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NUTRITION IN PATIENTS WITH CIRRHOSIS

Medical Science

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ABSTRACT

Malnutrition is common in patients with cirrhosis and is associated with decreased quality of life, increased complications, and increased morbidity post liver transplant. Advancements in the understanding of malnutrition and the limitations of traditional nutrition assessment have spurred the development of new methods of evaluating nutrition status that are particularly applicable to patients with cirrhosis. Nutrition therapy for patients with cirrhosis is also undergoing an evolution. A nutritional screening should be incorporated into the routine clinical care of patients with cirrhosis, with a more extensive nutritional assessment that includes a detailed history, dietary recall, baseline nutrition laboratory tests, and evaluation of sarcopenia using imaging modalities or strength testing to determine the degree of frailty. A thorough assessment will allow for a personalized treatment plan that provides the patient with total daily caloric intake goals with an emphasis on quality protein, education on timing of oral intake with a reduction in periods of fasting, identification and treatment of micronutrient deficiencies, and recommendation of safe and realistic exercise programs to help prevent and/or reduce sarcopenia and improve frailty.

KEYWORDS

INTRODUCTION

Liver cirrhosis is the end stage disease of liver and is caused by many factors especially Chronic Hepatitis, alcohol, infection, and metabolic disorders. In liver cirrhosis the metabolisms of various nutrients are affected. Diet plays a key role as a nutritional therapy in liver disease. In liver cirrhotic patients, the primary goal is to ensure an adequate nutrient intake in their diet [1-7]. Patients with cirrhosis frequently have either global malnutrition or alterations in specific aspects of nutritional status, such as micronutrient deficiencies, due to multiple mechanisms, including poor nutritional intake, poor absorption, and increased losses. Malnutrition is present in almost every patient with alcoholic cirrhosis and is frequent in most other types of cirrhosis. Poor nutritional intake is often seen in cirrhotic patients, especially in patients with alcoholic liver disease, which is a large cause of cirrhosis in the United States and worldwide.

Cirrhotic patients often have multiple micronutrient deficiencies. (The Table displays a select list of micronutrient deficiencies and their manifestations in patients with cirrhosis.) One of the most common deficiencies involves zinc, which is critical for the function of a host of zinc finger transcription factors; with inadequate zinc, patients can develop many metabolic abnormalities. In addition to poor intake and decreased absorption, patients often lose a lot of zinc in their urine. Therefore, supplementing patients with zinc is often helpful in many types of cirrhosis.

Table.
Signs and Symptoms of Select Micronutrient Deficiencies in Patients With Cirrhosis

Micronutrient Deficiency	Signs/Symptoms
Magnesium	Insulin resistance, muscle cramps
Selenium	Myopathy, cardiomyopathy
Vitamin B1/thiamine	Wernicke-Korsakoff syndrome, neurologic symptoms
Vitamin B2/riboflavin	Glossitis, cheilitis, lingual papillae atrophy
Vitamin A/retinol	Abnormal dark adaptation, rough skin
Vitamin C	Scurvy with purpura and petechiae
Vitamin D	Altered bone metabolism, altered gut barrier/immune function
Vitamin E	Oxidative stress
Niacin	Skin photosensitivity, confusion, pellagra
Folate, s-adenosylmethionine	Anemia, altered methylation, epigenetic effects

In addition, one of the most significant nutritional problems in cirrhotic patients is muscle wasting and sarcopenia. Patients with cirrhosis often go into a catabolic phase overnight due to limited glycogen stores in the liver. Thus, it is critically important for cirrhotic patients to maintain their muscle mass. One way to do this is by having a late-night snack, which helps prevent the development of a catabolic phase with muscle loss.

