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A Comprehensive Review On Nutritional Evaluation Of Supplemented Value Added Products On Liver Cirrhosis Patients

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Abstract

Patients with cirrhosis often exhibit a nutritional problem, which is an independent predictor of morbidity and death before to and after transplantation. Consequently, a good evaluation of the patient's food intake using various techniques, such as food records, meal frequency questionnaires, and a 24-hour recall, should be regarded as an essential step in the nutritional therapy of these patients. The majority of people on the waiting list do not consume enough food every day. The primary objective of the study is to evaluate the nutrient intake of Supplemented Value-Added Products in patients with liver cirrhosis, incorporating both and subjective data. A major effect of liver cirrhosis is hepatic encephalopathy (HE). The most prominent clinical indication of protein-calorie deficiency in cirrhotic patients is sarcopenia. This situation is a potential risk due to the fact that the muscular system serves as alternate site for ammonia purification. In the earliest stages of a disease, a multidisciplinary team should check a patient's nutritional condition using a anthropometric measurements, food diary, and blood chemistry testing. Dietary guidelines for people with cirrhosis are identical to those for cirrhotic individuals without HE. The daily calorie consumption of a non-obese person should be about 30–40 Kcal/Kg/day, with such a dietary protein of 1–1.5 g/Kg/day, largely of vegetable origin, and 4–6 meals per day. In patients, it is important to assess fluids and electrolytes and supplement any nutrient deficiencies, like sodium and zinc, along with vitamin deficiencies, causing the neurological symptoms. Due to the significance of nutritional status, this element should be considered in the diagnostic–therapeutic approach for those suffering from liver cirrhosis.

Keywords: Liver cirrhosis; protein caloric-malnutrition; sarcopenia; dietary intervention; mortality

Introduction

The liver is primarily in charge of the storage, transportation, and purification of nutrients taken through the gastrointestinal tract. In order to maintain glucose homeostasis, one of the crucial roles is the breakdown and storage of the glycogen as an energy source during fasting. In contrary, the liver boosts glycogen synthesis & inhibits glycogenolysis and gluconeogenesis when blood glucose levels rise (Yao et al., 2018). Significant metabolic anomalies are detected in cirrhosis, the final phase among all severe liver disorders, resulting to an increase in mortality as well as a decline in life quality. Multiple metabolic pathways are disturbed in liver cirrhosis patients: The liver's glycogen store capacity is drastically diminished as a consequence of cirrhosis, leading to irregular energy generation. Close to 70% of cirrhotic

individuals exhibit hyperglycaemia and insulin sensitivity, whereas about 14–46% develop type II diabetes. (Silva et al., 2015). Increased protein turnover, with amino acids serving as alternative substrates during hepatic gluconeogenesis. To meet the increased demand for protein, the body becomes very catabolic. Furthermore, the utilisation of the branched-chain amino acids (BCAAs) like the isoleucine, leucine acquired from the catabolism of muscle for glutamine synthesis as well as ammonium clearance creates a discrepancy in the acid concentrations of plasma amino, to aromatic amino acids (AAA), i.e., phenylalanine, tryptophan, attempting to dominate (Yao et al., 2018). In attempt to obtain energy from other sources, there is a rise in lipolysis and combustion of quasi fatty acids in cirrhotic patients (Mizock, 1999).

In the year 2019, the European Association for the Study of the Liver (EASL) changed its dietary recommendations for individuals suffering from the disease of chronic liver. The objective was to address number of concerns associated with this subject, including how to notice nutritional irregularities and also which patients require examination, what the repercussions of malnutrition are and the way to act to restore and avoid it. These guidelines focus on sarcopenia and how to avoid it, as well as obesity and hepatic encephalopathy (EASL, 2019). In the initial stages of liver cirrhosis, it may be challenging to identify nutritional loss. Since loss of nutrition and muscle mass are commonly noted in cirrhosis, the determination of nutritional status is a first step in the diagnosis of cirrhotic patients (Amodio et al., 2014). In reality, it is the first stage in defining the pattern of tissue loss and determining the most effective therapeutic techniques. The most complicated approaches for monitoring nutritional status involve patient cooperation, significant expenses, and skilled workers, although they are valuable for validating measures taken at the bedside. All patients should be screened, but notably those with a high malnutrition risk, such as those with acute and a body mass index below 18.5%. (Amodio et al., 2013).

