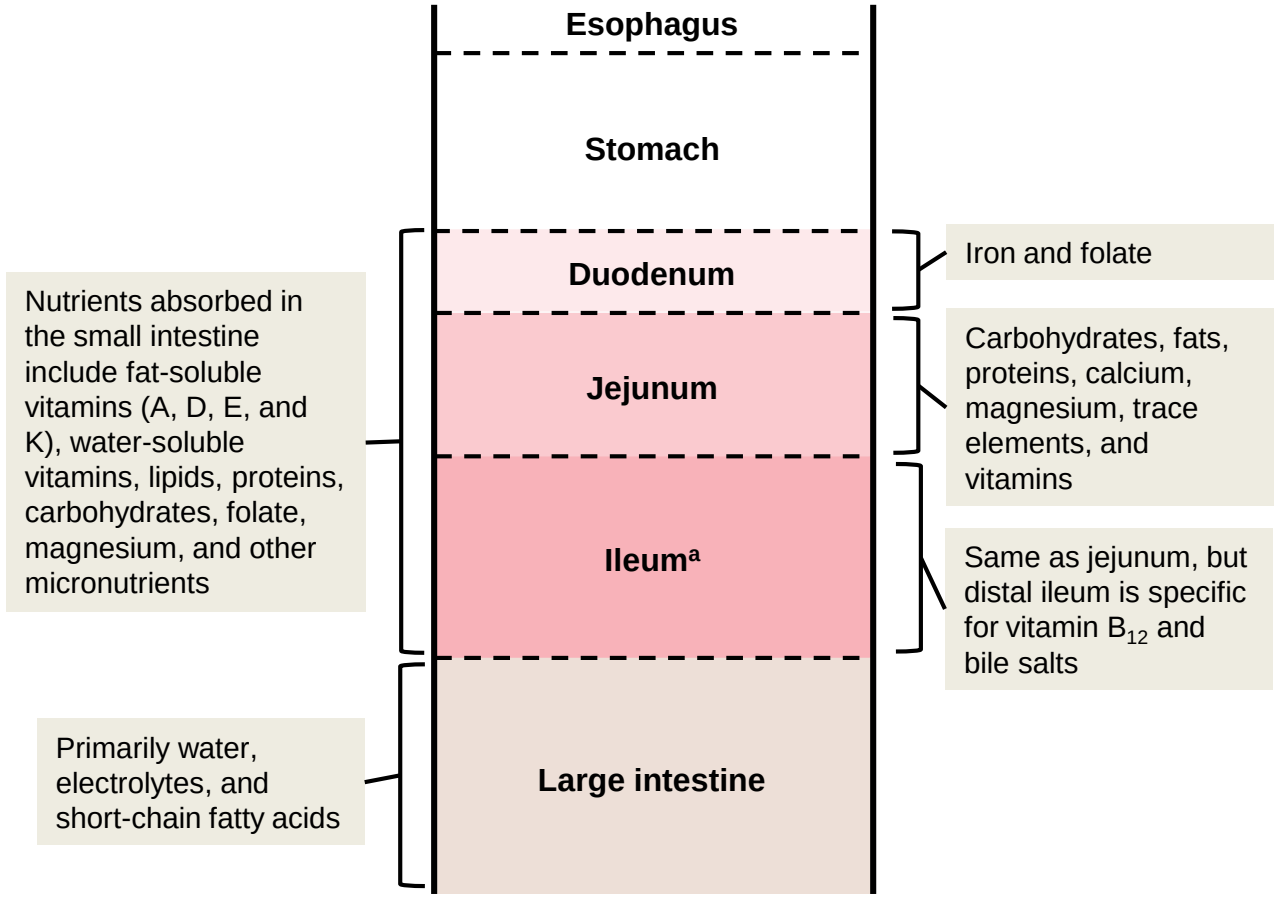
- Nutrition therapy is an important aspect of IBD disease management, in addition to pharmacological therapy or surgery[1,2]
- Goals of nutrition therapy include the following[1-3]:
  - Promote healing, immunity, and energy levels
  - Prevent or minimize symptoms of IBD
  - Address malnutrition and ensure optimal growth
  - Improve efficacy of medications

- Diet is the primary behavioral factor that can be manipulated by patients with IBD[3]
  - Patients who seek to improve their underlying condition may alter their diet through food avoidance or experiment with trial-and-error processes to identify foods that trigger symptoms[4]
- No diet has been shown to prevent IBD, but nutrition-related factors have been associated with a decreased risk of new-onset IBD[1]
  - Breastfeeding is associated with a lower risk of childhood onset of IBD[2-4]
  - Diets rich in fruits and vegetables and low in animal fats and sugar are associated with a decreased risk of IBD[1]
- Dietary factors may contribute to the development and pathogenesis of IBD by altering the microbiota, metabolome, host-barrier function, and innate immunity[5]
- Concerns regarding the side effects of IBD medications (eg, biologics) may prompt patients to seek dietary guidance[1,6]

IBD=inflammatory bowel disease.

1. Sabino J, et al. *Gastroenterology*. 2019;157(2):295-297. **2.** Bischoff SC, et al. *Clin Nutr*. 2020;39(3):632-653. **3.** Halmos EP, Gibson PR. *Nat Rev Gastroenterol Hepatol*. 2015;12(3):133-146. **4.** Romano A, Castagna V. In: *Human Nutrition From the Gastroenterologist's Perspective*. Springer International Publishing Switzerland; 2016:79-98. **5.** Levine A, et al. *Gut*. 2018;67(9):1726-1738. **6.** Martinez B, et al. *Inflamm Bowel Dis.* 2017;23(7):1057-1064.

Nutrient Absorption in the GI Tract



- Nutrient absorption takes place in various sites of the GI tract[1]
- Nutrient absorption may be compromised in patients with IBD, depending on the location and severity of intestinal inflammation[2,3]
  - Small intestine inflammation can result in malabsorption of macro- and micronutrients[2]
  - Large intestine inflammation can result in malabsorption of water and electrolytes[2]

Figure modified from Gropper SS, et al.[1]
[a]Many additional nutrients may be absorbed from the ileum depending on the transit time.
GI=gastrointestinal; IBD=inflammatory bowel disease.

