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assessment of patients with chronic liver diseases

Contribución de la dinamometría y la evaluación global del Royal Free Hospital en la evaluación nutricional de la enfermedad hepática crónica

Contribution of dynamometry and the Royal Free Hospital global assessment to the nutritional assessment of patients with chronic liver diseases

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ABSTRACT

Protein-calorie malnutrition (PCM) is a prognostic factor increasing complications and mortality in chronic liver diseases. Objectives: To quantify the dietary intake and compare different methods of nutritional assessment in patients with chronic liver diseases. Ninety seven outpatients of Hospital de Clínicas de Porto Alegre, with chronic hepatits (CH) and cirrhosis (CIR), were assessed from April 2009 to January 2010. The CH patients presented higher calorie and protein intake (p<0.05) than the CIR patients. Malnutrition prevalence in CH and CIR groups by the Royal Free Hospital-Global Assessment (RFH) was 51.2 vs 84%, Hand Grip Strength 61 vs 82.1%, Subjective Global Assessment 14.6 vs 32.1%, Adductor Pollices Muscle 7.3 vs 14.3%, Arm Muscle Circumference 4.9 vs 14.3% and Body Mass Index 2.4 vs 3.6% (p<0.05), respectively. HGS and RFH were the best methods to identify malnutrition and present concordance with each other. Key-words: Nutritional assessment, liver disease, handgrip strength, eating.

INTRODUCTION

Protein-calorie malnutrition (PCM) is frequently found in patients with chronic liver diseases (1-3), increasing hepatic disease, and vice versa (4-8). Today, the nutritional status is considered a prognostic factor in patients with cirrhosis (9), increasing complications, hospitalization period and mortality (10,11). The prevalence of malnutrition in patients with chronic liver diseases ranges between 10% to 100% (4-7,12), suggesting that different methods of nutritional assessment can lead to distinct results. Even in patients with compensated cirrhosis (Child-Pugh A), the prevalence of malnutrition may be high (between 40% (13) and 68% (1). However, some studies have shown the diagnosis of malnutrition is still deficient in most cases (14). The cause of malnutrition in patients with liver diseases is multifactor, especially due to alterations in the dietary intake and deficient nutrient digestion and absorption (15,16).

The nutritional assessment in adults with chronic liver diseases has been the focus of several recent studies (4,14,17,18). Different methods may be used in the nutritional assessment in this patients, such as nutritional anamnesis, dietary intake analisys, subjective global assessment, anthropometry, biochemical and immunological methods, composite indexes, such as the global assessment proposed by the Royal Free Hospital, and functional tests, such as dynamometry (14,15,17). In fact, the definition of nutritional diagnosis, despite the various methods available in end-stage liver diseases is still controversial (19,20). Reduced dietary intake is frequent and one of the main causes of malnutrition in patients with liver diseases; therefore, the early detection of malnutrition is crucial to proper nutritional guidance to these patients. For this reason, studies on this area still necessary.

OBJECTIVES

The purpose of this study was to quantify the dietary intake and compare different nutritional assessment methods

of adults with chronic liver diseases, cirrhotic or non-cirrhotic patients.

SUBJECTS AND METHODS

This is a cross-sectional study, conducted in a single center, between April 2009 and January 2010, with outpatients of the Gastroenterology Service of Hospital de Clínicas de Porto Alegre (HCPA), Brazil. The patients were included in the study after signed the informed consent term approved by the Research Ethics Committee of the Research and Postgraduate Program Group of HCPA (08-057/2008). The study analyzed 97 adult patients with chronic liver diseases, divided into two groups: a) chronic hepatitis without cirrhosis (CH) and b) cirrhosis (CIR). The patients in the first group had anatomopathological exams compatible with chronic hepatitis, with fibrosis analyzed through Metavir (21) system between F0 and F3, with no indication of nodules and no clinical and laboratorial signs that could suggest advanced fibrosis. The patients in the second group had cirrhosis, whose diagnosis was determined through anatomopathological exams or other clinical criteria (prolonged prothrombin time, hypoalbuminemia, thrombocytopenia, evidences of portal hypertension in abdominal echography and/or presence of gastric or esophageal varices in upper gastrointestinal endoscopy). The study excluded patients unable to feed themselves, patients without neuropsychological conditions to cooperate or with neuromuscular alterations in the upper limbs and patients with chronic kidney failure in renal replacement therapy and with hepatocellular carcinoma.