Literature review

In addition to intestinal haemorrhage and the ascites, the liver cirrhosis has been accompanied with impaired nutritional status, which may lead to serious consequences and a shortened life span.

Protein-Calorie in Liver Cirrhosis

Protein-calorie nutrition best describes nutrition in cirrhotic individuals, in which the fat mass as well as muscle mass are decreased. Nevertheless, the substantial and progressive decrease in of the muscle mass in cirrhotic patients shows that sarcopenia is the most significant nutritional shortage (Ferreira et al., 2005). Protein-calorie malnutrition affects between 25 and 56% of individuals with hepatic cirrhosis. A patient, despite being more common in individuals with severe illness (Fallahzadeh and Rahimi, 2020). Thus, even people with mild illness are susceptible to malnutrition.

Sarcopenia, Myosteatosis, and Sarcopenic Obesity in Liver Cirrhosis: Beyond BMI

The evaluation of nutritional status depending upon BMI may not be valid in cirrhotic individuals due to the impact of water retention. Forty to seventy percent of individuals suffer from sarcopenia, and the pathophysiology seems to be complex. Possible explanations include an increase in plasma myostatin, intestinal malabsorption of nutrients, a decrease in caloric & protein consumption, as well as a rise in pro-inflammatory cytokines (Yao et al., 2018). The presence of sarcopenia, which is also linked with reduced muscular performance, doubles or triples the risk of sepsis and death (Merli and Riggio, 2009).

Nutrition in cirrhosis Patients

Nutrition's significance in the pathophysiology of cirrhosis has long been postulated. It is not

unexpected that cirrhotic individuals are sensitive to dietary issues given that HE is a late consequence of severe liver cirrhosis. Nutrition and LC may interact for a variety of reasons (Gomes and Augusti, 2015). Probably the most investigated mechanism of dietary impacts on cirrhosis is ammonium metabolism, since its synthesis is greatly controlled by food. Since the bulk of cellular proteins for microbial fermentation are sourced from protein intake, it is fair to anticipate dietary interventions which change proteins may have an important therapeutic benefit (Yao et al., 2018). However, the nutritional status definition in patients with cirrhosis has several limitations (Yao et al., 2018): In actuality, Riggio et al., researches found that women and men have diverse bodily compositions. In contrast, a greater loss of muscle tissue was found in males under stressful settings (Riggio et al., 1997).

- There is no uniform method for diagnosing and categorising malnutrition;
- The prevalence of cirrhosis is impacted by its aetiology, being quite high in hospitalised individuals with an alcoholic aetiology;
- Hydro saline retention renders unreliable body mass index and weight;
- Plasma dilution and changed hepatic production influence the significance of biochemical indicators such as albumin.
- More precise measures, including as DEXA and dilution methods, are expensive, not always accessible, and need the employment of expert staff.

In clinical practise, numerous instruments are used to evaluate nutritional status, like ones that integrate subjective and objective data.

The Aim of the study is to assess nutritional status of Supplemented Value Added Products on Liver Cirrhosis Patients including ones which combine the subjective as well as objective data.

The Objectives of the study are

- In the early phases of the disease, a multidisciplinary team should examine preventive action based on an appropriate analysis of nutritional condition.
- To recommend dietary supplements for patients with cirrhosis of liver.