1. Gropper SS, et al. *Advanced Nutrition and Human Metabolism.* 5th ed. Wadsworth/Cengage Learning; 2009. **2.** Crohn's & Colitis Foundation. https://www.crohnscolitisfoundation.org/diet-and-nutrition/malnutrition-and-ibd. Accessed May 1, 2020. **3.** Balestrieri P, et al. *Nutrients.* 2020;12(2):372.

Factors Contributing to Malnutrition in Patients With IBD

- *Malnutrition* refers to deficiencies, excesses, or imbalances in a person's intake of energy or nutrients[1]

- Many factors can contribute to nutritional inadequacies in patients with IBD:
  - **Behavioral factors:** alterations in diet through food avoidance or trial-and-error processes to identify foods that trigger symptoms[2-4]
  - **Physical factors:** malabsorption, small intestinal bacterial overgrowth, and surgery[5,6]
  - **Medication:** IBD medications such as corticosteroids, sulfasalazine, and methotrexate[7]
  - **Symptoms of IBD:** diarrhea, nausea, vomiting, and abdominal pain[5,7]

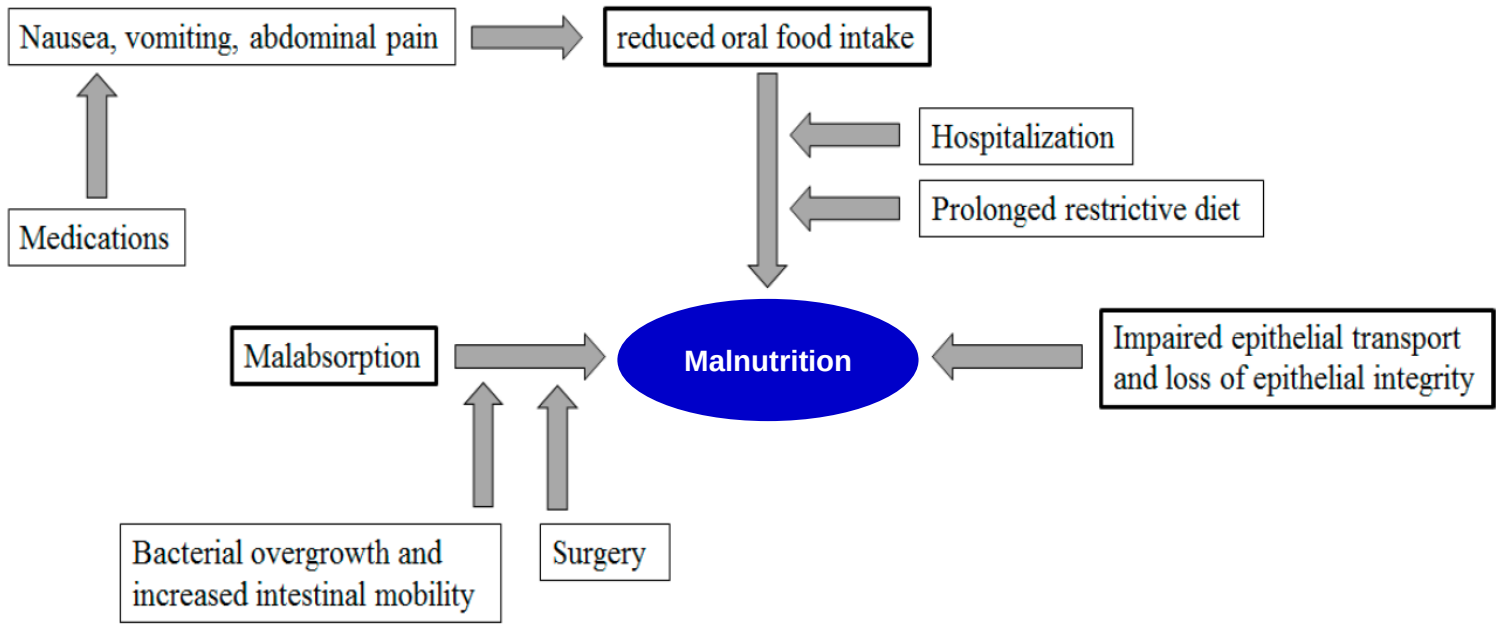


Figure modified from Balestrieri P, et al.[5]
IBD=inflammatory bowel disease.

1. World Health Organization. https://www.who.int/news-room/fact-sheets/detail/malnutrition. Accessed May 1, 2020. **2.** Casanova MJ, et al. *J Crohns Colitis.* 2017;11(12):1430-1439. **3.** Halmos EP, et al. *Nat Rev Gastroenterol Hepatol*. 2015;12(3):133-146. **4.** Romano A, Castagna V. In: *Human Nutrition From the Gastroenterologist's Perspective*. Springer International Publishing Switzerland; 2016:79-98. **5.** Balestrieri P, et al. *Nutrients.* 2020;12(2):372. **6.** Wedrychowicz A, et al. *World J Gastroenterol*. 2016;22(3):1045-1066. **7.** Crohn's & Colitis Foundation. https://www.crohnscolitisfoundation.org/diet-and-nutrition/malnutrition-and-ibd. Accessed May 1, 2020.