The severity of liver disease was assessed through Child-Pugh classification (22) and Model of end-stage liver disease (MELD) score (23).

Nutritional assessments were performed by an experienced nutritionist. The 24-hour dietary recall (R24h) was applied, which was later calculated in the program Epemed, São Paulo, Brazil, version 2.5. The values were compared to the proposed by the European Society for Clinical Nutrition and Metabolism (ESPEN) 2006 (35 Kcal/kg/day and 1.2 g protein/kg dry weight to CIR group and 30 Kcal/kg/day and 0.8 g protein/Kg actual weight to CH group) (24), and Dietary Reference Intakes.

Their nutritional status was evaluated for anthropometrical parameters: weight, height, arm circumference (AC), tricipital skin fold (TSF) and arm muscle circumference (AMC). The usual weight was obtained directly from the patient and the dry weight was estimated according to the water retention criteria (2 kg for mild ascites, 4 kg for moderate ascites and 8 kg for severe ascites) (25). The body mass index (BMI) was calculated and classified according to the cut-off points suggested to adults and elderly patients (26), using dry weight. The measurement of AC and TSF (Cescorf adipometer, of Porto Alegre) was performed following internationally accepted standards (27). The arm muscle circumference (AMC) was calculated using the formula: AMC = AC – (0.314 x TSF), and classified according to gender and age (27).

The subjective global assessment (SGA) was performed using the questionnaire proposed by Detsky et al. (28), based on the patients clinical history and physical examination, classifying them as well nourished (class A), moderate malnutrition (class B) or severe malnutrition (class C). The global nutritional assessment proposed by the Royal Free Hospital (RFH-GA) (17) was performed using a questionnaire with clinical questions, combined with the anthropometrical evaluation and dietary intake. Based on these parameters, the individuals were classified as well nourished, moderately malnourished or at nutritional risk and severely malnourished.

The measurement of non-dominant handgrip strength (HGS) was performed through dynamometry BASELINE (Smedley, New York, USA). Three measurements were performed and the highest value was used to classify the patient as nourished or malnourished (1). The measurement of adductor polices muscle (APM) thickness (Cescorf, of Porto Alegre) was performed three times at the imaginary triangle vertex, between the thumb extension and the index finger; the average was used as the APM value (29).

The statistical analysis was performed using SPSS 16.0 for Windows. The quantitative variables had their Gaussian distribution analyzed using the Kolmogorov-Smirnov test and were presented as mean values and standard deviation or median values and interquartile interval (25th and 75th percentiles).

The mean values were compared using the Student's t test for continuous variables with normal distribution and the Mann-Whitney test for continuous variables with asymmetrical distribution. The categorical variables were compared using the chi-square test or Fisher's exact test, when required. The correlation between the nutritional assessment methods was evaluated through Kappa coefficient. The significance level was 5%.

RESULTS

The study analyzed 97 adult patients, mean age of 52.8 ± 10.1 years (table 1). No significant difference was observed regarding age and gender between CH and CIR groups. The CH group had the virus of hepatitis C (VHC) etiology in all cases. The etiology of CIR group was secondary to VHC in 31 (55.4%) of the cases, followed by the association of VHC and alcohol in 13 (23.2%), alcohol in 10 (17.9%) and others in 02 (3.6%). The severity of liver disease in the CIR group, were 17 (30.4%) Child-Pugh A, 26 (46.4%) Child-Pugh B and 13 (23.2%) Child-Pugh C. Only 9 (14.3%) of the patients presented MELD score≥20. Ascites was found in 14 (26.4%) of the patients in this group. In the CH group 22 (53.6%) were in antiviral treatment. Figure 1 shows the nutritional status according to the methods and Child-Pugh scores.

