Original Research

NUTRITIONAL STATUS, DIETARY INTAKE AND NUTRITION IMPACT SYMPTOMS OF CIRRHOTIC PATIENTS

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ABSTRACT

Aims: To describe the nutritional status and nutrition regimen of patients with cirrhosis at the Gastroenterology Department of Military Hospital 103.

Methods: A cross-sectional study was conducted on 51 cirrhotic patients with mean age of 58 yrs. In all patients, dietary intake was assessed using the 24-h recall method and their nutritional status was identified by Subjective Global Assessment (SGA).

Results: Dietary energy and protein intake were 22.4±9.3 kcal/kg/day and 1.1±0.5 g/kg/day, respectively. Most of the patients did not meet the requirements for energy (78.4%), protein (45.1%), fiber (100%) and other micronutrients (vitamin A, vitamin B1-B2-B6, zinc, magnesium, calcium, phosphorus). The malnutrition rate based on SGA was 70.6%. The dietary energy and protein values of the malnourished group were significantly lower than those of the non-malnourished group. Common clinical symptoms affecting eating were fatigue, early satiety, anorexia, pain, and dry mouth.

Conclusions: The rate of malnutrition in patients with cirrhosis was high and symptoms affecting digestion were common. The dietary intake of most patients did not meet the needs of energy, protein, fiber and some other micronutrients.

Keywords: *cirrhosis, dietary intake, nutrition impact symptoms, malnutrition.*

I. INTRODUCTION

Cirrhosis is one of the final consequences of liver diseases, a condition in which liver cells are damaged continuously for a long time. Cirrhosis is a leading cause of mortality and morbidity worldwide as it is the 11th leading cause of death and 15th leading cause of morbidity in 2016 [1]. Cirrhosis tends to increase in Vietnam, but exact data are limited. According to the Institute for Health Metrics and Evaluation in Vietnam, cirrhosis is the 7th cause of death and disability with an increase of 47.3% in 2019 compared to 2009. Malnutrition is one of the complications and burden in cirrhotic patients [2]. Various causes of malnutrition in patients with cirrhosis include poor diet, decreased protein synthesis, increased metabolism and malabsorption, and increased intestinal protein excretion. Hospitalization and mortality rates are higher in malnourished cirrhotic patients in comparison to well-nourished patients [3].

At Military Hospital 103, in recent years, the number of inpatients treated for cirrhosis has been increasing. In addition to specialized treatment, patients receive nutritional care according to the medical process. Patients admitted to the hospital are screened and their nutritional status is assessed using the Subjective Global Assessment (SGA) tool. Then they are provided with an appropriately nutrition regimen according to their pathology diagnosis.

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Nutrition impact symptoms (NIS) in patients with cirrhosis (e.g., constipation, fatigue, anorexia, nausea, and vomiting) cause the impediments to adequate food intake. Assessing the actual dietary intake will help clinicians find the nutritional gap compared to the recommended needs, thereby making appropriate nutritional indications.

Therefore, the study was conducted to describe the nutritional status and dietary intake of cirrhotic patients at Military Hospital 103 in Viet Nam.

II. METHODS

2.1. Study design and sample selection

A cross-sectional study was conducted with convenience sampling of all cirrhotic inpatients satisfying the selection criteria at the Department of Gastroenterology, Military Hospital 103. As a result, 51 inpatients were recruited in the study.

∗ ***Diagnostic criteria***

Patients are diagnosed with cirrhosis when they have all 3 syndromes: (1) liver dysfunction syndrome, (2) portal hypertension syndrome and (3) morphological hepatic alteration syndrome. When the criteria to confirm the syndrome of liver function failure and portal hypertension syndrome in clinical and subclinical (Child-Pugh A cirrhosis) were not met, the patient is still diagnosed with cirrhosis if there is F on fibroscan.

∗ ***Selection criteria***

Patients over 18 years old, diagnosed with cirrhosis with sufficient records, medical records and voluntarily participated in the study.