Prevalence of Malnutrition in Patients With IBD

- Reported prevalence of malnutrition in patients with IBD ranges between 20% and 85%[1]
  - Malnutrition is a considerable problem in patients with CD, given its capacity to affect any part of the gastrointestinal tract—unlike UC, which is restricted to the colon[2,3]
- The nutritional status of patients with IBD is frequently altered even when they are in remission. However, the severity of malnutrition in patients with IBD may also be related to disease activity, duration, and extent of disease/inflammation[1-5]

Malnutrition	CD	UC
Prevalence[4]	• 65%-75%	• 18%-62%
Presentation[1]	• May develop over a long period of time	• May present during a severe acute flare
Inflammation and potential impact on nutritional deficiencies[1-3]	• Inflammation is patchy and may occur throughout the small and large bowel • Ileal involvement may result in decreased nutrient absorption. Protein-energy and specific nutrient malnutrition is more common in patients with CD	• Continuous and uniform inflammation confined to the colon • Patients with UC may have less significant nutrient deficiencies, although severe diarrhea and blood loss can cause weight loss and anemia

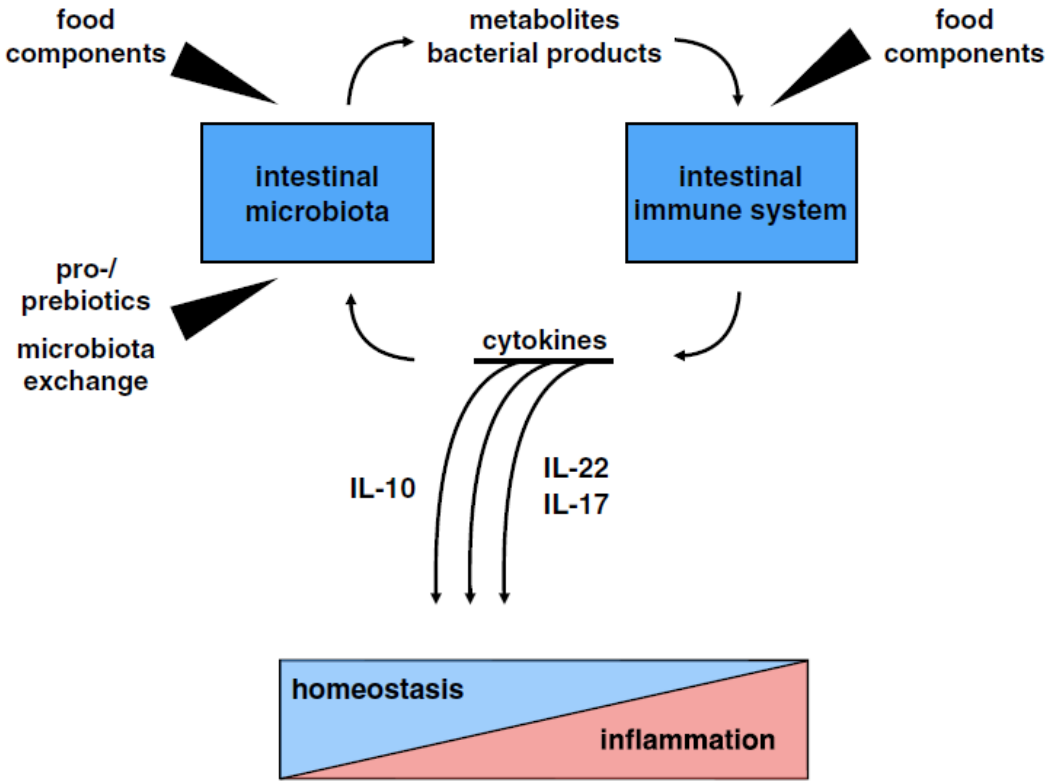
CD=Crohn's disease; IBD=inflammatory bowel disease; UC=ulcerative colitis.

1. Balestrieri P, et al. *Nutrients.* 2020;12(2):372. **2.** Bischoff SC, et al. *Clin Nutr*. 2020;39(3):632-653. **3.** Crohn's & Colitis Foundation. https://www.crohnscolitisfoundation.org/diet-and-nutrition/malnutrition-and-ibd. Accessed May 1, 2020. **4.** Scaldaferri F, et al. *Gastroenterol Res Pract*. 2017;2017:8646495. **5.** Casanova MJ, et al. *J Crohns Colitis.* 2017;11(12):1430-1439.

Role of Diet, Microbiome, and Inflammation in IBD

- Intestinal microbiota dysbiosis is repeatedly seen in patients with IBD and is recognized as a key factor in gut inflammation[1]
  - The dominant phyla in a normal gut are Firmicutes and Bacteroidetes, which account for approximately 64% and 23% of intestinal flora, respectively[2]
  - Intestinal microbiota can be beneficial and promote, for example, fermentation of indigestible carbohydrates, absorption of complex lipids, or vitamin synthesis[2]
  - Various studies have demonstrated a marked reduction in Firmicutes within the microbiota of patients with IBD[2]
  - Some bacteria, such as those from the phylum Proteobacteria, have been shown to have pathogenic potential in the development of IBD[2]
- A homeostatic balance of the host-bacteria relationship is important and vital for a normal health process[1]

Interactions Between Diet, Microbiota, and Immune System in the Intestine[2]



IBD=inflammatory bowel disease; IL=interleukin.

1. Pigneur B, Ruemmele FM. *Ther Adv Gastroenterol*. 2019;12:1756284819890534. 2. Witkowski M, et al. *Semin Immunopathol*. 2018;40(2):145-156.

Burden of Malnutrition in Patients With IBD

- Malnutrition has many detrimental effects[1]
  - It is associated with deterioration in muscle, respiratory, and immune function
  - It may delay wound healing and recovery from illness
- Malnutrition is associated with poor outcomes in patients with IBD[2]
  - It is an independent risk factor for venous thromboembolism, nonelective surgery, and increased mortality in patients with IBD
  - It is also associated with a higher frequency of postoperative complications, longer hospital stays, decreased quality of life, and higher health costs

A Nationwide Study Using Hospital Discharge Data[a] (1998-2004) in 52,142 Patients With IBD[b] and Malnutrition[1,c]

	In-hospital mortality, OR (95% CI)	Increase in length of stay, % (95% CI)	Increase in hospital charges, % (95% CI)
Malnutrition	3.49 (2.89-4.23)	55 (52-59)	57 (52-62)

- The adjusted OR for malnutrition among IBD admissions compared with non-IBD admissions was 5.57 (95% CI: 5.29-5.86)
- Hospital length of stay for IBD admissions with malnutrition was more than twice that of those without the diagnosis (11.9 days versus 5.8 days, *P*<0.00001)
- A greater than 2-fold difference in average hospital charges between those with and without malnutrition was observed ($45,188 versus $20,295, *P*<0.0001)

Note: The study was limited by the underlying disease severity in patients with IBD. Patients with severe disease may be more malnourished and may concurrently have a greater risk of in-hospital mortality.

