

Nutrition as a Part of Therapy in the Treatment of Liver Cirrhosis

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Abstract

Poor nutritional status is related to worse prognosis and increases the mortality rates in liver cirrhosis. Malnutrition is usual in patients and is associated with a poor outcome. Nutritional support decreases nutrition-associated complications. The dietary intake of patients is generally characterized by high levels of carbohydrate, fat, protein and cholesterol. Therefore, careful investigation of dietary habits could lead to better nutrition therapy in liver cirrhotic patients. The liver cirrhotic patients are malnourished due to presence of anorexia, vomiting and other gastrointestinal disorders. Hence, nutritional support is also required during therapy to prevent undernourishment, treatment interruption, and improve the quality of life. Some patients with liver cirrhosis have decreased dietary energy and protein intake, while the number of liver cirrhotic patients with overeating and obesity is increasing, indicating that the nutritional state of liver cirrhotic patients has a broad spectrum. Therefore, nutrition therapy for liver cirrhotic patients should be planned on an assessment of their complications, nutritional state, and dietary intake. Late evening snacks, branched-chain amino acids, zinc, vitamin and mineral supplementation, medium chain triglycerides, vegetable protein and probiotics are considered for effective nutritional utilization.

Keywords: Cirrhosis; Liver; Nutrition; Triglycerides; Probiotics

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]. It was found that increasing protein intake by nutrition therapy in liver cirrhosis can decrease mortality [8]. Diet therapy is the main path way 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 [9]. 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 [10]. 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

[11]. Only those patients 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 [12]. 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 [13]. 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 without 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 [5] with combination of oral nutrition supplements [1,2,7] which prove successful supplemental enteral nutrition in these patients as nutritional therapy. Very often, the spontaneous food intake of these patients is overestimated and the therapeutic gain [3,4,14,15].

Provision of Adequate Nutrition

Various studies on nutritional support in liver disease concluded that aggressive nutritional support is essential to meet elevated protein requirements and reduced muscle catabolism and improve disease outcome [4,7,16,17]. Priority should be given in the prevention and improvement of protein energy malnutrition in liver cirrhosis. Inappropriate protein, fat or sodium restrictions will cause malnutrition in hyper metabolic patient. As malnutrition is more prevalent in liver cirrhosis [18,9].

Sodium restriction

A diet low in sodium can help to treat ascites and edema as it will minimise the amount of salt entering the kidney, leaving less sodium available for re-absorption, therefore, less fluid is retained [19]. Those patients who have already poor appetite and inclusion of low salt diet make food unpalatable and may further reduce the food choices which results to Protein calorie malnutrition in cirrhotic patients. Diet should be fresh, perishable produce, which has to be bought, stored and prepared and many patients may not be able to do when they are already malnourished, weak and anorexic. There are also financial crises as well as issues of compliance. With these factors in mind and considering the clinical causes and significance of malnutrition, restrictions should be minimized and dietary therapy should aim to meet nutritional requirements. It would be better to use 'salt to tolerance' a reduction in salt intake that still allows adequate nutritional intake or nutritional support. A 2000 mg sodium-restricted diet is effective, when combined with diuretic therapy, for controlling fluid overload in 90% of patients with cirrhosis and ascites [20]. Various studies also indicate that sodium-restricted diets improve survival rate in liver cirrhotics. Foods that are high in sodium or salt include canned soups and vegetables; processed meats, such as bacon, sausages and salami; cheeses; condiments; and most snack foods. You can also determine if a food is high in sodium if its nutrition information label says that it has more than 300 mg of sodium per serving. As a rule of thumb, you should try to limit your sodium intake to less than 2,000 mg per day [21].

Fluid restriction

Restriction of fluid is also important factor in nutritional therapy of cirrhotics as presence of ascites (accumulation of fluid in abdomen). Careful monitoring should be taken and maintenance of electrolyte and fluid balance. When you have liver disease, your blood vessels ability to retain fluid is diminished because of decreased protein synthesis in your liver, mainly albumin. This causes fluid leaks in your blood vessels, which in turn, causes fluid buildup in other tissues, or ascites. By limiting the amount of salt and fluid in your diet, you can decrease fluid retention and swelling.