Optimization of Nutritional Status

The data supporting dietary therapy for liver cirrhosis are of low and restricted quality. Additionally, inquiries in this industry are frequently brief. Multidisciplinary methods are crucial. Dietitians aren't only trained in the area of nutritional examination, but may also identify nutritional abnormalities and provide individualised counselling to patients (Yao et al., 2018). In contrast, few physicians have the skills or time to undertake the comprehensive nutritional review; thus, risking underestimating this particular factor (Yao et al., 2018). Diet, although its importance in the therapeutic therapy of cirrhotic patients, is often undervalued57% of hospitalized patients received a proper nutrition evaluation upon arrival, and 56% of all these patients were declared malnourished, according to research by Huynh et al (Huynh et al., 2015). It confirms the relevance of nutritional considerations in cirrhotic patients by demonstrating that the previous dietary intervention conducted using a multidisciplinary approach may increase survival and quality of life (Iwasa et al., 2013). As with any other consequence of cirrhosis, it is thus vital to address the dietary needs of cirrhotic individuals (Amadio et al., 2013). When properly monitored, Berzigotti et al. discovered that even a low-calorie diet, medium physical activity and high content were beneficial and safe for weight loss (Swart et al., 1989).

The nutritional goal therapy is just to elevate the malnutrition of protein-calorie, provide adequate amount of nutrient intake, minimize hepatotoxic agents, possess a positive nitrogen balance as well as muscle atrophy (Silva et al., 2015). Other objectives include preventing the advancement of liver failure and managing disease-related consequences (Yao et al., 2018).As recommended by the ISHEN

recommendations, cirrhotic patients with HE should get the same diet as cirrhotic patients without HE. In actuality, the suggestions are identical (Amadio et al., 2013). There are several strategies that may be done to enhance the nutritional condition of cirrhotic patients. The dietary guidelines for cirrhotic patients are summarised in Table 1.

Table 1. Dietary recommendations for patients with cirrhosis.

	Normal		**Moderate Malnutrition**		**Severe Malnutrition**	
BMI	<30	>30	<30	>30	<30	>30
Caloric intake (kcal/die)	35–40	20–35	35–40	20–35	35–40	20–35
Carbohydrate intake (%)	50–60%					
Protein intake (g/die)	1.2–1.5	1–1.5	1.2–1.5			
Number of meals/die	4–6 meals					
Bedtime snacks	High in calories (at least 50 g of complex carbohydrate)					
Protein source	Vegetables and dairy products					
Fibre (g/die)	25–45 g					
Vitamin and micronutrients	Correction of deficiency as good clinical practice					

Caloric Requirement

In order to attain anabolism, cirrhotic patients should consume 30 Kcal/Kg per day; however, under extreme stress (such as surgery, infections or bleeding) or in impoverished subjects, the energy need should be gradually elevated to 35–40 Kcal/Kg per day (Fallahzadeh and Rahimi, 2020). Obviously, excess calories should also be avoided since they have a negative impact on lipogenesis and, therefore, on residual liver function (Silva et al., 2015).

These recommendations are inapplicable to the obese patients. In this situation, the caloric intake must be steadily declined to about 20–25 Kcal/Kg/day, preventing drastic reductions that could lead to muscle mass loss. The decrease in energy should focus on fats and carbs, while protein consumption should be maintained. Additionally, to the dietary recommendations, modest physical exercise should be suggested (Amodio et al., 2014). In order to avoid gluconeogenesis, which may lead to sarcopenia and an increase in ammonium production, the number of daily meals for these patients should be raised to four to six. Snacks should be introduced midmorning, mid-afternoon, and before night.

Protein

Maintaining a sufficient protein consumption in cirrhotic aims to enhance nitrogen balance and avoid sarcopenia. Several research have evaluated the influence of protein diet changes in individuals with HE, demonstrating its undeniably positive significance (Merli and Riggio, 2009). Patients with liver illness should take around 1 and 1.5 g/kg of protein per day, based on the extent of decompensation as well as renal function, according to new guidelines. In the event of dietary protein intolerance, the same recommendations proposed administering 0.5 g/Kg/day of the protein and supplementing the remainder with the BCAAs to guarantee a

sufficient daily protein intake (Plauth et al., 2006). Numerous studies demonstrate that this amount is beneficial for achieving a favourable nutrient intake by supplementation.