[a]Data extracted from Nationwide Inpatient Samples, which is the largest all-payer database of national hospital discharges. [b]A total of 36,448 patients with CD and 15,694 patients with UC were included in the study. [c]Clinically diagnosable protein-energy malnutrition.

CD=Crohn's disease; CI=confidence interval; IBD=inflammatory bowel disease; OR=odds ratio; UC=ulcerative colitis.

1. Nguyen GC, et al. *Inflamm Bowel Dis*. 2008;14(8):1105-1111. **2.** Bischoff SC, et al. *Clin Nutr*. 2020;39(3):632-653.

Clinical Aspects of Malnutrition in Patients With IBD

Types of Malnutrition in Patients With IBD

- Malnutrition comprises 3 broad groups of conditions[1]:
  - **Undernutrition:** wasting (low weight for height), stunting (low height for age), and underweight (low weight for age)
  - **Overnutrition:** overweight, obesity, and diet-related noncommunicable diseases
  - **Micronutrient-related malnutrition:** lack of specific important vitamins and minerals or micronutrient excess
- Malnutrition is common among patients with IBD and includes conditions of all 3 categories[2]

IBD=inflammatory bowel disease.

1. World Health Organization. https://www.who.int/news-room/fact-sheets/detail/malnutrition. Accessed May 1, 2020. **2.** Balestrieri P, et al. *Nutrients.* 2020;12(2):372.

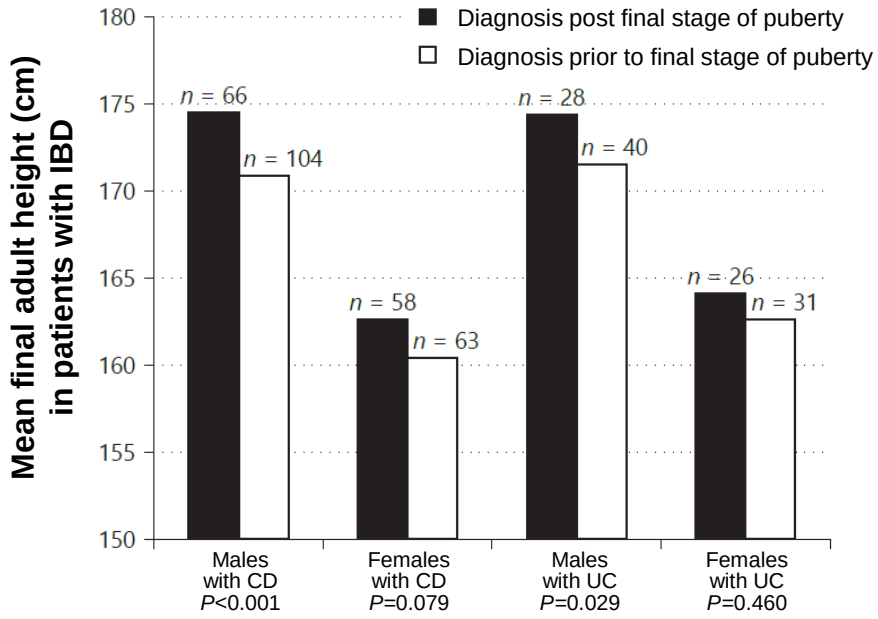
Protein-Energy Malnutrition in Patients With IBD

- Patients with IBD often do not consume an adequate number of calories[1]
  - Decreased hunger, reduced sensation of pleasure related to eating, and changes in mood may contribute to reduced caloric intake[2]
  - Self-imposed elimination diets (in an attempt to control symptoms and flares or prevent disease relapse) may also result in malnutrition[1-3]
- A prospective multicenter study of 333 patients with IBD in Spain showed that 76% of patients avoided some foods to prevent disease relapse, whereas 86% did so during active disease due to fear of worsening the flare[2]
  - Commonly excluded foods included fats, proteins, dairy products, and vegetables

Note: There could be a bias that most patients who agreed to participate in the nutritional assessment were those who had disease activity, even though consecutive patients in clinical remission or who had mild activity were included.

- In pediatric patients with IBD, malnutrition contributes to disrupted pubertal development and impaired growth velocity and can result in growth failure[1,4,5]

Pediatric Patients Diagnosed With IBD Prior to Puberty May Experience Reduction in Growth[5]



- Male gender, younger age at diagnosis, diagnosis prior to final stage of puberty, and lower height z-score at diagnosis impose risk for reduced adult height in both CD and UC

Note: This study was limited by its retrospective design and did not enable data collection on height velocity, bone age, and pubertal staging at diagnosis.

CD=Crohn's disease; IBD=inflammatory bowel disease; UC=ulcerative colitis.

1. Miele E, et al. *J Pediatr Gastroenterol Nutr*. 2018;66(4):687-708. **2.** Casanova MJ, et al. *J Crohns Colitis.* 2017;11(12):1430-1439. **3.** Limdi JK, et al. *Inflamm Bowel Dis.* 2016;22(1):164-170. **4.** Bischoff SC, et al. *Clin Nutr*. 2020;39(3):632-653. **5.** Rinawi F, et al. *Digestion.* 2019; doi:10.1159/000501924.