∗ ***Exclusion criteria***

Patients were excluded from the study if they had severe acute illnesses (such as coma, gastrointestinal bleeding due to esophageal varices, severe infections, and fever), cancerous complications on the background of cirrhosis, and incomplete medical records

2.2. Data collection

To control systematic bias (anthropometric measurements and recall errors), the researchers were well trained in the purpose of the investigation and the techniques of conducting an interview and measuring anthropometric data. Scale instruments were calibrated using balance, standard measure and recalibrated after each weighting. In addition, the questionnaires were designed simply and the contents were arranged logically and systematically, making it easy for the interviewees to understand and answer.

The information of the subjects was collected through medical records and through direct questioning of patients. They had a comprehensive clinical examination and history of associated diseases.

Dietary intake of each patient was assessed using the 24-h recall method. The patient and family members were asked about all the food and drinks consumed in 24 hours, in 3 days including 1 at the weekend and 2 on week days. Nutrient values were calculated based on the Vietnamese Food Composition Table 2016 [4]. The

collected data included dietary intake of energy, protein, vitamins (A, D, B1, B2, PP), zinc, magnesium, iron, calcium, and phosphorus.

Examination to detect nutrition impact symptoms (e.g., constipation fatigue, anorexia, nausea, vomiting...) and physical symptoms (liver dysfunction, portal hypertension syndrome, morphological hepatic alteration syndrome).

Patients were weighed in the early morning with an empty stomach immediately after admission and their weights were recorded in kilograms with accuracy of 0.1 kg. Heights were recorded in meters to the nearest 0.1 cm.

Patients with edema and ascites were calculated dry weight using the correction formula [5].

Blood was taken at about 6-8 AM, then blood tests were done within the first 6 hours from the time of blood collection, providing indicators such as peripheral blood count, hemoglobin, serum protein and albumin.

2.3. Standards for assessing nutritional status

Evaluation of the 24-hour diet: Energy and protein requirements based on the recommendations of The European Society for Clinical Nutrition and Metabolism (ESPEN) 2020 on nutrition in disease liver is 30-35 kcal/kg/day and 1.2-1.5g/kg/day [6] and Guideline of Hospital Diets from Vietnam Ministry of Health [7]; the need for micronutrients are based on the Recommended Dietary Allowances for Vietnamese people in 2016 [8].

Assessment of nutritional status by SGA, based on history of weight loss, history of dietary changes, digestive symptoms affecting diet and stress level of acquired disease, clinical examination of nutritional symptoms. Classification according to the degree of SGA-A, B, C [9].

Nutritional classification (Table 1) is based on biochemical and hematological tests according to cut-offs proposed by Thorsdottir [10] and Rossi [11].

Table 1. *Nutritional classification based on biochemical indicators*

Index	Normal	Mild malnutrition	Medium malnutrition	Severe malnutrition
Albumin (g/L)	35 – 52	30 – 35	25 – 29	< 25
Total protein (g/L)	60 – 80	< 60	-	-
Red blood cell (T/L)	4.2 – 5.4	3 – 4.2	2 – 3	< 2
Hemoglobin (g/L)	> 130	90 – 130	60 – 90	< 60
Lymphocytes (G/L)	> 2	1.2 – 2	0.8 – 1.2	< 0.8

2.4. Statistical analysis

Data were analyzed using SPSS 26.0 software. Mean and SD values were used for normally distributed variables, otherwise by median and interquartile range. Frequency and percentage (%) were used for categorical data. The criterion for determining statistical significance was $p < 0.05$.

2.5. Ethical consideration

The study was conducted only with the consent of the patients and they had the right to withdraw from the study for any reason. The study did not affect the patient's care and treatment. The patient did not have to pay any additional costs. The collected data were only used in research and in the diagnosis and treatment of patients. All patient information was kept confidential according to current regulations. The study was approved by the scientific council at Decision No. 2091 QD-HVQY.

III. RESULTS

3.1. Characteristics of the subjects

The average age of the patients was 58.4 ±11.1-year-old, ranging from 36 to 83 years old. The group aged 60 and over accounted for 45.1%. Median disease duration (interquartile range) was 24 (3-60) months. In 51 study subjects, the percentage of men accounted for the majority (92.2%).