Table 2 shows the prevalence of malnutrition, which was significantly higher in the CIR group when analyzed through RFH-GA, HGS and SGA. However, it was similar in both groups, when considering BMI, APM and AMC. The method with a higher prevalence of malnouritrition in the CIR group was RFH-GA (84%) and in the CH group was HGS (61%). No difference was observed in PCM in patients with chronic hepatitis, treated or not with antiviral drugs using all methods of nutritional assessment.

When comparing the nutritional assessment methods with each other using Kappa coefficients, a moderate concordance was observed between RFH-GA and HGS. SGA presented a weak concordance with APM, just like BMI, also with a weak correlation with AMC. The other methods did not show any concordance each other or HGS (table 3).

A significant association was observed between the severity of disease (Child-Pugh score) and the worst nutritional status classified through SGA and APM (p<0,05). No association was observed between MELD score and the nutritional assessment methods employed in the study.

Table 4 shows the mean intake of energy, protein, carbohydrate, lipid and micronutrients of both groups. The energy intake was inadequate in 21 (51.2%) of the CH group and 44 (78.6%) of the CIR group. The protein intake was insufficient in 14 (34.1%) of the CH group and 50 (89.2%) of the CIR group

(p<0.05). The CH group presented a significantly higher energy intake (kcal/kg/day) when compared to the CIR group. The protein intake (total and g/kg/day) was also different in both groups. The protein intake of <0.6g/kg/day was observed in 10 (24.4%) and 20 (35.7%) of CH and CIR groups, respectively.

The mean intake of micronutrients – calcium, phosphorus, iron and zinc – in both groups did not reach the minimum nutritional recommendations; in the CIR group, the intake of phosphorus and zinc was significantly lower (Table 4). A high prevalence of inadequate zinc and iron intake was found in both groups. The zinc intake of <10 mg/day was found in 30 (73.1%) of the patients in the CH group and in 49 (87.5%) of the patients in the CIR group. The iron intake of <10mg/day was 20 (48.8%) and 30 (53.6%) in patients of CH and CIR groups, respectively.

No significant difference was observed between the

TABLE 1

General features of chronic liver disease patients in groups (CH) and cirrhosis (CIR).

Features	CH group n=41	CIR group n=56
Age (years) - (X±dp)	51.7±10.4	53.6±9.2
sex- n(%)		
Male	23 (56.1)	37 (66.1)
Female	18 (43.9)	19 (33.9)
Etiology – n(%)		
VHC	41 (100)	31 (55.4)
VHC and alcohol	-	13 (23.2)
alcohol	-	10 (17.9)
Others	-	2 (3.5)
Child - Pugh n(%)		
A	-	17 (30.4)
B	-	26 (46.4)
C	-	13 (23.2)
MELD - n(%)		
<20	-	48(84.2)
≥ 20	-	9(14.3)