Altered Body Composition and Overnutrition in Patients With IBD

- Poor dietary intake, increased rates of protein turnover and loss of nutrients during active disease, or effects of IBD treatments contribute to alterations in body composition[1,2]
  - Low muscle mass (sarcopenia), strength, and performance have been reported in adult patients with IBD[2]
  - A systematic review of patients with IBD (N=658 across 5 studies) reported that 42% of patients with IBD had sarcopenia[3]
    Note: This study was limited by its retrospective nature and the heterogenous definitions of sarcopenia, determined by 1 or more radiologic assessments of body mass composition across the studies.
  - Patients affected by sarcopenia may present with normal BMI or be overweight or obese (sarcopenic obesity) and therefore may not be identifiable as undernourished using traditional measures[1,4-6]
  - Inadequate body composition is associated with poor outcomes such as postoperative complications, longer hospital stays, and increased healthcare costs[5]
- Patients with IBD may experience overnutrition and become overweight or obese (including during remission)[1,2,6]
  - A study reviewing medical records of patients with IBD[a] (from 2000 to 2012; N=581) reported obesity (BMI≥30) in 32.7% of adult patients with IBD (30.3% for CD and 35.2% for UC)[7]
    Note: This study was limited by its retrospective nature and the use of BMI, which has a poor linear relationship with total body fat. Additionally, the lack of measurement for mesenteric fat, which may be more important to inflammation than subcutaneous fat, may limit the interpretability of the data.

[a]Patients identified from the IBD registries of the Dallas Veterans Affairs Medical Center and Parkland Health and Hospital Systems.
BMI=body mass index; CD=Crohn's disease; IBD=inflammatory bowel disease; UC=ulcerative colitis.

1. Balestrieri P, et al. *Nutrients.* 2020;12(2):372. **2.** Bischoff SC, et al. *Clin Nutr*. 2020;39(3):632-653. **3.** Ryan E, et al. *Inflamm Bowel Dis*. 2019;25(1):67-73. **4.** Adams DW, et al. *Inflamm Bowel Dis*. 2017;23(7):1182-1186. **5.** Casanova MJ, et al. *J Crohns Colitis.* 2017;11(12):1430-1439. **6.** de Castro MM, et al. *Clin Nutr ESPEN*. 2019;33:60-65. **7.** Flores A, et al. *Dig Dis Sci*. 2015;60(8):2436-2445.

Common Micronutrient Deficiencies in Patients With IBD

- Type of micronutrient and vitamin deficiency in patients with IBD depends on many factors, including disease localization, activity, and medication use for IBD[1]
- Vitamin supplementation may correct most deficiencies but cannot guarantee adequacy; iron, zinc, and vitamin D are likely to require specific replacement regimens[2]

Micronutrient Deficiencies[3]

Micronutrient	At-risk individuals	Food sources	Common consequences of deficiency
Iron	Those with active disease; vegetarians and vegans; pre-menopausal women	Red meat; offal	Anemia, fatigue, weakness, brittle nails
Zinc	Vegetarians and vegans; chronic diarrhoea	Meat; fortified cereals	Impaired healing, disturbed smell and taste, delayed growth in children
Magnesium	Chronic or severe acute diarrhoea	Leafy-green vegetables; soybean	Disturbed bone health, muscular cramps, fatigue
Calcium	Restriction of dairy	Dairy; calcium-fortified dairy alternatives	Decreased bone density

Micronutrient	At-risk individuals	Food sources	Common consequences of deficiency
Vitamin B_{12}	Vegetarians and vegans; ileal disease or resection	Animal-based foods	Anemia, fatigue, neurological effects
Vitamin D	Dark-skinned patients; those with decreased exposure to UV rays	Limited amount in fortified foods (e.g. margarine, milk)	Disturbed calcium homeostasis and bone health; possible enhancement of inflammatory activity
Folate	Those on restrictive or elimination diets; sulfasalazine therapy	Whole grains; leafy-green vegetables; fortified cereals	Anemia, fatigue

IBD=inflammatory bowel disease; UV=ultraviolet.

1. Scaldaferri F, et al. *Gastroenterol Res Pract*. 2017;2017:8646495. **2.** Bischoff SC, et al. *Clin Nutr*. 2020;39(3):632-653. **3.** Halmos EP, Gibson PR. *Nat Rev Gastroenterol Hepatol*. 2015;12(3):133-146.

Conditions and Complications of Malnutrition in Patients With IBD

- Malnutrition can lead to complications in patients with IBD, including sarcopenia, osteopenia, obesity, and anemia[1]
- In addition to micronutrient and vitamin loss, water loss can result in dehydration[2]

Condition	Prevalence and characteristics in patients with IBD
Low bone mass, strength, and osteoporosis[1]	• Estimated prevalence: 20% to 50% • Deficiencies of calcium, vitamins, and other micronutrients can lead to low bone mass and osteoporosis • Other contributing factors include overall cumulative corticosteroid exposure, extensive small-bowel disease or resection, chronic inflammation, and lack of physical activity
Anemia[1]	• Estimated prevalence: 36% to 90% • Iron deficiency is the main cause of anemia in patients with IBD
Sarcopenia[3]	• Estimated prevalence: ~40% • Contributing factors: poor dietary intake, increased rates of protein turnover and gut loss of nutrients during active disease
Obesity[4,5]	• Estimated prevalence: ~30% • Contributing factor: overnutrition
Growth delays[6]	• Approximately one-third of children with CD and one-tenth of children with UC have an adult height that is less than expected due to IBD • Contributing factors: chronic inflammation and malnutrition, long-term corticosteroid use