Pathophysiology of Malnutrition in Chronic Liver Disease

The pathogenesis of malnutrition in cirrhosis is multifactorial. Factors include decreased oral intake and both maldigestion and malabsorption, particularly in patients with cholestasis.[8,9] Decreased oral intake occurs for several reasons, including anorexia, dysgeusia owing to zinc deficiency, and/or unpalatable diets due to sodium restriction and inappropriate protein restriction for patients who have hepatic encephalopathy or chronic renal insufficiency. Additionally, patients with decompensated cirrhosis and ascites experience early satiety because of extrinsic compression of the gastrointestinal tract from peritoneal fluid.[9] Poor oral intake also occurs frequently during hospitalization because of procedures and/or hepatic encephalopathy.[10] Cirrhotic patients also experience fat malabsorption because of diminished luminal bile acids resulting from decreased synthesis and portosystemic shunting as well as coexisting chronic pancreatitis in patients with chronic alcohol consumption.[8] Malabsorption may also occur in patients with portal hypertensive gastropathy and/or enteropathy, intestinal dysbiosis, and chronic lactulose use.[9] In addition to decreased oral intake and malabsorption, patients with cirrhosis have alterations in metabolism because of decreased hepatocyte mass, which results in a shift from glycogenolysis to gluconeogenesis as a source of energy. Gluconeogenesis subsequently leads to lipopenia and sarcopenia.[8] Hypermetabolism is also seen in 15% to 34% of patients with cirrhosis and may be related to sympathetic overactivity, gastrointestinal bacterial translocation, and a proinflammatory phenotype.[11,12]

Sarcopenia is a major consequence of malnutrition and correlates with frailty.9 Sarcopenia occurs as a consequence of increased proteolysis and a reduction in protein synthesis. Glycogen store depletion in cirrhosis leads to an increased reliance on gluconeogenesis as a source of glucose. Gluconeogenesis primarily utilizes aromatic amino acids (AAAs) and branched-chain amino acids (BCAAs), which are released from skeletal muscle via proteolysis. BCAAs are catabolized in skeletal muscle, which leads to low serum levels. Conversely, AAAs are catabolized in the liver, and serum levels are elevated because of decreased hepatic uptake due to portosystemic shunting and hepatocellular dysfunction. A decrease in circulating BCAAs, particularly leucine, subsequently causes decreased protein synthesis and increased protein catabolism.[13,14] Other disturbances that promote proteolysis and protein synthesis inhibition include increased skeletal muscle ammonia production, endotoxemia, and low testosterone levels.[10,13,14]

Nutrition Assessment

Nutrition assessment in liver disease has traditionally relied on

measurement of serum proteins such as albumin, prealbumin or transferrin. However, the best available evidence indicates that serum protein levels are not accurate measures of nutrition status.13,14 Those serum proteins that were erroneously thought to reflect nutrition status are inverse acute phase reactants, which rapidly decrease in infection, injury or other physiologic stress, and then begin to increase as the stress resolves independent of changes in nutrition intake.13,14 Serum proteins are also affected by a plethora of non-nutritional factors including synthetic function of the liver, hydration status, renal failure, corticosteroid administration (prealbumin) and iron status (transferrin).13 In many patient populations, weight loss is the most useful indicator of malnutrition. However, patients with decompensated cirrhosis who have ascites often gain weight even when oral intake is poor and advanced malnutrition is present. A modified body mass index (BMI) has been proposed for patients with cirrhosis, and to provide an index for underweight in patients with ascites. A BMI < 18.5 kg/m2 is usually considered underweight, but in patients with cirrhosis a BMI < 20 kg/m2 was associated with increased mortality. A BMI < 23 kg/m2 may indicate underweight in patients with mild ascites, while BMI < 25 kg/m2 may be underweight for patients with severe or tense ascites. Alternatively, adjustments to actual weight can be made based on the severity of ascites (see Table 1). Conversely, patients without cirrhosis may have substantial loss of muscle, but maintain, or even increase fat stores with no net change in body weight.