HCV: Hepatitis C virus; CIR: cirrhosis group; CH: chronic hepatitis

FIGURE 1

Association of different methods of nutritional assessment with the Child-Pugh score in patients CIR group (n = 56)
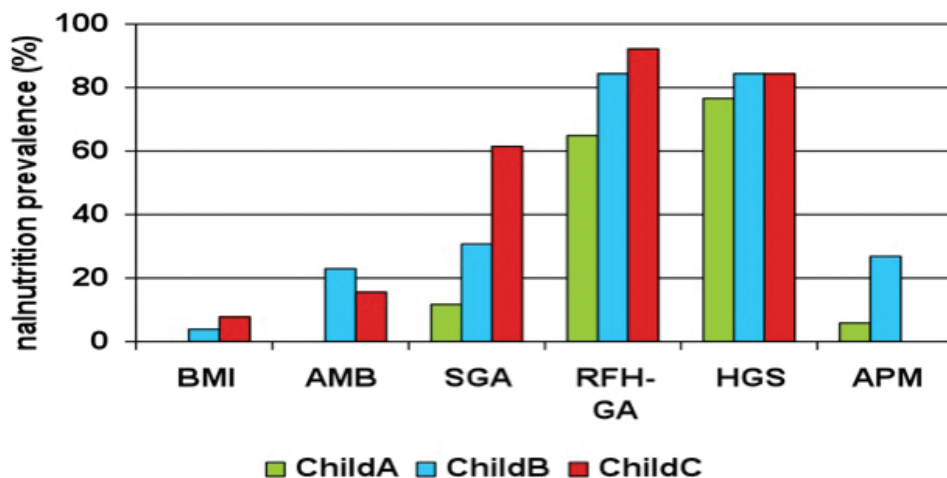
disease severity by Child-Pugh classification and MELD score and the calorie-protein intake in the CIR group. However, a significant association was obtained between the inadequate calorie intake and the worst nutritional status classified through RFH-GA (p<0.0001), in both groups. An association was observed between HGS and inadequate energy intake (p<0.001) and inadequate protein intake (p<0.05), only in the CIR group. The other methods – BMI, AMC, SGA and AMP – did not show any association with the malnutrition diagnosis and inadequate energy and protein intake, in both CIR and CH groups.

DISCUSSION

Although the use of R24h from a single day represents the individuals' current ingestion and not their habitual intake, repeating the questionnaire on more than one day is suggested. However, Ferreira et al.[8] did not find any difference between the dietary intake of patients with cirrhosis through the 24-hour and 3-day dietary recall methods. In assessments using R24h, higher food intake is usually reported, demonstrating an effect of inflated nutrient intake distribution[30]. For this reason, the measurements obtained in the study may be underestimated; an alarming fact when considering the inadequate intake presented by a large number of patients from both groups.

The inadequate food intake and the deficiency of nutrients have been associated with liver diseases (8,13). In this study, half the patients with chronic liver diseases without cirrhosis and most individuals with cirrhosis presented inadequate energy intake (lower than the minimum recommendation) (24), contributing to malnutrition in this population and confirming the description of other studies (8,18). Recently, the insufficient food intake was independently associated with the nutritional status in the pre-liver transplantation period and 90 days after that (18). Another study associated the insufficient intake with the nutritional status, the disease severity was considered a risk factor for mortality (4). This study observed a correlation between the food intake and the prevalence of malnutrition only through RGH-GA and HGS, reinforcing the association of malnutrition with reduced muscle function.

The protein intake below the recommended values in cirrhotic patients and patients with chronic hepatitis should be highlighted. Regarding the patients with hepatitis, this is an unprecedented finding. For cirrhotic patients, it agrees with some studies8, but disagrees with others, where the protein intake was closer to the ideal value (4,12,18). If one fasting night in cirrhotic patients is comparable to 3 fasting days in healthy individuals31, it demonstrates the importance of an adequate energy-protein intake of individuals with liver diseases and emphasizes the potential harmful effect of the findings obtained with this study.

Dietary restrictions commonly recommended to cirrhotic patients, such as sodium, protein and liquid restrictions, may affect the adequate food intake and worsen these patients' clinical conditions (32). Ferreira (8) analyzed the type of nutritional guidance received by the patients with liver diseases and observed that 71.7% of them were prescribed food reduction

TABLE 2

Prevalence of malnutrition in chronic hepatitis and cirrhosis groups according to different diagnostic methods.