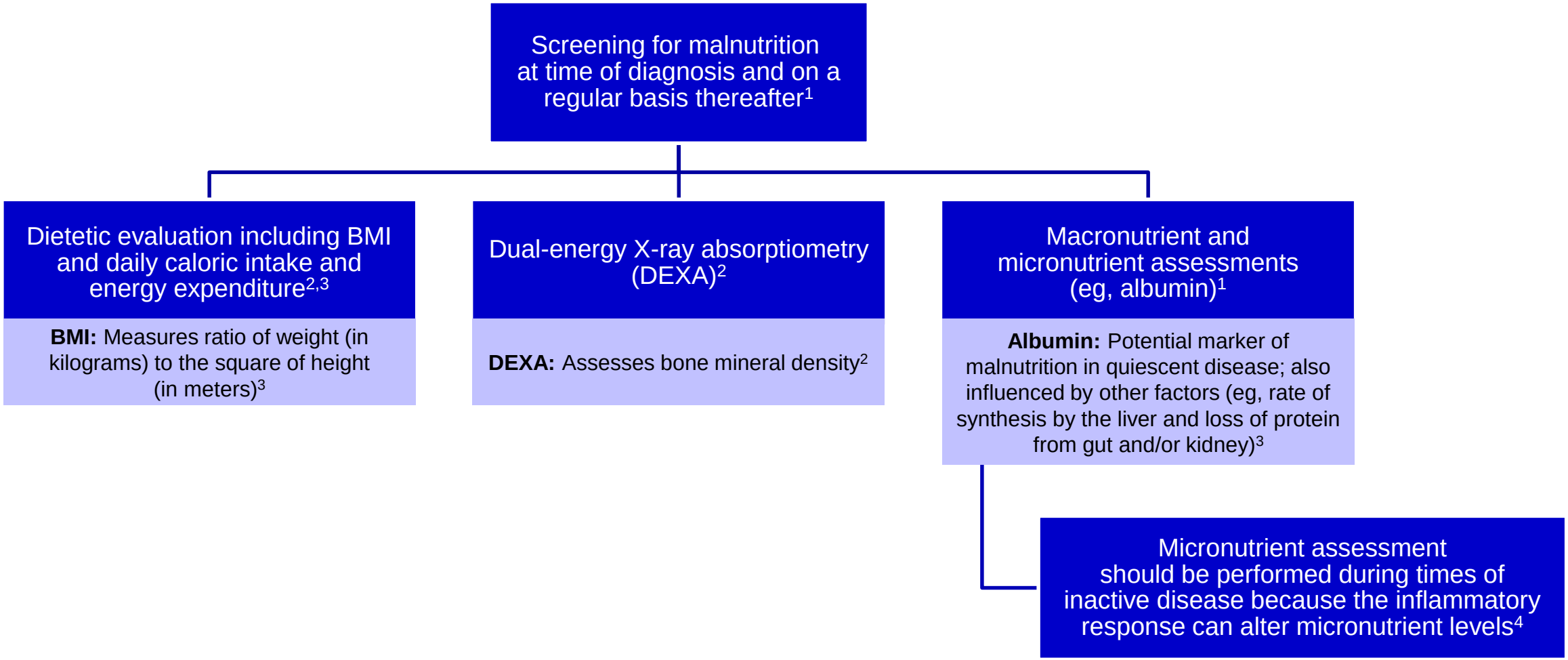
Nutritional care in patients with IBD is intended to prevent malnutrition and micronutrient deficiencies[1]

CD=Crohn's disease; IBD=inflammatory bowel disease; UC=ulcerative colitis.

1. Balestrieri P, et al. *Nutrients.* 2020;12(2):372. **2.** Bischoff SC, et al. *Clin Nutr*. 2020;39(3):632-653. **3.** Ryan E, et al. *Inflamm Bowel Dis*. 2019;25(1):67-73. **4.** Halmos EP, Gibson PR. *Nat Rev Gastroenterol Hepatol*. 2015;12(3):133-146. **5.** Flores A, et al. *Dig Dis Sci*. 2015;60(8):2436-2445. **6.** Crohn's & Colitis Foundation. https://www.crohnscolitisfoundation.org/diet-and-nutrition/malnutrition-and-ibd. Accessed May 1, 2020.

Management of IBD With Nutrition

Assessment of Nutritional Status in Patients With IBD



BMI=body mass index; IBD=inflammatory bowel disease.

1. Bischoff SC, et al. *Clin Nutr*. 2020;39(3):632-653. **2.** Balestrieri P, et al. *Nutrients.* 2020;12(2):372. **3.** Halmos EP, Gibson PR. *Nat Rev Gastroenterol Hepatol*. 2015;12(3):133-146. **4.** Nazarenkov N, et al. *Gastroenterol Hepatol*. 2019;15(3):133-144.

Role of Registered Dietitian for Medical Nutrition Therapy

- It may be useful to partner with a registered dietitian to assist with nutritional interventions
- Dietitians may
  - Help tailor dietary modifications based on IBD history, anatomy, complications, comorbidities, and specific nutrient needs
  - Provide close monitoring through different phases of nutrition therapy (including advising on feasibility of or adherence to specific diets)
  - Address individualized meal planning
  - Answer patient questions and concerns that may arise during different stages of diet therapy

IBD=inflammatory bowel disease.

Nazarenkov N, et al. *Gastroenterol Hepatol.* 2019;15(3):133-144.

Dietary Approaches in IBD: Enteral Nutrition

- **Enteral nutrition (EN)**: Use of a specific formula as nutritional therapy[1]
  - EN is not currently a primary therapy option in UC but can be used for nutritional support[2]
  - Exclusive enteral nutrition (EEN): well-established method for inducing remission in children with recent-onset CD[2]
    - Clinical remission rates with EEN are 80% to 85% among children and adolescents with CD, and EEN has been shown to improve nutritional status, growth, and development[2,3]
    - Evidence of efficacy in adults is significantly less than in children and likely related to practical issues (eg, disruption to normal life, poor palatability, lack of experience, lack of guidance) rather than mechanistic differences[4]
  - EEN is difficult to sustain as long-term maintenance therapy in CD[3]

A Retrospective Propensity Score–Matched Study[a] Assessed the Impact of EN on Outcomes After Hospitalization in Patients With IBD (N=1578)[5,b]

Patients[b]	30-Day hospital readmission, OR (95% CI)	30-Day mortality, OR (95% CI)
IBD	0.73 (0.52-1.02)	0.27 (0.08-0.90)
CD (n=800)	0.83 (0.54-1.28)	0.19 (0.04-0.99)
UC (n=778)	0.55 (0.32-0.97)	0.49 (0.08-3.09)

EN was associated with lower odds of readmission for UC and lower odds of mortality for CD

Note: This study was limited by its retrospective design, variation in EN provided, and the potential for bias introduced through variables chosen for propensity score matching.

