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Nutritional assessment in hepatic cirrhosis; clinical, anthropometric, biochemical and hematological parameters

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Abstract

Introduction: **Since malnutrition is common in patients with hepatic cirrhosis (HC) is necessary to investigate the interference of the pathophysiological changes of liver in the methods of diagnosis of the nutritional status.**

Objective: **To evaluate the frequency of malnutrition among patients with HC outpatients, using different assessment methods of the nutritional state.**

Methods: **Nutritional state was determined by subjective global assessment (SGA); body mass index (BMI); percentage of ideal body weight (%BW); triceps skinfold thickness (%TST), mid-arm circumference (%MAC) and of the ideal mid-arm muscle circumference (%MAMC); serum albumin (ALB) and total lymphocyte count (TLC).**

Results: **Seventy-eight patients were evaluated, 56.4% were male and mean age were 53.0 ± 7.7 years. The HC etiology was alcoholic in 56.4% of the cases. According to the classification of Child-Pugh, 48.7% were A, 26.9% were B and 24.4% were C. Variable degrees of malnutrition were diagnosed in 61.5% (SGA), 16.7% (BMI), 17.9% (%BW), 93.6% (%TST), 62.8% (%MAC) and 38.5% (%MAMC) of the patients. The levels of ALB and TLC were compatible with malnutrition diagnosis in 43.6% and 69.2% of the patients, respectively. The frequency of diagnosis of malnutrition increased according to the severity of HC and it also increased in patients with alcoholic etiology. A greater depletion of adipose tissue in women and of muscular tissue in men was demonstrated.**

Conclusions: **The diagnostic frequency of malnutrition in ambulatory-treated patients varies according to the nutritional evaluation method used. The prevalence of malnutrition is greater in the more advanced stages of HC and in alcoholic etiology.**

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Key words: *Nutritional assessment. Hepatic cirrhosis. Protein-energy malnutrition. Alcoholism.*

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EVALUACIÓN NUTRICIONAL EN CIRROSIS HEPÁTICA; LOS PARÁMETROS CLÍNICOS, ANTROPOMÉTRICOS, BIOQUÍMICOS Y HEMATOLÓGICOS

Resumen

Introducción: **Desde la malnutrición es común en pacientes con cirrosis hepática (CH) es necesario investigar la interferencia de los cambios fisiopatológicos de hígado en los métodos de diagnóstico del estado nutricional.**

Objetivo: **Evaluar la frecuencia de desnutrición en los pacientes con CH ambulatoria, utilizando diferentes métodos de evaluación del estado nutricional.**

Métodos: **El estado nutricional se determinó mediante la valoración global subjetiva (VGS), índice de masa corporal (IMC), porcentaje de peso corporal ideal (% PCI), el pliegue del tríceps (% PT), circunferencia del brazo (% CB) y de la ideales mediados de circunferencia muscular del brazo (% CMB), albúmina de suero (ALB) y recuento total de linfocitos (RTL).**

Resultados: **Setenta y ocho pacientes fueron evaluados, el 56,4% eran varones y la edad media fue 53,0 ± 7,7 años. La etiología fue alcohólica CH en el 56,4% de los casos. De acuerdo con la clasificación de Child-Pugh, el 48,7% eran A, el 26,9% fueron el B y el 24,4% fueron C. Grados variables de desnutrición fueron diagnosticados en un 61,5% (VGS), 16,7% (IMC), 17,9% (% PCI), 93,6% (% PT), 62,8% (% CB) y 38,5% (CMB%) de los pacientes. Los niveles de ALB y RTL fueron compatibles con el diagnóstico de la desnutrición en 43,6% y 69,2% de los pacientes, respectivamente. La frecuencia de diagnóstico de la malnutrición aumenta de acuerdo con la gravedad de CH y también aumentó en los pacientes con etiología alcohólica. Una disminución mayor de tejido adiposo en las mujeres y de tejido muscular en los hombres fue demostrada.**

Conclusiones: **La frecuencia de diagnóstico de la malnutrición en ambulatorio de pacientes tratados varía de acuerdo con el método de evaluación nutricional utilizado. La prevalencia de desnutrición es mayor en las etapas más avanzadas de la CH y de etiología alcohólica.**

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Palabras clave: *Evaluación nutricional. Cirrosis hepática. Desnutrición proteico-energética. Alcoholismo.*

Abbreviations

BMI: Body mass index.
BW: Body weight.
CH-FUU: Clinical Hospital of the Federal University of Uberlândia.
HC: Hepatic cirrhosis.
MAMC: Mid-arm muscle circumference.
MAC: Mid-arm circumference.
PEM: Protein-energy malnutrition.
ALB: Serum albumin.
SGA: Subjective global assessment.
TST: Triceps skinfold thickness.
TLC: Total lymphocyte count.

