

Carol Rees Parrish, M.S., R.D., Series Editor

Nutritional Care in Adult Inflammatory Bowel Disease



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Nutritional deficiencies are common in patients suffering from inflammatory bowel disease. Assessment of the nutritional status should be part of the comprehensive care of these patients. Failure to address the nutritional deficiencies can result in poor quality of life and poor outcomes with the medical and surgical therapies. Identification and treatment of specific deficiencies are thus an integral part in the therapy of inflammatory bowel disease. This article addresses the assessment and management of the nutritional state of adult inflammatory bowel disease patients.

INTRODUCTION

Inflammatory bowel disease (IBD) is a chronic disorder of the gastrointestinal (GI) tract characterized by intestinal inflammation. The most common forms of this condition are Crohn's disease (CD) and ulcerative colitis (UC). Treatment of this condition is life long and often involves immunosuppressive therapy. Patients suffer from malnutrition due to a combination of factors including modified diets, medication effects, altered intestinal absorption, and intestinal resection. Malnutrition is also associated with increased severity of IBD in those patients requiring hospitalization (1). Assessing for nutritional deficiencies is quite important for the care of these patients. Nutritional care of IBD patients involve identifying dietary and disease-related deficiencies and providing appropriate supplementation.

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Nutritional disturbances often begin even during this initial period of subtle symptoms, thus nutritional assessment of IBD patients should be the standard of care upon diagnosis (2).

Nutrition Assessment

Nutrition assessment of the IBD patient is a comprehensive process with evaluation of multiple factors. Patients diagnosed as children or adolescents have growth disturbances as a consequence of nutritional deficiencies (3). Factors predictive of malnutrition include a low BMI or a large decrease in BMI (4). Patients with a disease flare are more likely to be malnourished due to reduced intake, malabsorption and intestinal inflammation leading to GI tract protein losses. The impact of protein-calorie malnutrition as a prognostic factor is demonstrated as greater mortality in IBD patients, this has been associated with the more aggressive disease phenotypes (5).

Initial assessment should include body weight, an

evaluation of extent and health of bowel remaining or involved in the disease process. Micronutrient deficiencies must also be assessed. Actual body weight as a percentage of ideal body weight provides an important global assessment of underlying nutritional status (6). Patients with actual body weight $\leq 85\%$ of ideal body weight may already be in a compromised nutritional state. A patient at or above ideal body weight, but lost $> 10\text{-}20\%$ of previous actual body weight over preceding 2-4 months may be at higher risk for nutritional problems than just being underweight (7). Summary of the initial assessment is given in table 1.

Serum albumin is a very sensitive marker of inflammation but not a good indicator of nutritional status. Albumin as a sole measure of global nutritional status can be misleading. Low levels may be seen in patients with active inflammation, with normalization occurring with control of the inflammatory process. Lower albumin levels have been correlated with poor surgical outcomes in the IBD patient (8).

Diet and Inflammatory Bowel Disease

An association of western diet and IBD has been suggested (9). Refined carbohydrates and low fiber, higher saturated fat diets are factors that have been implicated with increased IBD incidence. Migrant ethnic populations previously not associated with disease are increasingly being diagnosed with IBD (10). The impact of a more western diet has been seen in the Asian population in their native lands as well. A study in Japan demonstrated a pre-diagnosis diet higher in confections, fats, oils, omega 6 and 3 fatty acids is associated with an increased risk of developing disease (11). Presence of these components represents a shift from the traditional Japanese diet. A recent review of the literature has shown that high dietary intake of total fats, poly-unsaturated fatty acids, omega-6 fatty acids, and meat were associated with an increased risk of CD and UC (9). Additionally, high fiber and fruit intake was associated with a lower incidence of CD; a high vegetable intake was associated with decreased risk of developing UC (9).