Table 2. *Characteristics of research subjects (n=51)*

Causal factors	*n* (%)	Liver dysfunction	*n* (%)
Alcohol	27 (52.9)	Child-Pugh A	7 (13.7)
Hepatitis viruses (B, C)	13 (25.5)	Child-Pugh B	16 (31.4)
Alcohol and Hepatitis viruses (B, C)	7 (13.7)	Child-Pugh C	28 (54.9)
Others	4 (7.8)		

Table 2 shows the characteristics of the subjects. Among causes of cirrhosis, alcohol was at the highest rate (52.9%), followed by hepatitis viruses (25.5%). The majority of patients had severe liver dysfunction (54.9% Child-Pugh C). Child-Pugh B rate was 31.4%.

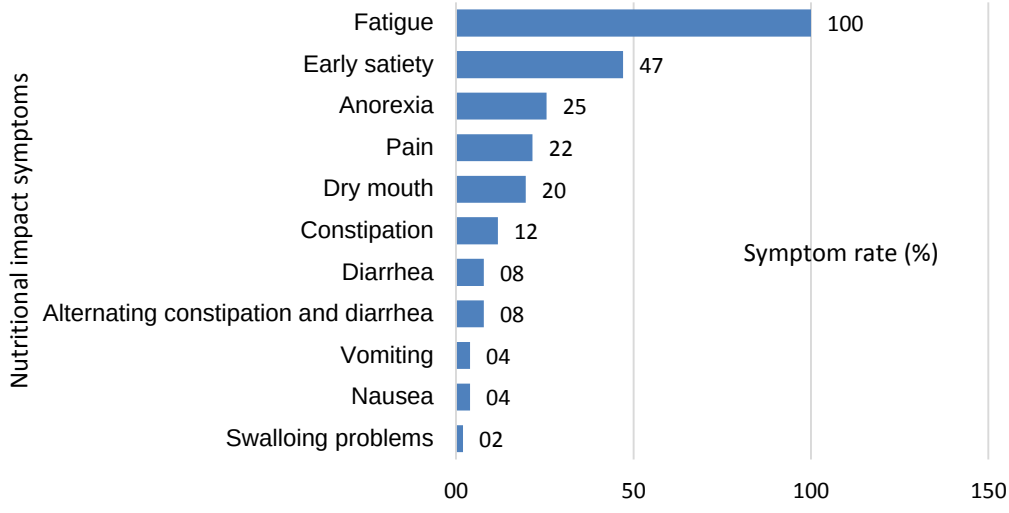

Figure 1. *Nutrition impact symptoms*

Figure 1 shows that the common clinical symptoms affected eating of patients were fatigue (100%), early satiety (47.1%), anorexia (25.5%), pain (21.6%), dry mouth (19.6%).

Table 3. *Characteristics of the 24-hour dietary intake of patients with cirrhosis*

Characteristic	Mean ±SD	Min	Max	RDAs	Under-achievement of RDA (*n*, %)
Energy (Kcal/day)	1329.1±547.4	189.0	2151.0	30	
DEI (Kcal/kg/day)	22.4 ± 9.3	2.9	38.2		40 (78.4)
Protein (g/day)	67.9 ± 30.8	8.3	116.5	1.2	
DPI (g/kg/day)	1.1± 0.5	0.1	1.9		23 (45.1)
Fiber (g)	4.8 ± 2.7	0.1	10.2	Male: 38 Female: 25	51 (100)
Vitamin C (mg)	111.1 ± 69.9	0.7	273.6	100	13 (25.5)
Vitamin B1 (mg)	0.8 ± 0.5	0	2.0	1.3	43 (84.3)
Vitamin B2 (mg)	0.9 ± 0.5	0.2	2.4	1.5	43 (84.3)
Vitamin B6 (mg)	0.6 ± 0.3	0	1.2		51 (100)
Vitamin A (mcg)	133.6 ± 82.3	5.1	420.3	650	51 (100)
Calcium (mg)	589.7 ± 203.0	194.2	1160.3	800	49 (96.1)
Phosphorus (mg)	1011.8±466.5	117.6	1882.6	700	12 (23.5)
Iron (mg)	9.5± 4.1	1.1	16.1	Male: 7.9 Female: 17.4	51 (100)
Potassium (mg)	1464.3±648.5	155.0	2646.5	> 3510	50 (98)
Magnesium (mg)	127.4 ± 65.5	12.0	288.7	Male: 340 Female: 270	45 (88.2)
Zinc (mg)	8.9± 3.8	1.5	18.9	Male: 10 Female: 8.4	9 (17.6)