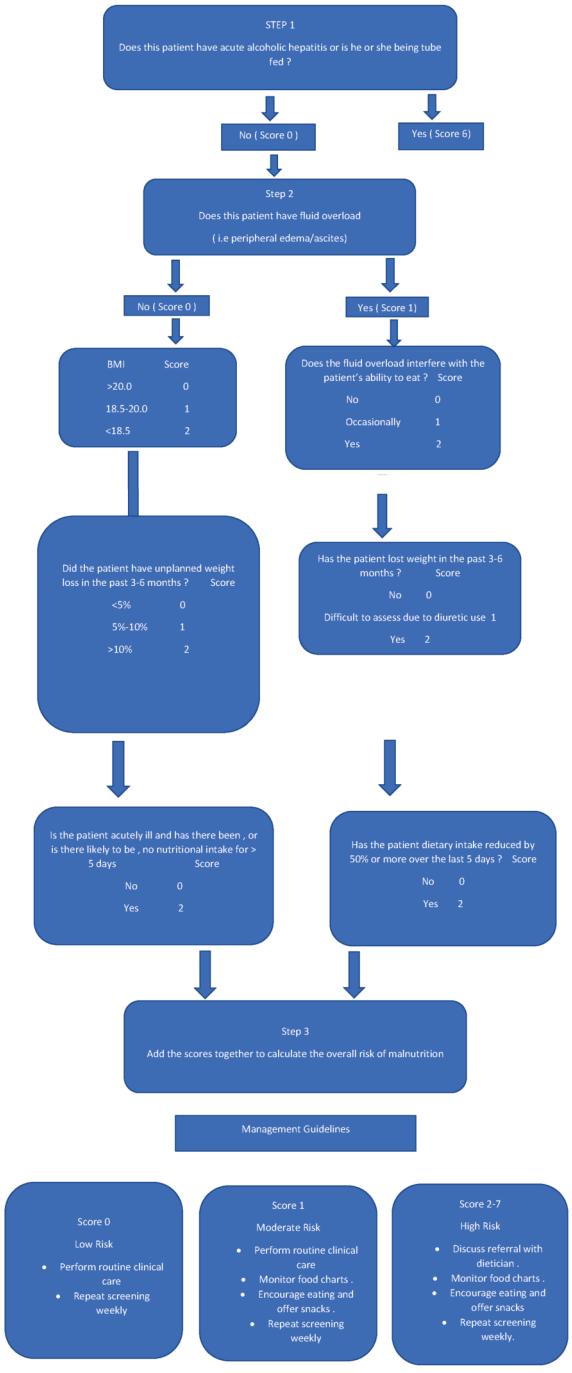
Table 1. Estimated Fluid Weight Estimation in Ascites Degree of Ascites Estimated Ascitic Weight Masking Euvolemic Weight

Mild Ascites	3-5 kg
Moderate Ascites	7-9 kg
Severe Ascites	14-15 kg

Physical examination to investigate possible muscle wasting in the extremities and temporal muscle should be part of routine nutrition assessment in patients with cirrhosis. Studies of body composition using ultrasound, bioimpedance or CT scan have identified severe muscle wasting as a common occurrence in cirrhosis, and the degree of sarcopenia may even be a prognostic indicator for some cirrhotic populations.15,16 A new study identified that pre-transplant muscle mass was associated with post-transplant outcomes including duration of ICU stay and days of mechanical ventilation.15 In men, muscle mass was a significant predictor of survival and ability to be discharged to home (rather than discharged to a transitional facility).15 Further research is needed to define standards of muscle mass for different age and disease categories, and to standardize technology and techniques for measurement of muscle mass before routine use is indicated in the clinical setting. Research also indicates that changes in functional status may be one of the better indicators of alterations in nutrition status. Measurement of handgrip strength has been used as surrogate a marker for functional status in some studies.16 Obviously, measurement of handgrip strength is not feasible in patients that are sedated, critically ill or have severely altered mental status. However, handgrip strength appears to be able to predict decline in nutrition status before other signs of clinical compromise are apparent.19 When measurement of handgrip strength is not feasible, discussions with patients and the patient's family or caregivers about possible changes in a patient's functional status can provide insights into overall nutrition status. Evaluation of recent oral intake remains one of the most valuable components of nutrition assessment in patients with cirrhosis. A reliable history that documents poor oral intake may be all that is needed to appreciate a patient's nutrition status. A more detailed interview can be helpful to assess diet quality, variety of intake and investigate the source of limitations to oral intake. Patients that are not meeting basic calorie and protein requirements are also likely not receiving sufficient vitamin and minerals (unless they consistently take vitamin/mineral supplements).17 Nutrition deficiencies do not normally occur in isolation, and detection of any nutrition inadequacies should be a reminder to consider other possible vitamin and mineral deficiencies.