[a]Nationwide Readmissions Database (2010-2015). [b]Patients with IBD and protein-energy malnutrition.
CD=Crohn's disease; CI=confidence interval; IBD=inflammatory bowel disease; OR=odds ratio; UC=ulcerative colitis.

1. Crohn's & Colitis Foundation. https://www.crohnscolitisfoundation.org/diet-and-nutrition/nutritional-support-therapy. Accessed June 10, 2020. **2.** Romano A, Castagna V. In: *Human Nutrition From the Gastroenterologist's Perspective*. Springer International Publishing Switzerland; 2016:79-98. **3.** Green N, et al. *Nutrients*. 2019;11(5):947-960. **4.** Ashton JJ, et al. *Clin Nutr.* 2019;38(1):80-89. **5.** LeBrett WG, et al. Poster presented at: Crohn's & Colitis Congress; January 23-25, 2020; Austin, TX.

Findings for EN Therapy in Pediatric Patients With CD

- PEN and EEN diets as well as anti-TNF therapy have been shown to improve clinical symptoms of active CD[1]
  - However, greater mucosal healing was observed with EEN or anti-TNF therapy compared with PEN
- Oral consumption of enteral formula may be as efficacious as continuous nasogastric feeding to induce remission and mucosal healing, with similar high compliance rates[2]
- The efficacy of EEN may be influenced by the location and the extent of intestinal inflammation[3]
  - Children with disease in the colon have been shown to respond better to EEN if the ileum is also involved (due to potential differences in underlying inflammatory mechanisms)

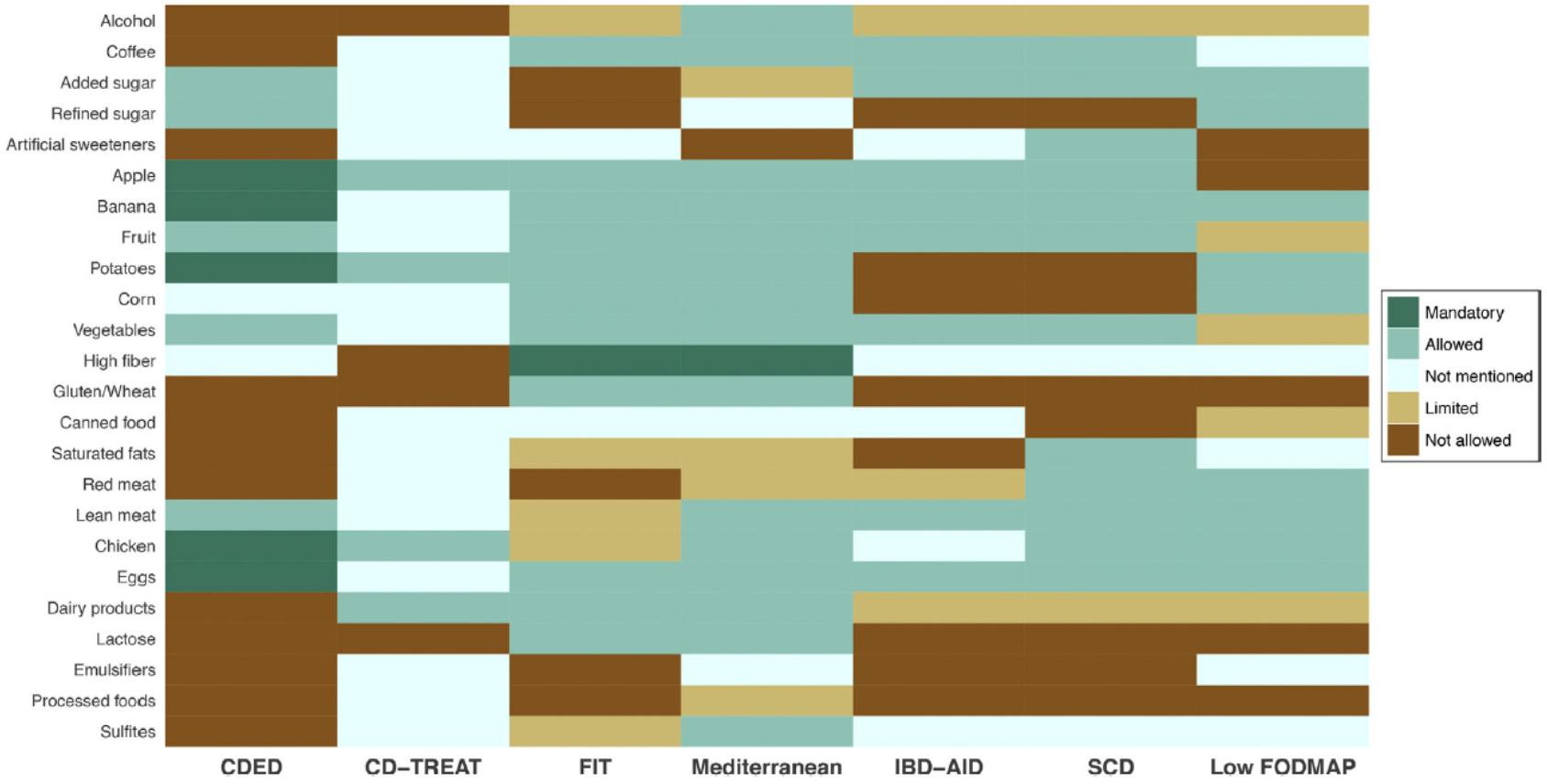
CD=Crohn's disease; EEN=exclusive enteral nutrition; EN=enteral nutrition; PEN=partial enteral nutrition; TNF=tumor necrosis factor.

1. Lee D, et al. *Inflamm Bowel Dis.* 2015;21(8):1786-1793. **2.** Rubio A, et al. *Aliment Pharmacol Ther.* 2011;33(12):1332-1339. **3.** Afzal NA, et al. *Dig Dis Sci.* 2005;50(8):1471-1475.