RDAs, Recommended Dietary Allowances; DEI, Dietary Energy Intake; DPI, Dietary Protein Intake

*** Diet type with average biological value of iron (approximately 10% of iron is absorbed): When the diet has meat or fish from 30g - 90g/day or vitamin C from 25mg - 75mg/day.*

**** Moderate absorption: mean biological value of zinc = 30% (moderate intake animal or fish protein: molecular phytate-zinc ratio is 5 : 15)*

In Table 3, dietary energy and protein intake were 22.4 ± 9.3 kcal/kg/day and 1.1±0.5 g/kg/day, respectively. Most of the patient's dietary intake did not meet the needs of energy (78.4%), protein (45.1%), fiber (100%), as well as other substances such as vitamin A (100%), vitamin B1 (84.3%), magnesium (88.2%), calcium (96.1%), phosphorus (23.5%), and zinc (17.6%).

3.3. Nutritional status of patients with cirrhosis

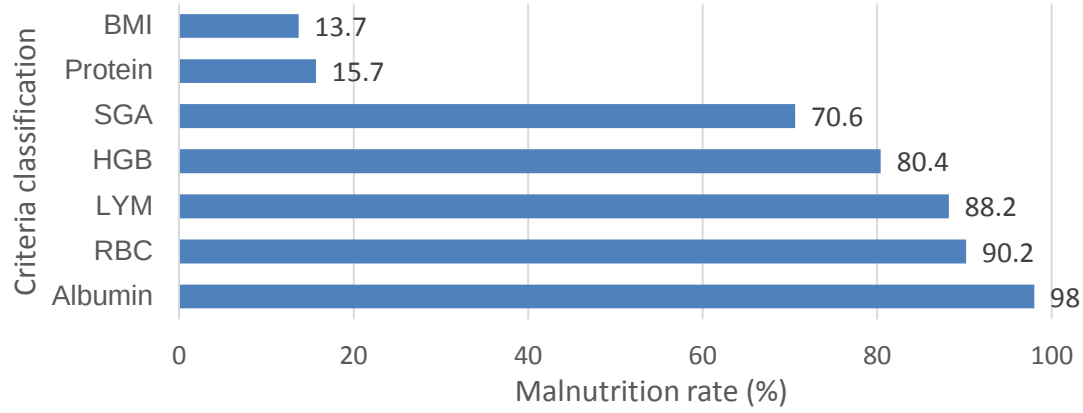

Figure 2. *Classification of malnutrition according different criteria in patients with cirrhosis.*
RBC, Red blood cell; LYM, Lympho blood cell; HGB, Hemoglobin;
SGA: Subjective Global Assessment; BMI, Body mass index

Figure 2 shows malnutrition rates according to different criteria in the patients. The highest rate of malnutrition was found by albumin level (98%), followed by blood cells (90.2%), lymphocytes (88.2%), and hemoglobin (80.4%). The overall rate of undernutrition according to the SGA (70.6%) was higher than that by BMI and protein level.

3.4. Dietary intake according to nutritional status

Table 4. *Dietary value of cirrhotic patients by SGA classification*

Dietary value	SGA A (*n*=15)	SGA B-C (*n*=36)	*p-value*
24-h calory, Kcal, Mean (SD)	1678.1 (230.4)	1183.7 (576.9)	0.002*
Kcal/kg, Mean (SD)	27.5 (4.8)	20.3 (10.0)	0.01*
Target-calory response (*n*, %)	5 (33.3)	6 (16.7)	0.264**
Protein 24h, g, Mean (SD)	85.1 (13.4)	61.7 (31.9)	0.009*
Protein/kg, g/kg, Mean (SD)	1.4 (0.2)	1.1 (0.6)	0.031*
Target-protein response (*n*, %)	14 (93.3)	18 (50.0)	0.004**
Fiber, g, Mean (SD)	5.3 (2.7)	4.5 (2.8)	0.377*

**Comparison of two group means by the one-way analysis of variance (ANOVA)*
***Pearson Chi-Square with Fisher's Exact Sig. (2-sided)*

Table 4 shows that nutritional value of dietary protein of the malnourished group (SGA B-C) was lower than that of the non-malnourished group (SGA-A) ($p<0.05$). There was no statistically significant difference in target-calory achievement and dietary fiber intake of the patients.