Nutritional Evaluation

Obtaining an accurate and reliable nutritional assessment in cirrhotic patients presents unique challenges. Typical nutrition biomarkers are skewed in cirrhosis because of decreased protein synthesis (albumin) and volume overload leading to alterations in body weight. Currently, there are sparse validated screening tools as well as a lack of consensus of the definition of malnutrition in this patient population. An assessment typically starts with a nutritional screening questionnaire to identify patients at risk of malnutrition. If this initial screening raises concern, it should be followed by a more extensive nutritional assessment by a registered dietitian with expertise in liver disease.[18]



A flow chart showing the Royal Free Hospital-Nutritional Priortizing Tool to determine a patient's risk of malnutrition.

MANAGEMENT

In liver cirrhosis the metabolisms of various nutrients are affected. Diet plays a key role as a nutritional therapy in liver disease. In liver cirrhotic patients, the primary goal is to ensure an adequate nutrient intake in their diet [20-26]. It was found that increasing protein intake by nutrition therapy in liver cirrhosis can decrease mortality [27]. Diet therapy is the main pathway for long-term nutritional support of patients with cirrhosis, thereby reducing the need for artificial nutrition. Diet therapy has proven to be effective in cirrhosis in terms of energy and protein. There are several studies that support the view that a modified eating pattern with four to seven small meals rather than three big traditional meals, and including at least one late evening carbohydrate-rich snack, improves nitrogen economy in liver

cirrhosis. In fact, such a modified eating pattern has been included in some international recommendations for nutritional therapy in chronic liver disease [28]. However, the feasibility of these dietary modifications in cirrhosis is not well established, since there is only limited information about the spontaneous energy intake patterns in these patients. In this sense, a recent study in the UK investigating the daily distribution of energy intake in cirrhotic patients [29]. The use of chemically enteral diets as supplements proves a good alternative therapy for the long-term management of malnourished cirrhotics in whom only the conventional diet is unable to improve their nutritional status. In liver cirrhosis implementation of Oral supplementation with liquid diets is proven unsuccessful in these patients due to presence of anorexia and other gastrointestinal symptoms. But inclusion of short-term tube feeding has resulted in improvements in length of hospital stay and severity of liver disease (30). Only those patient which have chronic encephalopathy need protein restricted to 0.6-0.8 g/kg/d. During acute episodes of encephalopathy, little restriction of proteins may be needed, but normal protein intake should be resumed soon after the cause of encephalopathy has been identified and treated. Branched-chain amino acid formulas are thought to be beneficial for cirrhotic patients with encephalopathy [31]. If ascites and hyponatremia are present, water restriction is needed. When cirrhosis is caused by primary sclerosing cholangitis and primary biliary cirrhosis at that time supplementation of lipid form of fat soluble vitamins (A, D, E, and K) and calcium may be necessary if Steatorrhoea is present. Zinc deficiency is common in cirrhotic patients from a decrease in hepatic storage capacity. Vitamin A deficiency may arise due to decreased release from the liver. Zinc supplements should be considered for liver cirrhotic patients when plasma levels are low or when they are complaining of dysgeusia or night blindness [32]. The points that should be kept in mind while providing nutritional therapy in liver cirrhosis with different conditions are as

Cirrhosis without encephalopathy

- Provide 1-1.5 g /kg/day protein.
- Provide high calorie and high carbohydrate diet which contain 1260-1400 J/ kg/day
- Sodium and water is restricted only in the presence of ascites and edema
- Inclusion of frequent small meals with evening carbohydrate snack meals
- Supplementation of vitamins and minerals.

Cirrhosis without encephalopathy

- Provide 0.6–0.8 g/ kg/ day of proteins until encephalopathy is diagnosed
- Provide high carbohydrate diet via enteral or Parenteral route

Cirrhosis with encephalopathy

- Protein should be restricted to 0.6 – 0.8 g/kg/day
- Frequent small meals rich in calorie dense
- Sodium and water restriction and supplementation of vitamins and minerals
- Encourage patients in inclusion of vegetarian protein than animal protein in their diet.