Introduction

The liver exercises essential functions in food digestion and in the absorption, metabolism, storage, transport, activation and utilization of nutrients.[1] Compromising these functions in patients with hepatic cirrhosis (HC) can result in the development of protein-energy malnutrition (PEM).[2] Although PEM is not always diagnosed, it can be a frequent complication in patients with HC,[3] and its onset and/or severity increases with the progression of liver disfunction[3,4,5] mainly in situations of metabolic stress associated with the presence of infection and/or hospitalization.

There can be a deficiency in cellular and in humoral immunological responses in patients with PEM.[6] In HC patients this can contribute to the risk of infection, especially in the urinary tract, lung and peritoneum.[7,8] Undernourished patients also present a decrease in intestinal motility and in digestive enzyme syntheses, as well as intestinal mucosa atrophy,[9] delayed healing of wounds,[10] lower quality of life and lower rate of survival,[11] longer hospitalization periods and increased costs.[12]

The diagnosis of the nutritional state and the treatment of malnutrition in HC patients can contribute to a reduction in the frequency and/or severity of these complications.[13] However, the simple-application and low-cost methods, such as anthropometrics, which are generally available for the diagnosis of the nutritional state of HC patients are interfered by the pathophysiological alterations caused by hepatic insufficiency.[14] This means that the results arising from these methods have to be critically and criteriously examined. Few investigators have critically analyzed the results obtained in studies using clinical, anthropometric, biochemical and hematological methods for diagnosing the frequency of PEM in HC ambulatory-treated patients. There is also some controversy about the relation between the etiology of HC and the prevalence of PEM, i.e., the association between the greater frequency of PEM diagnosis and the alcoholic etiology of HC has been demonstrated by some[3] but not by other investigators.[4]

The aim of this present study was to assess, by the use of different assessment methods of the nutritional state, the frequency of PEM diagnosis in HC ambulatory-patients and to relate the diagnosis of PEM to the severity and to the etiology of the hepatic disease and to the gender of the patient.

Methods

This cross-sectional study was developed in the Clinical Hospital of the Federal University of Uberlândia (CH-FUU). The patients were consecutively enrolled in the order in which they arrived for medical appointments at the ambulatory. None of the female patients was pregnant or breast feeding and all the patients diagnosed with other chronic diseases, such as, diabetes mellitus; renal, cardiac or pancreatic insufficiency; neoplasia or acquired immunodeficiency syndrome were excluded.

Nutritional assessment was accomplished by using anthropometrical and clinical methods, as well as biochemical and hematological laboratory exams, which are available and can be routinely used for clinical practice in general hospitals in developing countries. Subjective global assessment (SGA) according to the proposition of Detsky et al.[15] was used. For anthropometric assessment the body weight, height, triceps skinfold thickness (TST), and mid-arm circumference (MAC), were measured. The serum albumin level was determined by using Roche Diagnostics GmbH kits, Mannheim, Germany, for Cobas Integra instruments. The total lymphocyte count (TLC) was accomplished by the use of Scatter Pak kits, Miami, Florida, USA, for Coulter STKS sets. These last two tests were accomplished in single performance at the laboratory for clinical analysis at CH-FUU

The following items were calculated: body mass index [BMI = weight/height^2 (kg/m^2)]; the percentage of ideal mid-arm muscle circumference (%MAMC) after the calculation of the mid-arm muscle circumference [$MAMC = MAC\ (cm) - \pi \times TST\ (cm)$], as well as the percentage of ideal body weight (%BW), of ideal triceps skinfold thickness (%TST) and of ideal mid-arm circumference (%MAC). For calculating the %BW reference standards proposed by Metropolitan Life Insurance Company[16] were used. For calculating the %TST, %MAC and %MAMC, reference standards proposed by Frisancho[17] were used. The nutritional state was classified according to the reference standards proposed by Blackburn and Harvey.[9]

The exact Fisher test or the chi-square test was used to compare the prevalence and the severity of PEM according to the severity and the etiology of the hepatic disease, and to the gender of the patients. $P < 0.05$ was considered significant.

This project was approved by the Ethics Committee for Research at the Federal University of Uberlândia and informed consent was obtained from all the participating patients.

Results

The nutritional state of 78 HC patients, attended at the gastroenterology ambulatory of the CH-FUU was assessed. Forty-four patients (56.4%) were male, with mean age (standard deviation) of 53.0 ± 7.7 years and variation from 38 to 74 years. The etiology of the HC was alcoholic in 44 (56.4%) patients, hepatitis C virus in 14 (17.9%), hepatitis B virus in 12 (15.4%), autoimmune in 2 (2.6%) and cryptogenic in 6 (7.7%). All of the alcoholic etiology HC patients had maintained alcohol abstinence for at least one year and this was confirmed by family members. According to the Child-Pugh classification,[18] 38 (48.7%) patients were Child-Pugh A, 21 (26.9%) Child-Pugh B, and 19 (24.4%) Child-Pugh C.