Protein restriction

Protein restrictions have a potentially devastating effect on nutritional status of liver cirrhosis as it changes the protein requirements and energy metabolism. It will lead to negative nitrogen balance, which will result in worsening hepatic encephalopathy. It should be restricted only in the presence of encephalopathy. An increased amount of ammonia worsens the encephalopathy condition. In fact poor nutritional status with reduced muscle mass has been directly linked with worsening encephalopathy. It was found that vegetable protein is better tolerated than the animal protein as it contains more valine which is beneficial for preventing encephalopathy [22]. Multiple recent studies have shown the importance of maintaining the positive nitrogen balance via increased protein and caloric intake in cirrhotic patients [23]. Negative nitrogen balance due to protein restriction leads to protein-energy malnutrition [24], and decrease the survival rate in patients with liver cirrhosis [23]. European Society for Clinical Nutrition and Metabolism (ESPEN) recommends that patients with liver cirrhosis should receive 35-40 kcal/kg per day [25]. Protein requirements are increased in cirrhotic patients and high protein diets are generally well tolerated in the majority of patients. The inclusion of adequate protein in the diets of malnourished patients is often associated with a sustained improvement in their mental status. Protein helps preserve lean body mass; skeletal muscle makes a significant contribution to ammonia removal. Protein restriction must be avoided and the recommendation is to maintain 1.2-1.5 g proteins/kg/day [26].

Low-Fat diets

In many countries mortality rates from liver cirrhosis is greater than what per capita alcohol consumption would predict [27]. Several investigations have concluded that excess dietary fat may encourage cirrhosis progression. High intakes of total fat, [28] saturated fat, [29] and polyunsaturated fat [27] have been implicated. Medium chain triglycerides should be included in the diet of liver cirrhosis as it is better tolerated by the patients and it contains C8 to C10 which is digested and absorbed in the absence of bile. This fat is present in the coconut oil. Use olive oil in cooking instead of butter, shortening, margarine or vegetable oils. Unlike other oils, olive oil is an unsaturated fat, and may have a less significant impact on blood cholesterol than saturated fats. Also, saturated fats can become toxic in your bloodstream, and may worsen the symptoms of cirrhosis.

Vegetarian diets

Inclusion of Plant-based diet as nutritional therapy in liver cirrhosis is essential as it contains high amount of dietary fiber, which may reduce ammonia-related to encephalopathy and reduce the strain on your [30]. Vegetable protein sources are also higher in arginine, an

amino acid that decreases blood ammonia levels through increasing urea synthesis. They are also lower in methionine and tryptophan. As per Clinical studies the vegetarian diet increases the results of standard tests, improve nitrogen balance and electroencephalogram (EEG), and lower blood ammonia concentrations in liver cirrhotic patients [30].

Antioxidants and B-vitamins

Cirrhotic patients have significant reductions in antioxidant enzymes and antioxidant nutrients, such as carotenoids, selenium, vitamin E, and zinc [31-33]. Deficiency of folate is also found in liver cirrhotic patients [34] and an estimated 50% have increased blood homocysteine concentrations [35] which cause liver fibrosis and ultimately cirrhosis. Vitamin K is essential for the management of cirrhosis, because it helps in prevent bleeding of liver tissues. It also helps in conversion of glucose into glycogen, a chemical that is stored in your liver. Glycogen is essential for bile excretion and healthy liver function. Increase your intake of vitamin K by adding broccoli, avocados, spinach, kale, strawberries, cabbage and eggs. Patients should take at least multivitamin and mineral supplements that meet 100% of dietary allowances as there is a reduction of food intake and deficiencies of various nutrients in liver cirrhosis [31].