When liver cirrhotic patients cannot meet their nutritional requirements from usual diet then it is better to provide nutritional counseling [24] with combination of oral nutrition supplements [20,21,26] which prove successful supplemental enteral nutrition in these patients as nutritional therapy.

Summary

Malnutrition is highly prevalent among patients with cirrhosis, including otherwise well-compensated patients with CTP class A cirrhosis. It is important to screen all patients with cirrhosis, regardless of etiology or severity, and to identify patients with malnutrition because of its marked impact on morbidity, mortality, and quality of life. In patients who fail to meet their nutritional goals, a period of supplemental enteral feeding may be considered. A thorough nutritional and exercise assessment will allow for a personalized treatment plan that includes both dietary and exercise recommendations. The dietary portion should provide total daily calorie goals with an emphasis on quality protein as well as address any vitamin and micronutrient deficiencies with nutrient-rich foods and/or supplementation. The exercise recommendations should be tailored for each individual patient. Activity goals should take into account any activity limitations as well as the degree of portal hypertension in order to reduce skeletal muscle loss and frailty.

REFERENCES

1. Mendenhall CL, Moritz TE, Roselle GA, Morgan TR, Nemchausky BA, et al. (1995) Protein energy malnutrition in severe alcoholic hepatitis: diagnosis and response to treatment. The VA Cooperative Study Group #275. JPEN J Parenter Enteral Nutr 19: 258-265.
2. Bunout D, Aicardi V, Hirsch S, Petermann M, Kelly M, et al. (1989) Nutritional support in hospitalized patients with alcoholic liver disease. Eur J Clin Nutr 43: 615-621.
3. Cabre E, Gonzalez-Huix F, Abad-Lacruz A, Esteve M, Acero D, et al. (1990) Effect of total enteral nutrition on the short-term outcome of severely malnourished cirrhotics. A randomized controlled trial. Gastroenterology 98: 715-720.
4. Kearns PJ, Young H, Garcia G, Blaschke T, O'Hanlon G, et al. (1992) Accelerated improvement of alcoholic liver disease with enteral nutrition. Gastroenterology 102: 200-205.
5. Le Cornu KA, McKiernan FJ, Kapadia SA, Neuberger JM (2000) A prospective randomized study of preoperative nutritional supplementation in patients awaiting elective orthotopic liver transplantation. Transplantation 69: 1364-1369.
6. Smith J, Horowitz J, Henderson JM, Heymsfield S (1982) Enteral hyperalimentation in undernourished patients with cirrhosis and ascites. Am J Clin Nutr 35: 56-72.
7. Hirsch S, Bunout D, de la Maza P, Iturriaga H, Petermann M, et al. (1993) Controlled trial on nutrition supplementation in outpatients with symptomatic alcoholic cirrhosis. JPEN J Parenter Enteral Nutr 17:
8. Cheung K, Lee SS, Raman M. Prevalence and mechanisms of malnutrition in patients with advanced liver disease, and nutrition management strategies. Clin Gastroenterol Hepatol. 2012;10(2):117-125.
9. Tandon P, Raman M, Mourtzakis M, Merli M. A practical approach to nutritional screening and assessment in cirrhosis. Hepatology. 2017;65(3):1044-1057.
10. European Association for the Study of the Liver. EASL Clinical Practice Guidelines on nutrition in chronic liver disease. J Hepatol. 2019;70(1):172-193.
11. Peng S, Plank LD, McCall JL, Gillanders LK, McIlroy K, Gane EJ. Body composition, muscle function, and energy expenditure in patients with liver cirrhosis: a comprehensive study. Am J Clin Nutr. 2007;85(5):1257-1266.
12. Müller MJ, Böttcher J, Selberg O, et al. Hypermetabolism in clinically stable patients with liver cirrhosis. Am J Clin Nutr. 1999;69(6):1194-1201.
13. Dasarathy S, Merli M. Sarcopenia from mechanism to diagnosis and treatment in liver disease. J Hepatol. 2016;65(6):1232-1244.