In accordance with these findings, Cordoba et al. determined that perhaps a diet with such a regular protein, which is biologically more appropriate, shall be safely delivered to patients having HE, although a diet with a low content of protein offered no benefit (Cordoba et al., 2004). The impact of protein eating is dependent upon both the quantity and time of protein consumption. In fact, supplementation at night is linked with larger muscle mass growth than supplementation during the day (Yao et al., 2018). Plant sources discovered in fruits, grains, vegetables, legumes appear to be a feasible alternative to animal proteins for improving protein consumption (Amodio et al., 2001). This is because plant proteins are frequently more absorbed than animal proteins (Merli et al., 2016). As a result, manipulating the ratio of fermentable carbohydrates to proteins might be a logical dietary intervention. This might have a comparable impact to lactulose while guaranteeing enough protein consumption (Yao et al., 2018). Clearly, an appropriate nutritional intervention cannot be generalised, but must be tailored to each patient's nutritional condition and gastrointestinal tolerance to fermentable fibres (Yao et al., 2018).

Protein Supplementation

Reduced BCAA access in cirrhotic patients may impair the transformation of ammonium into glutamine in the muscle tissue, with unfavourable effects on the elimination. For direct and lengthy BCAA supplementation, the daily recommended amount is about 0.25 g/Kg/day, that has certain effects on the nutrition as well as a reduction in symptoms and recurrence. However, a number of studies haven't yet showed these benefits; hence, ESPEN does not suggest its routine use at current time (Merli and Riggio, 2009). Nutritionally, BCAAs are known to increase protein and calorie consumption, alleviate anorexia, and enhance albumin concentrations and nitrogen balance. Additionally, BCAAs upgrade the nutritional condition of patients with cirrhosis by restricting protein loss as well as boosting protein synthesis; the BCAAs may also improve adaptation and innate immune response (Gluud et al., 2013).

The poor critical to a successful of the items, the frequency of daily use, and the possibility of accompanying gastrointestinal problems, including such abdominal distension and diarrhoea, frequently impair patient compliance with this supplementation (Riggio et al., 1997).

Carbohydrates and Lipids

Less study has been conducted on the importance of fatty acids and carbohydrates in the treatment of malnutrition compared to proteins. Considered to postpone the metabolic switch to the basal state, hence increasing amino acid utilisation and renal ammoniogenesis (Amodio et al., 2014). Hyperinsulinemia and hyperglycaemia, that are available in approximately 40% of cirrhotic patients, pose the greatest concern regarding the ingestion of carbohydrates. A high-carbohydrate diet, particularly if it is complex and has a lower glycaemic index, does not seem to affect glycaemic control in the cirrhotic individuals and, in fact, represents an extra source of energy (Yao et al., 2018).

Carbohydrates must constitute around 50–60% of non-protein energy needs in the diet of

cirrhotic patients (Silva et al., 2015). Compared to lipids, they can be supplied without restriction to cirrhotic individuals. However, nuts like hazelnuts, almonds, and peanuts are calorically dense and are high in lipids, so, might be beneficial for cachectic patients having diminished appetite. Conversely, obese people must be advised to reduce their cholesterol levels (Amodio et al., 2014).