Lactose Intolerance in Inflammatory Bowel Disease

Lactose intolerance may be seen in patients with IBD usually during disease flares (12). Historically, there has been a stronger association with CD and a poor association with UC (13). Recently, lactose sensitivity

Table 1. The Initial Assessment of Nutritional Status

Goals of Initial Assessment

- The patient's current nutritional state
- If nutritional support is clinically indicated or not
- Aims of support (long term maintenance or short term replenishment of nutrition)
- Establish a baseline for monitoring treatment

Initial Assessment

- Body weight
- Change in bodyweight
- The extent of bowel involvement with active disease
- Extent of bowel remaining after surgery
- Nutrient deficiencies

has been demonstrated across all IBD subtypes, which is thought to be due to lactase gene downregulation (14). However, it is incorrect to assume lactose intolerance in all IBD patients. IBD patients avoid dairy products more than they need to based on the prevalence of lactose malabsorption. This may be due to multiple factors such as incorrect patient perception, arbitrary advice from physician and lack of early input from a nutrition expert. Thus early input from a nutrition expert may help to avoid restrictive diets (15).

The Low-residue Diet in Inflammatory Bowel Disease

Although not supported by controlled studies, patients experiencing flare symptoms may benefit from a low residue, low fiber diet. CD patients with stricturing

small bowel disease are typically advised to consume a low-residue or low-fiber diet to decrease the risk of bowel obstruction. In an a study of CD patients without stenosing disease there was no difference in outcomes of hospitalization, surgery, complications, and post-operative recurrence with low-residue diets compared to normal diet (16). These diets can be strictly controlled in the inpatient setting; however, significant degree of patient education is necessary for implementation in outpatients.

Iron Deficiency

One third of patients with IBD may have low hemoglobin and iron deficiency is commonly seen in these patients (17,18). While evaluating for iron deficiency it is important to obtain serum iron, total iron binding capacity and ferritin levels, along with a CBC to help delineate iron deficiency from anemia of chronic inflammatory disease. It is sometimes difficult in those with IBD flares as ferritin is an acute phase reactant that is elevated in the setting of active inflammation; serum iron is sequestered and hence decreased. Additional interpretation of an iron panel for decreased serum iron and increased transferrin is necessary. With the presence of significant anemia, it is important to delineate between inflammatory anemia of chronic disease and anemia related to iron deficiency. Calculating degree of iron deficiency and identifying goals of replacement is ideal prior to initiation of an iron replacement strategy. Severe anemia may not respond to iron replacement, with the need for packed red blood cell transfusion potentially necessary. Close monitoring of response to iron replacement is essential to identify those with a need for additional interventions.

Iron replacement in IBD patients is often done using intravenous iron (IV) preparations mainly by IV iron sucrose preparations. Oral iron is often poorly tolerated in IBD patients. The poor tolerance of oral iron may be related to the higher doses used and using a lower dose such as one ferrous sulfate tablet daily may be better tolerated in IBD patients (19). In chronic inflammatory conditions, hepcidin overexpression in the liver plays a role in decreased duodenal absorption of iron. Use of IV iron dextran is associated with an increased risk of anaphylactic infusion reactions. Ferric carboxymaltose was recently reported to be efficacious for iron replacement in those with IBD (20), however it is not yet FDA approved for use in the United States. Iron replacement may be quicker if erythropoietin

agents are concomitantly used in patients with lower reticulocyte levels. Inflammatory cytokines may lower erythropoietin production of the kidney and lead to blunted response (18).

Zinc Deficiency

Zinc deficiency is seen most frequently in IBD patients with short gut syndrome. Typically, a peeling of skin on the palms and soles of the feet are presenting features. Replacement in these patients is usually done through their parenteral nutrition formulation. Monitoring of zinc status of patients on parenteral nutrition is beneficial. Overzealous zinc supplementation may lead to copper deficiency, which can present as fatigue or anemia. In patients with fistulas, diarrhea or intestinal drainage, 12mg of zinc should be added for each liter lost. This calculation is based on the NPO state and may not be applicable to all patients. In stable patient without extra loss 3-4 mg should be given daily (21).