Dietary Approaches in IBD: Food-Based Treatment, Including Exclusion Diets

- Appropriate patient selection for inclusion in trials of dietary therapy is critical, because the opportunity for early therapeutic escalation with medications that can prevent disease progression must be considered for nonresponders
- Multiple diets are being investigated in clinical trials
- Food components that are recommended versus avoided in these trials vary widely
- None of the studies published to date suggest that dietary therapy should replace traditional therapy; however, these studies may elucidate how dietary intervention may be used in appropriately selected patients with adequate follow-up

Select Exclusion Diets Being Investigated in IBD



AID=anti-inflammatory diet; CDED=Crohn's disease exclusion diet; CD-TREAT=Crohn's disease treatment-with-eating diet; FIT=food influence on the intestinal microbiota diet; FODMAP=fermentable oligosaccharides, disaccharides, monosaccharides, and polyols; IBD=inflammatory bowel disease; SCD=specific carbohydrate diet.

Sabino J, et al. *Gastroenterology*. 2019;157(2):295-297.

Select Investigational Nutritional Diets for the Management of IBD

- **CD exclusion diet (CDED) with partial enteral nutrition (PEN):** whole-foods diet for inducing sustained remission in patients with active CD[1,2]
  - In a prospective study (n=78), CDED-PEN was as effective as EEN for inducing mucosal healing and sustained remission (75%) and was tolerated better than EEN by pediatric patients with mild to moderate CD[1]

    Note: This study was limited by the indirect assessment of mucosal healing instead of endoscopy.

- **CD treatment-with-eating diet (CD-TREAT):** individualized food-based diet with similar composition to EEN[3]
  - In an RCT (n=25), CD-TREAT had similar effects to those of EEN on the gut microbiome and metabolome in healthy adults
  - In an open-label study (n=5), CD-TREAT led to a remission rate of 60% and decreased colonic inflammation in pediatric patients with active CD

    Note: This study was limited by the small number of patients enrolled.

- **Specific carbohydrate diet (SCD):** diet that restricts complex carbohydrates and eliminates refined sugar[4,5]
  - SCD is used in many different medical conditions, including IBD, irritable bowel syndrome, celiac disease, and autism[4]
  - In 2 prospective studies (n=10 and n=12), SCD improved mucosal healing and clinical and laboratory parameters and was associated with changes in gut microbial composition in pediatric patients with IBD[4,5]

    Note: The open-label study designs, small numbers of patients enrolled, and lack of control groups were the main limitations of these studies.

CD=Crohn's disease; EEN=exclusive enteral nutrition; IBD=inflammatory bowel disease; RCT=randomized controlled trial.

1. Levine A, et al. *Gastroenterology*. 2019;157(2):440-450. **2.** Sigall-Boneh R, et al. *Inflamm Bowel Dis.* 2014;20(8):1353-1360. **3.** Svolos V, et al. *Gastroenterology*. 2019;156(5):1354-1367. **4.** Cohen SA, et al. *J Pediatr Gastroenterol Nutr.* 2014;59(4):516-521. **5.** Suskind DL, et al. *Clin Gastroenterol.* 2018;52(2):155-163.

Dietary Guidance From the International Organization for the Study of IBD (IOIBD)

- The IOIBD recently provided expert opinion on specific dietary components, food groups, and food additives that may be prudent to increase or decrease in the diet to control and prevent relapse of IBD
  - Recommendations specific to patients with CD and UC are included
  - Guidance is based on the best current evidence available
  - The recommendations are not meant to exclude the role of nutritional assessment for malnutrition and correction of deficiencies when needed
  - For patients with persistent symptoms despite resolution of inflammation and absence of strictures, the IOIBD suggested that a low-FODMAP or lactose-free diet may improve symptoms

Dietary Guidance for Patients With CD and UC

	CD recommendations	UC recommendations
Prudent to increase foods containing	• Vegetables • Fruits	• Omega 3 oils from fish and food
Prudent to decrease foods containing	• Saturated and trans fat • Emulsifiers • Carrageenans • Artificial sweeteners • Maltodextrins • Titanium dioxide	• Red meat, processed meats • Dairy fat, palm and coconut oil • Saturated and trans fat • Emulsifiers • Carrageenans • Artificial sweeteners • Maltodextrins • Titanium dioxide

CD=Crohn's disease; FODMAP=fermentable oligosaccharides, disaccharides, monosaccharides, and polyols; IBD=inflammatory bowel disease; UC=ulcerative colitis.

Levine A, et al. *Clin Gastroenterol Hepatol*. 2020;18(6):1381-1392.

Summary

- Dietary factors may contribute to the development and pathogenesis of IBD by altering the microbiota, metabolome, host-barrier function, and innate immunity
- Malnutrition affects 20% to 85% of patients with IBD and includes conditions such as protein-energy malnutrition, altered body composition and overnutrition, and micronutrient deficiency
- Malnutrition can lead to complications including anemia, osteoporosis, sarcopenia, obesity, and growth delays (in children), and it is associated with decreased quality of life, poor treatment outcomes, and higher health costs
- Patients with IBD are encouraged to screen for malnutrition and partner with a registered dietitian for subsequent nutritional interventions
- Common dietary approaches under investigation to support disease management for patients with IBD include enteral nutrition, CDED, CD-TREAT, and SCD

CDED=Crohn's disease exclusion diet; CD-TREAT=Crohn's disease treatment-with-eating diet; IBD=inflammatory bowel disease; SCD=specific carbohydrate diet.

Available Resources

- Crohn's & Colitis Foundation
  - Malnutrition and IBD
  - Nutritional support therapy
- World Health Organization
  - Malnutrition fact sheet and Q&A
- International Organization for the Study of Inflammatory Bowel Disease
- Malnutrition Advisory Group, a standing committee of the British Association for Parenteral and Enteral Nutrition
  - Online Malnutrition Universal Screening Tool (MUST)
- Pt-Global Platform
  - Online Patient-Generated Subjective Global Assessment (PG-SGA) questionnaire
- Nutrition4Kids Foundation
  - Nutrition4IBD.com

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