Fibres, Vitamins and Micronutrients

Vegetables may have a beneficial effect on persons with liver cirrhosis due to their high fibre. If tolerated, cirrhotic patients should be encouraged to ingest 25–45 g/day of fibre through fruits and vegetables due to its prebiotic and laxative effects. In cirrhotic patients with levels of 30 ng/mL, vitamin D therapy with 5000 IU/day of the vitamin D3 or about 50,000 IU/week either vitamin D3 or D2 over three months is appropriate. Lastly, the hydro-electrolyte balance of cirrhotic patients must be regularly monitored Rapid diagnosis of micronutrient insufficiency is essential, as nutritional supplementation has been linked to a decrease in the risk of infection and the mortality, along with an improvement in functioning of liver. (Silva et al., 2015). Concerning zinc deficiency, that is especially prevalent in cirrhotic persons, the favourable effects of fortification on the neurologic symptoms continue to be contentious and appear to be limited. Good clinical practise dictates that the deficit should always be rectified with an oral dose of 600 mg per day throughout the underlying treatment of cirrhosis (Fallahzadeh and Rahimi, 2020). Sodium insufficiency is another deficit that may appear in patients having cirrhosis. Hyponatremia is difficult to treat for both doctors and patients. Vaptans block arginine-vasopressin hormone V2 sensors within major collector duct cells preferentially; nonetheless, the use is just advised for experimental purposes at this time (EASL, 2019).

Lastly, the pragmatic solution in cirrhotic patients is an addition of micronutrients and vitamins within the first 2 weeks of the nutritional aid, as assessing the deficiency of each element would be time-consuming and expensive (Plauth et al., 2006).

Parenteral Nutrition

This is a supplementary option to enteral feeding; however, it should be started if a patient could be fed intravenously or orally, or if the caloric goal has not been fulfilled. In cases of gastrointestinal weakness, intestinal obstruction, resistance to enteral nutrition, or if the waiting period exceeds 72 hours, enteral nutrition should be initiated (Silva et al., 2015). The suggested calorie intake is about 35 Kcal/Kg/day along with about 1.2 g/Kg/day of protein, which may be raised to 1.5 in individuals who are extremely malnourished or under extreme stress (de Bruijn et al. 1983).The major finding from research evaluating the food consumption of patients is the poor level of compliance with the dietary requirements offered by the current international standards (EASL, 2019). This conclusion raises two critical issues. The first issue is why these patients' diets deviate so far from what is suggested. This finding can be explained by a number of factors, including inadequate knowledge of patients and physicians regarding the composition of food and beverages, family environment and low socioeconomic conditions, low awareness of the central role of nutrition in the management of the disease, which leads to general noncompliance with prescribed diets, and insufficient time to provide nutritional recommendations in daily clinical practise (Rose et al., 2020 and Abdelsayed, 2015).The second issue is: how can we increase these patients' food intake? In the majority of instances, in accordance with the standard course of therapy, the physician offers patients with broad recommendations on liquid and food intake, supported by basic written materials. Interestingly, in the analyses, a considerably larger number of patients accepted the nutritional examination.

There is a need for close coordination between hepatologists and nutritionists since the dietary needs of patients with end-stage cirrhosis are very variable owing to the disease's consequences, including ascites, hepatic encephalopathy, renal failure, and diabetes. In fact, several of the measures required to control these issues might have a harmful influence on these patients' nutritional balance (Merli et al., 2013). Therefore, the dietary intervention should be adjusted to the particular patient's requirements.

Conclusion

Patients with cirrhosis have a very poor level of adherence to the worldwide dietary standards. In the context of a comprehensive examination of nutritional status, the daily food consumption of these patients should be evaluated as part of their treatment. In addition, any dietary intervention should be the outcome of a multidisciplinary approach comprising both hepatologists and nutritionists, and should be customised to the individual patient's requirements. Nutritional status evaluation is one of the initial steps in the assessment of liver cirrhosis patients. However, this is sometimes complicated because to the differing body compositions of men and women, the expense and accessibility of certain procedures, the absence of a defined assessment criteria, and the necessity for patients' involvement. This last element is necessary in certain assessments, but it cannot always be attained in people with impaired cognitive state. Despite the significance of dietary factors on the prognosis of a patient, this sector is often disregarded or treated only when malnutrition is blatantly apparent. To prevent the formation of further potential complications of liver cirrhosis, it would be important to care for patients as a member of a multidisciplinary team which comprises a professional dietician, as well as to address this aspect from the onset of the disease.

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