Magnesium Deficiency

Magnesium deficiency can be seen in IBD patients. Most patients with hypomagnesemia are asymptomatic. Symptomatic magnesium depletion is often associated with multiple other biochemical abnormalities including hypokalemia, hypocalcemia and metabolic acidosis. Severe deficiency can result in cardiac arrhythmia and neuromuscular manifestations such as tremors, paresthesias, seizures and even coma. For mild deficiency, oral formulations may be used, although it should be noted that it might aggravate diarrhea in a patient population who may already be suffering from this symptom. Commonly available oral formulations available are magnesium gluconate, magnesium sulfate, magnesium oxide and magnesium chloride. Intravenous supplementation is optimal for severely decreased levels in the setting of concomitant electrolyte disturbances, especially during concerns of cardiac dysrhythmia (22). Efficacy of intravenous replacement is improved over IV-piggyback (typically infused over 1-4 hours) if delivered over 8-12 hours, as the renal threshold is not exceeded.

Vitamin B12 Deficiency

Vitamin B12 deficiency is most common in CD disease patients with intestinal resections, but can also occur in the setting of inflammation of the native terminal ileum. The normal range of vitamin B12 is quite broad (200-900 ng/L), and was based upon patients without

pro-inflammatory conditions. There is an acute phase reactant effect with vitamin B12 levels. In those patients with small bowel bacterial overgrowth, serum B12 levels may be misleading, as the B12 may be biologically inactive. Checking a methylmalonic acid may increase sensitivity of the results. Oral supplementation may be ineffective in the setting of intestinal inflammation and small bowel resections. Intramuscular monthly replacement with 1000mcg of vitamin B12 is quite efficacious. Subcutaneous injections can also be given weekly at the 1000mcg dose for increased patient comfort. Nasal preparations are available; however, the use of intranasal agents may be cost-prohibitive in some patients (23). It should be noted that B12 deficiency can be treated with synthetic, oral B12, even in the patient with loss of terminal ileum, as it does not require intrinsic factor and can be absorbed along the small bowel that is left. Higher doses are needed however (1000-2000mcg daily).

Folate Deficiency

There are some data suggestive of folate supplementation's protective effect on colon cancer (24). IBD patients with colonic disease also have an increased risk of colon cancer. But dedicated studies with folate have not been performed in these patients. There is an increased risk for thrombosis in patients with IBD. Elevated homocysteine is more common in IBD patients and is associated with an increased risk for thrombosis, cardiovascular disease, and lower levels of folate (25). Supplementation with 1mg of oral folic acid daily in patients with high homocysteine levels is beneficial. IBD patients treated with methotrexate should be on folic acid supplementation. Methotrexate depletes the pool of reduced folates by inhibiting dihydrofolate reductase. Folate deficiency is a risk factor for methotrexate toxicity.

Vitamin D and Calcium Deficiency

Innate immunity plays a role in the development of IBD (26). A recent study has shown lower plasma levels of vitamin D may be associated with higher risk of both UC and CD. The association was more significant for CD (27). Vitamin D deficiency has been associated with a lower quality of life in IBD patients (28). 25-OH vitamin D (25(OH)D) levels should be monitored closely and deficiency corrected. To maintain a healthy level of 25(OH)D, the recommendation is that it should be above 30 ng/ml. A multivitamin containing 400

IU of vitamin D is inadequate to satisfy the body's requirement. It is estimated that at least 1,000 IU of vitamin D per day is needed to satisfy the body's requirement. A patient with an initial level of 10 ng/ml would at least require 3000 IU/day for several months to achieve a level of 40 ng/ml and 4000 IU/day to achieve a level of 50 ng/ml. With plasma levels of 20-30 ng/ml supplementation 3,000 units daily may be effective. The easiest way to correct vitamin D deficiency is to give the patient an oral dose of 50,000 IU of vitamin D once per week for 8 weeks. To maintain vitamin D levels, the patient can be given either 50,000 IU of vitamin D once or twice per month thereafter. Although specific guidelines do not exist in IBD rechecking a level 3 months after starting therapy may help to assess adequacy of treatment.