Diagnosis methods	Group CH (n=44) n (%)	Group CIR (n=56) n (%)	P
RFH-GA	21 (51.2)	47 (84.0)	<0.001
HGS	25 (61.0)	46 (82.1)	0.02
SGA	06 (14.6)	18 (32.1)	0.048
APM	03 (7.3)	08 (14.3)	0.287
AMB	02 (4.9)	08 (14.3)	0.09
BMI	01 (2.4)	02 (3.6)	0.306

CIR: cirrhosis group; CH: chronic hepatitis; SGA: Subjective Global Assessment, AMB: Arm muscle circumference, RFH-GA: Royal Free Hospital global assessment, BMI: body mass index, APM: adductor pollicis muscle; HGS non-dominant handgrip strength.

TABLE 3

Concordance between the different diagnostic methods.

Concordance Kappa	SGA	AMB	BMI	APM	RFH-GA	HGS
SGA	1	-	-	-	-	-
AMB	0.177	1	-	-	-	-
BMI	0.099	0.273	1	-	-	-
APM	0.222	0.092	0.099	1	-	-
RFH-GA	0.198	0.031	-0.001	0.017	1	-
HGS	0.115	0.051	0.023	0.110	0.480	1

CIR: cirrhosis group; CH: chronic hepatitis; SGA: Subjective Global Assessment, AMB: Arm muscle circumference, RFH-GA: Royal Free Hospital global assessment, BMI: body mass index, APM: adductor pollicis muscle; HGS non-dominant handgrip strength.

or elimination (sodium: 76.3%, animal protein: 27.2%, red meat: 28% and fat: 49.1%).

The VHC has shown to cause systemic inflammatory alterations and changes in the profile of adipokines, with increased leptin and reduced adiponectin, which causes reduced food intake, weight loss and energy expenditure alteration (33). Another fact that contributes to inadequate food intake are zinc-deficient diets. In this study, we observed a high prevalence of patients with inadequate zinc intake, not only in the group of cirrhotic patients, but also in the group of patients with chronic hepatitis (>70% of the patients). In both groups, the intake of iron, calcium, phosphorus and potassium did not reach the minimum nutritional recommendations and, as the association of these nutrients with the development of complications and diseases, such as osteoporosis, hypokalemia and anemia are largely known, this fact should be deeply considered.

It is impossible to confirm whether these factors contributed or not, based on the results of this study. However, 53.6% of the patients with chronic hepatitis of this study were in antiviral treatment. The antiviral treatment with com pegylated interferon and ribavirin might have influenced the results, as some of the side effects of this treatment may alter nutrient intake and absorption. Although medications influence food intake negatively, this study observed that malnutrition and reduced food intake are similar in individuals treated or not with antiviral drugs. Studies with a larger number of patients are required to confirm these findings.

The RFH-GA, HGS and SGA testes detected higher levels of PCM, with a significant difference between the groups of chronic hepatitis and cirrhosis, while the AMC, APM and BMI tests presented a poor performance, without any difference between the groups.

The nutritional assessment of patients with liver diseases is complex. Parameters widely used in other pathologies are not really useful in this population, such as the BMI. In fact, in this study, when using the BMI, 37% of the cirrhotic patients were well nourished and more than 60% were overweight or obese, which is attributed to water retention (8,12,14). This method underestimates the malnutrition diagnosis in cirrhotic patients and should not be used in this population.

Just like the BMI, the proportion of malnourished patients analyzed through AMC and APM was small and differed statistically from the other methods (SGA, HGS and RFH-GA). The AMC is also influenced by water retention (35). APM is a method that could be promising in cirrhotic patients, especially in those with HS, as it does not require the individual's help, but it also reached inferior results when compared to SGA, HGS and RFH-GA. Muscle function alteration occurs before anatomical depletion, which may explain the results obtained through APM (29).

The SGA is widely used in patients with liver diseases (1,4,8,12) showing good performance, but, in this study, it provided inferior results when compared to RFH-GA and HGS. These findings agree with previous studies1 that compared SGA and HGS. In this study, as well as in others (12), the SGA was associated with the disease severity through Child-Pugh score, demonstrating that, the higher the liver disease severity, the higher the PCM prevalence. However, no association was observed between MELD score and the several nutritional assessment methods employed in this study, possibly because the patients had severe liver disease, but with low appreciable risk for three months through this score.