Branched-chain amino acids and enteral feeding for liver cirrhotic malnourished patients

Protein-energy malnutrition is common in 65% to 90% of patients with cirrhosis. Blood concentrations of branched-chain amino acid serve as both indicators of nutritional status and predictors of survival rate [36]. In a study of 646 patients with decompensated cirrhosis, the ingestion of 12 g/day of branched-chain amino acids over 2 years was associated with decreased mortality of roughly 35%, compared with nutrition support from diet alone [37]. Enteral feeding is also the recommended route for artificial nutrition in cirrhosis, and is associated with improved liver function and a lower hospital mortality rate. In January 2006 the European Society for Clinical Nutrition and Metabolism (ESPEN) issued specific guidelines on enteral nutrition in liver disease this can be easily applied in both inpatients and outpatients [38]. In a study conducted by Nakaya et al. [36], the long-term use of BCAA mixtures has proved more beneficial than a late evening snack in terms of improving the serum albumin levels and the metabolic state in cirrhotic patients [39]. The Fischer ratio, the balance between branched-chain amino acids (BCAA) and aromatic amino acids (AAA), is 3:1 in healthy population. It becomes inverted in cirrhotic patients. BCAA are essential for protein production and prevent the catabolism. A meta-analysis of BCAA supplementation revealed the improved rate of recovery from episodic Hepatic encephalopathy, but did not demonstrate a survival advantage [40]. Long-term oral supplementation with BCAA mixture is better than ordinary food to improve the serum albumin level and the energy metabolism in cirrhotic patients [41]. High protein high calorie diet had a beneficial effect on the patients with cirrhosis and hepatic encephalopathy. This effect was statistically significant regarding the mental status, level of the serum ammonia and the body weight. The daily eating pattern consisting in 4 meals and 1 late evening carbohydrate snack contributed to liver cirrhosis improvement, avoiding protein loading in a period of day, but maintaining the protein positive balance.

Probiotic treatment

In liver cirrhotic patients there was imbalance in bacterial gut flora which contributes significantly to ammonia production, resulting in varying degrees of encephalopathy. So these patients should intake of supplemental combinations of probiotics which reduces the blood ammonia concentrations [42,43]. Those patients which are treated with a combination of probiotics (*Lactobacillus plantarum*) and fiber had a lower rate of getting bacterial infections than those treated with selective intestinal decontamination, indicating a beneficial effect on the prevention of bacterial translocation.

Some investigations have shown that liver cirrhotic patients have a trend to take more energy via carbohydrates, which may reflect their insufficient glycogen storage, and fasting accelerates the oxidation of fat [44-46]. As a measure for energy malnutrition, a late evening snack is recommended. When the number of meals is divided into 4-6 per day, nitrogen balance improves [47]. Also glucose intake at night shows a similar effect [48]. Hyperinsulinemia and glucose intolerance are often shown in liver cirrhotic patients and are associated with a reduction in glucose uptake in the liver and peripheral tissues [49]. It is nutritionally important that improving hyperinsulinemia brings about normalization of insulin dependent glucose uptake and glycogen synthesis [50]. Nutrition therapy for liver cirrhosis patients with glucose intolerance requires a lower standard of energy intake to prevent hyperinsulinemia and hyperglycemia. In Japan, the standard of 25-30 kcal/kg ideal body weight/day is an advisable range. Dietary fiber-rich meals with a low glycemic index, a lower content of simple carbohydrates, and more exercise, as well as α -glucosidase inhibitor improve hyperinsulinemia and hyperglycemia in liver cirrhotic patients [51-54]. Zinc supplementation is also effective for improving hyperglycemia [55,56].

Conclusion

The most common and difficult to handle myth about liver disease is that there should be almost complete restriction of dietary fat and protein intake in diet, which is in contrast to the actual scientific dietary advices for such patients. Hence we should regularly and persistently convince the patients to take high protein and fat rich diet with less AZ salt, as decided upon degree of decompensation. Sodium and water should be restricted only in the presence of ascites and edema; protein should be 1.5 g/kg/day and restricted only in the presence of encephalopathy. Protein should be from vegetable source and inclusion of Medium chain triglycerides in the diet should be done as they are easily digested in the absence of bile. Supplementation of vitamins and minerals should be taken. Always take consultation of registered Dietitian which provides you a right diet for right treatment.

Author's Contribution

The author of the paper is doing research work on "Nutritional Assessment & Dietary Habits of Liver Cirrhosis Patients in Kashmir" and the subject review paper is part of a research work. Acquisition, analysis and interpretation of data and subsequent drafting of the Review Paper have been carried out.

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