IV. DISCUSSION

4.1. General characteristics of study subjects

The mean age of the study subjects was 58.4±11.1, ranging from 36 to 83 years old. The group under 40 years old accounted for 3.9%, the group from 40 to 59 years old accounted for 51%, the group aged 60 and over accounted for 45.1%. In 51 research subjects, the percentage of men accounted for the majority (92.2%). This is probably a characteristic of the fact that men are more likely to use alcohol, one of the important risk factors for cirrhosis. The majority of cirrhosis patients are middle-aged men.

There are many causes associated with cirrhosis but alcohol and hepatitis virus infection (hepatitis B, C virus) are the two main causal factors. In this study, 66.6% of the causes of cirrhosis were related to alcohol (52.9% due to alcohol alone and 13.7% associated with alcohol and virus), while hepatitis B and C virus infections were only found in 39.2% of patients. This result is consistent with the results of many recent domestic studies such as the study of Duong Quang Huy (2015) which found that alcohol-related cirrhosis is more than hepatitis virus cirrhosis (62.4% *vs*. 35.9%) [12]. Thus, alcohol is gradually becoming the dominant cause of cirrhosis, which requires the promotion of education and communication as well as stronger sanctions to limit the abuse of alcohol and beer.

Using the Child-Pugh scale to classify the degree of cirrhosis, the rate of patients with Child-Pugh A, B, C, cirrhosis was 14%, 31% and 55%, respectively. These data had less Child's class B (31% vs 53%) and more (55% vs 36%) Child's class C cirrhosis in comparison to Mahashi (2015) [3].

In studies on cirrhosis, the degree of cirrhosis according to the Child-Pugh scale often has different rates depending on the study objectives to select patients as well as the treatment tolerance characteristics of each research facility. But in general, inpatient cirrhosis had a high rate of moderate and severe disorders.

4.2. Characteristics of the 24-hour dietary intake

In the study, the average energy intake by weight was 22.4kcal/kg/day, lower than the ESPEN 2019 recommendation of 30-35kcal/kg/day [6]. Especially, they are sick people who can barely eat anything. The rate of not meeting the recommended energy and protein requirements in the study group was very high (78.4% and 45.1%). This rate is lower than the study at the National Hospital of Tropical Diseases in 2020-2021 with the rate of under-achievement for the recommended energy and protein requirements of 86.7% and 82.5% [13].

Vitamin deficiencies in liver disease are associated with liver dysfunction, reduced reserves, disease severity, inadequate dietary intake, and malabsorption. Deficiency of fat-soluble vitamins (A, D, E, K) is common in patients with liver disease because the liver is the main organ that produces and excretes bile. On the contrary, some substances if being consumed in excess for a long time can cause liver damage such as vitamin A, iron. Therefore, a balanced diet of nutrients in patients with liver disease is important to avoid

the risk of micronutrient deficiencies or excesses in liver disease. In this study, due to the lack of energy in the diet, the result was that most of the patients did not meet the requirements for vitamins and minerals. Especially, 100% of the patients did not meet the requirements for fiber, vitamin B6, vitamin A, and iron in dietary.

Assessing the 24-hour diet is important in assessing the patient's nutritional status. In addition, this is also the basis for clinicians in nutritional interventions. As recommended by ESPEN, the primary goals of nutritional interventions are to provide adequate protein (1.2–1.5g/kg/day) and ensure adequate energy intake (total energy 35 kcal/kg/day); (1.3 × resting energy expenditure) [6]. For patients who do not meet the recommended intake, nutritional counseling alone or in combination with oral nutritional supplementation (ONS) is an effective first-line intervention. Enteral nutrition (EN) using a standard whole protein formula should be provided when patients with cirrhosis are unable to meet nutritional requirements from normal food despite nutritional counseling. In some cases, a nutritional product containing branched-chain amino acids (BCAA) may be prescribed specifically for patients with impaired liver function. Parenteral nutrition (PN) is a valuable second-line option and must be initiated immediately when moderately or severely malnourished cirrhotic patients cannot receive adequate oral or parenteral nutrition [6].