Poor nutritional status affecting the vitamin D calcium homeostasis can lead to complications such as osteopenia, osteoporosis and formation of calcium oxalate renal stones. It is important to treat calcium and vitamin D deficiency together, as absorption is essentially co-dependent. Supplementation of calcium is best at a divided dose of approximately 1200-1500 mg/day. Calcium citrate is the optimally absorbed calcium in IBD patients, with chewable formulations available as well. Divided dosing of thrice daily or at least twice daily is more ideal absorption.

Alternative Nutritional Supplementation: Omega 3 fatty acids and curcumin in inflammatory bowel disease

The role of fish oil has been studied in IBD patients. Long chain omega 3 fatty acids are believed to have an anti-inflammatory effect. In CD fish oil is safe and may be beneficial for maintenance of remission (29). In UC, only 2 of 5 trials have shown response measured by clinical disease active score at pre-determined endpoints. When gauging for endoscopic response, all 3 trials addressing this have shown benefit (30). Future studies are still necessary to advocate fish oil supplementation in all IBD patients.

There are some data describing the role of curcumin inhibiting angiogenesis in human intestinal microvascular endothelial cells. Chronic GI inflammation, as seen in IBD, has responded to such anti-angiogenic therapy in models of IBD. Its measured anti-TNF activity has also been described. An initial

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human pilot study concluded that it reduced clinical relapse in patients with quiescent IBD without apparent adverse treatment effects (31,32). Further trials are necessary to define the role of this dietary supplement.

Enteral Nutrition Supplementation

Enteral nutrition supplements can be used for increased protein intake for weight gain in malnourished patients. Newer formulations have improved taste, which has theoretically resulted in improved patient adherence. Sole elemental diet therapy has been used more often in pediatric IBD for induction of remission in comparison to adult patients. Interestingly, enteral nutrition's efficacy at inducing remission may be related to the modulation of the gut microflora that occurs during therapy (33). Successful long-term treatment extension of elemental diet in IBD has not been clearly shown. Perhaps, this is owed to instability of the microbiome effect and potential external influences. With respect to improving nutrition status, enteral nutrition support should be attempted prior to parenteral feeding (34).

Parenteral Nutrition

Parenteral nutrition (PN) is utilized in certain patients with IBD. Often, nutritional optimization is recommended and preferred by the surgical team prior to undergoing an abdominal operation for active IBD. It is especially useful in CD patients with bowel obstructions and prolonged cessation of oral intake. The risks and benefits of PN must be carefully weighed in all situations. Due diligence is required in the monitoring of PN-related complications such as central venous line infections or thromboses is extremely important. Risks and benefits need to be assessed with respect to the degree of malnutrition and pre-treatment goals of such targeted therapy. It is important to have patient education and home care in place for successful management of the central venous line and feeding regimen. Most patients do well with cycled feeding of 10-12 hours during nighttime, affording increased mobility during the majority of the day and increased treatment adherence. Frequent testing of electrolytes and liver enzymes are necessary, in addition to serial weight measurements for effective ongoing management to ensure goals are achieved. Bowel rest and PN were initially used as treatment for severely malnourished patients with severe aggressive Crohn's disease (35). Short-term efficacy was achieved

in certain patients with subsequent successful surgical outcomes; however, long-term efficacy is quite variable. IBD patients on long-term PN typically had significant intestinal resections to the point of short gut syndrome with disease refractory to multiple medical therapies. It is important to have a multidisciplinary approach that includes nurses, registered dietitians and a specialized pharmacist. The complexity of patient monitoring and even the recent shortages in parenteral nutrition components make early action and experienced resourcefulness a huge benefit for patient care.

CONCLUSION

Care of patients with IBD includes the management of the disease process and its manifestations including nutritional deficiencies. Dietary assessment of patients will often reveal substantive gaps in adequate nutritional intake. Protein-calorie malnutrition as well as vitamin and mineral deficiencies are frequently seen. Medication effects may contribute to the deficiencies as well, with replacement that needs to begin at the onset of therapy. Multidisciplinary team approach with a physician, a registered dietician and specialized pharmacy personnel leads to optimal care. Appropriate nutrition care in IBD positively impacts patients. Optimal nutrition status should become part of the strategic quality care measures for IBD patients. ■

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