Again HGS presented the higher PCM diagnosis in patients with liver diseases (1,14); it detected 61.0% and 82.1% of malnutrition in CH and CIR groups, respectively, which reflects its ability to diagnose malnutrition in individuals without other clinical evidences. An interesting finding was the recently described significant association between reduced muscle function measured through dynamometry and muscle depletion evaluated through the method of neuron activation analysis (13). This method is considered by many as the nutritional assessment standard9, which reinforces the findings of this study.

The correlation between RFH-GA and HGS is an unprecedented, but logical, fact, as the reduced intake (assessed through RFH-GA) (17) is associated with reduced body protein mass and should soon affect muscle function (assessed through HGS). These findings are even more meaningful when considering other studies that showed a correlation of cirrhotic

TABLE 4

Nutrient intake among groups CH and CIR.

Nutrients	CH Group (n=41) X±dp	CIR Group (n=56) X±dp	p
Energy (Kcal/day)	1778.29 ± 862.25	1504.09 ± 478.07	0.710
Energy (Kcal/kg/day)	25.24 ± 10.84	21.08 ± 7.55	0.039
Carbohydrate (g)	232.45 ± 117.15	226.80 ± 91.68	0.798
Protein (g)	76.79 ± 43.15	55.80 ±20.60	0.006
Protein (g/kg)	1.09 ± 0.58	0.78 ± 0.30	0.003
Lipid (g)	62.57 ± 32.31	44.57 ± 20.88	0.003
Calcium (mg)	554.57 ± 336.80	543.78 ± 306.62	0.872
Phosphorus (mg)	538.99 ± 337.26	361.25 ± 209.29	0.004
Iron (mg)	12.77 ± 7.79	10.73 ± 4.70	0.142
Sodium (mg)	1938.67 ± 1244.46	1818.11 ± 1025.73	0.614
Potassium (mg)	1362.08 ± 796.12	958.13 ± 515.38	0.006
Zinc (mg)	8.2 ± 5.63	5.89 ± 3.42	0.022

CIR: cirrhosis group; CH: chronic hepatitis.

malnourished patients with the worst prognosis, both through HGS (1) and RFH-GA (5,17). It should be noted that the HGS convenience seems to be higher than that of RFH-GA.

CONCLUSIONS

Energy-protein intake was inadequate in patients with chronic liver diseases, either cirrhotic or non-cirrhotic patients, with a significant correlation between intake and handgrip strength and the Royal Free Hospital global assessment. In addition, both methods presented a concordance with each other in the assessment of malnutrition.

RESUMEN

La malnutrición se asocia con un peor pronóstico y morta-lidad en pacientes con enfermedades crónicas del hígado. Obje-tivos: Cuantificar la ingesta alimentaria, y comparar diferentes métodos de evaluación nutricional en pacientes con hepatitis y cirrosis. Fueran estudiados 97 pacientes del ambulatorio del Hospital de Clínicas de Porto Alegre con hepatitis crónica (HC) y cirrosis (CIR), desde abril 2009 hasta enero 2010. Los pacientes con HC presentaron mayor consumo de calorías y proteínas por kilogramo de peso corporal (p<0,05) que los pacientes del grupo CIR. La prevalencia de desnutrición en los grupos HC y CIR fué: Royal Free Hospital-global assessment (RFH) 51,2 vs 84%, hand grip streght (HGS) 61 vs 82,1%, evaluación subjetiva global 14,6 vs 32,1%, músculo aductor del pulgar 7,3 vs 14,3%, circunferencia muscular del brazo 4,9 vs 14,3% y el indice de masa corporal 2,4 vs 3,6% (p<0,05). HFH y HGS fueron los métodos que mejor evidenciaron la malnutrición habiendo concordancia entre ellos.

Palabras clave: enfermedades crónicas del hígado, ingesta alimentaria, dinamometría, evaluación nutricional.

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