14. Sinclair M, Gow PJ, Grossmann M, Angus PW. Review article: sarcopenia in cirrhosis—aetiology, implications and potential therapeutic interventions. Aliment Pharmacol Ther. 2016;43(7):765-777.
15. Dimartini A, Cruz RJ Jr, Dew MA, et al. Muscle mass predicts outcomes following liver transplantation. Liver Transpl. 2013 Aug 20.
16. Alvares-da-Silva MR, Reverbel da Silveira T. Comparison between handgrip strength, subjective global assessment, and prognostic nutritional index in assessing malnutrition and predicting clinical outcome in cirrhotic outpatients. Nutrition. 2005;21(2):113-7.
17. Ferreira LG, Ferreira Martins AI, Cunha CE, et al. Negative energy balance secondary to inadequate dietary intake of patients on the waiting list for liver transplantation. Nutrition. 2013;29(10):1252-8.
18. Tandon P, Raman M, Mourtzakis M, Merli M. A practical approach to nutritional screening and assessment in cirrhosis. Hepatology. 2017;65(3):1044-1057.
19. Norman K, Stobäus N, Gonzalez MC, Schulzke JD, Pirlich M. Hand grip strength: outcome predictor and marker of nutritional status. Clin Nutr. 2011;30(2):135-42.
20. Mendenhall CL, Moritz TE, Roselle GA, Morgan TR, Nemchausky BA, et al. (1995) Protein energy malnutrition in severe alcoholic hepatitis: diagnosis and response to treatment. The VA Cooperative Study Group #275. JPEN J Parenter Enteral Nutr 19: 258-265.
21. Bunout D, Aicardi V, Hirsch S, Petermann M, Kelly M, et al. (1989) Nutritional support in hospitalized patients with alcoholic liver disease. Eur J Clin Nutr 43: 615-621.
22. Cabre E, Gonzalez-Huix F, Abad-Lacruz A, Esteve M, Acero D, et al. (1990) Effect of total enteral nutrition on the short-term outcome of severely malnourished cirrhotics. A randomized controlled trial. Gastroenterology 98: 715-720.
23. Kearns PJ, Young H, Garcia G, Blaschke T, O'Hanlon G, et al. (1992) Accelerated improvement of alcoholic liver disease with enteral nutrition. Gastroenterology 102: 200-205.
24. Le Cornu KA, McKiernan FJ, Kapadia SA, Neuberger JM (2000) A prospective randomized study of preoperative nutritional supplementation in patients awaiting elective orthotopic liver transplantation. Transplantation 69: 1364-1369.
25. Smith J, Horowitz J, Henderson JM, Heymsfield S (1982) Enteral hyperalimentation in undernourished patients with cirrhosis and ascites. Am J Clin Nutr 35: 56-72.
26. Hirsch S, Bunout D, de la Maza P, Iturriaga H, Petermann M, et al. (1993) Controlled trial on nutrition supplementation in outpatients with symptomatic alcoholic cirrhosis. JPEN J Parenter Enteral Nutr 17: 119-124.
27. Kondrup J, Müller MJ (1997) Energy and protein requirements of patients with chronic liver disease. J Hepatol 27: 239-247.
28. Plauth M, Merli M, Kondrup J, Weimann A, Ferenci P, et al. (1997) ESPEN guidelines for nutrition in liver disease and transplantation. Clin Nutr 16: 43-55. 10. Madden AM, Morgan MY (1999) Patterns of energy intake in patients with cirrhosis and healthy volunteers. Br J Nutr 82: 41-48.
29. Madden AM , Morgan MY (1999) Patterns of energy intake in patients with cirrhosis and healthy volunteers . Br J Nutr 82: 41-48
30. Cabré E, Gassull MA (2001) Nutritional aspects of liver disease and transplantation. Curr Opin Clin Nutr Metab Care 4: 581-589.
31. Fabbri A, Magrini N, Bianchi G, Zoli M, Marchesini G (1996) Overview of randomized clinical trials of oral branched-chain amino acid treatment in chronic hepatic encephalopathy. JPEN J Parenter Enteral Nutr 20: 159-164.
32. Munoz, SJ (1991) A critical review on nutritional therapies in acute and chronic liver diseases. Includes guidelines for the treatment of patients with cirrhosis and acute hepatic failure, Nutritional therapies in liver disease. Sem in Liver Dis, 11:278–291.