4.3. Nutritional status of the study group

Symptoms affecting digestion

People with cirrhosis can reduce their food intake for many reasons. According to a study by Catarina Lindqvist on symptoms that can affect nutritional status (Nutrition Impact Symptom-NIS) in patients with chronic liver disease), 90% of patients had one NIS or more, 51% had four NISs or more. The most common symptoms were dry mouth (61%), abdominal pain (58%), diarrhea (45%) and nausea (41%) [14]. Our study showed that the most common symptoms affecting digestion in the last 2 weeks were fatigue (100%), early feeling of fullness (47.1%), anorexia (25.5%), pain (21.6%), dry mouth (19.6%). It is these digestive symptoms affecting eating and drinking that directly lead to nutritional deficiencies, causing weight loss and wasting of the patients. Early detection and proper assessment of these symptoms will be helpful for doctors to improve symptoms, to help patients get enough energy to achieve nutrition goals, and improve treatment efficiency.

Nutritional status based on indicators and assessment tools

The rate of malnutrition according to Albumin in this study was 92.2%, higher than that of Hoang Trong Tiep (2010) (84.42%) [15]. Data from this study showed that 100% of patients with Child-Pugh B and C cirrhosis had albumin test below 35g/L. Serum albumin concentration is one of the commonly used indicators to assess the body's visceral protein reserves. The liver is the only organ that synthesizes albumin. In cirrhotic patients, albumin levels often decrease with disease progression due to impaired liver function and nutritional deficiencies. Therefore, the more severe the liver

dysfunction, the lower the serum albumin concentration.

The rate of malnutrition according to blood protein in this study was 15.7%, higher than the study result of Hoang Trong Tiep (2010) [15] and lower than the study of Nguyen Ngoc Hanh (2014) (28.6%) [16].

Albumin and protein levels are affected by many factors other than malnutrition (inflammation, impaired liver function, renal protein loss in nephrotic syndrome, intestinal loss, etc.). Evaluation of nutritional status based on erythrocytes, hemoglobin, and lymphocytes also can be affected by circulating fluid volume and inflammation. Because of their lack of clinical specificity, they should not be considered as markers of nutritional status in cirrhotic patients.

In fact, in clinical practice, it is necessary to test Albumin below 25g to have an indication for Parenteral nutrition (PN). Thus, in the ONS intervention, priority should be given to ingredients containing branched-chain amino acids (BCAAs): leucine, isoleucine, valine because these groups of nutrients are well tolerated in patients with liver failure, participating in early important energy metabolism. In studies of ONS for patients with cirrhosis, Aminoleban can improve nutrition, improve Child-pugh score and increase survival rate of cirrhosis patients according to Nguyen Ngoc Hanh (2014) [16] and Hanai (2020) [17]. Aminoleban is a complete nutritional product with 5 groups of nutrients (carbohydrates, proteins, fats, vitamins and minerals), of which 25% of energy comes from protein, especially with branched-chain amino acids (BCAA) accounting for 45 % should be very suitable for patients with liver failure. Patients should take 1 pack at 10pm, before going to bed or take 1 pack during the day [18].

SGA is a highly reliable method widely used in hospitals. In this study, the rate of malnutrition according to SGA of the study group was 70.6%, lower than in the study of Hoang Trong Tiep when studying on patients with Child-pugh B, C cirrhosis was 82.83% [16]. SGA method to detect cirrhotic patients with nutritional problems is better than BMI because SGA is not only based on the patient's anthropometry but also due to the process of weight loss, diet reduction and some clinical symptoms. Thus, although SGA was developed very early, it is still valid and has been proposed by ESPEN to assess nutritional status for many different diseases, including cirrhosis [6].

V. CONCLUSION

The study on 51 cirrhotic inpatients at the Military Hospital 103 shows that the dietary energy and protein intake were below the ESPEN 2019 recommendations and Guideline of Hospital Diets from Vietnam Ministry of Health. Nearly a half of patient can approach the protein target but most of them could not meet needs of calories, protein, and fiber as well as other micronutrients. The rate of malnutrition and nutrition impact symptoms were high in cirrhotic patients.

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