The frequency of the diagnosis of PEM in patients with HC varied according to the different methods of nutritional assessment that were used. According to SGA, of the 78 patients that were assessed, 48 (61.5%) had malnutrition diagnosis, of which 32 patients (41.0%) had moderate malnutrition and 16 patients (20.5%) had severe malnutrition.

According to the anthropometric methods that use body weight almost exclusively, the frequency of malnutrition diagnosis was less. By %BW and by BMI, malnutrition was diagnosed, respectively, in 14 (17.9%) and in 13 (16.7%) patients, of which four (5.1%) and nine (11.5%) patients had mild malnutrition; nine (11.5%) and two (2.6%) had moderate malnutrition; one (1.3%) and two (2.6%) had severe malnutrition.

Regarding the assessment of body composition according to the distribution of adipose tissue by %TST and of muscular tissue by %MAMC, malnutrition was demonstrated, respectively, in 73 (93.6%) and in 30 (38,5%) patients; it was mild in nine (11.5%) and in 13 (16.7%), moderate in 21 (27.0%) and in 12 (15.4%), and severe in 43 (55.1%) and in five (6.4%). By ALB and TLC, it was found that 34 (43.6%) and 54 (69.2%) patients presented results which were within the reference values proposed for the diagnosis of malnutrition[9], which was, respectively, mild in 15 (19.3%) and in 24 (30.8%), moderate in 10 (12.8%) and in 23 (29.5%), severe in nine (11.5%) and in seven (8.9%) (table I).

In relating the nutritional state of the patients to the severity of the hepatic dysfunction, a greater number of malnourished and of severely malnourished patients was observed by SGA, respectively, in Child-Pugh C (17/19, $P < 0.01$; 11/19, $P < 0.01$) and B (16/21, $P < 0.05$; 4/21, $P < 0.05$) than in A (15/38; 1/38). By %BW and BMI, a greater frequency of malnourished patients was respectively demonstrated in Child-Pugh C (9/19, $P < 0.01$ and 10/19, $P < 0.01$) and B (5/21, $P < 0.01$ and 3/21, $P < 0.05$) than in A (0/38 and 0/38). By %BW, a greater number of moderately malnourished patients was also observed in Child-Pugh C (6/19, $P < 0.01$) and B (3/21, $P < 0.05$) than in A (0/38). By BMI, a greater number of mildly malnourished patients was verified in Child-Pugh C (6/19, $P < 0.01$) and B (3/21, $P < 0.05$) than in A (0/38). By the %TST, it was demonstrated that the number of severely malnourished patients was greater ($P < 0.01$) among those classified as Child-Pugh C (15/19) than among those classified as A (16/38) (table II).

The determination of %MAC and of %MAMC demonstrated, respectively, a greater number of malnourished patients in Child-Pugh C (17/19, $P < 0.01$ and 15/19, $P < 0.01$) and B (16/21, $P < 0.05$ and 9/21, $P < 0.05$) than in A (16/38 and 6/38). It was also demonstrated by %MAC analysis that there was a greater frequency of severely malnourished patients in Child-Pugh C (10/19, $P < 0.01$) and B (4/21, $P < 0.05$) than in A (1/38). By %MAMC, a greater number ($P < 0.01$) of moderately and severely malnourished

Table I
Diagnosis of the nutritional state of ambulatory patients with hepatic cirrhosis

Methods	*Nutritional state*			
		Malnutrition		
	Eutrophic *n (%)*	*Mild* *n (%)*	*Moderate* *n (%)*	*Severe* *n (%)*
SGA	30 (38.5)	32 (41.0)		16 (20.5)
%BW	64 (82.1)	4 (5.1)	9 (11.5)	1 (1.3)
BMI	65 (83.3)	9 (11.5)	2 (2.6)	2 (2.6)
%TST	5 (6.4)	9 (11.5)	21 (27.0)	43 (55.1)
%MAC	29 (37.2)	16 (20.5)	18 (23.1)	15 (19.2)
%MAMC	48 (61.5)	13 (16.7)	12 (15.4)	5 (6.4)
ALB	44 (56.4)	15 (19.3)	10 (12.8)	9 (11.5)
TLC	24 (30.8)	24 (30.8)	23 (29.5)	7 (8.9)

n (%) = Number and percent of patients; SGA = Subjective global assessment; %BW = Percentage of ideal body weight; BMI = Body mass index; %TST = Percentage of ideal of triceps skinfold thickness; %MAC = Percentage of ideal of mid-arm circumference; %MAMC = Percentage of ideal of mid-arm muscle circumference; ALB = Serum albumin; TLC = Total lymphocyte count.

Table II
Diagnosis of malnutrition in ambulatory patients in accordance with the severity and the etiology of the hepatic cirrhosis (HC), and with the gender of the patients

Methods	Malnutrition	*Severity of hepatic insuficiency*			*Etiology of the HC*		*Gender*	
		Child-Pugh A n (%)	*Child-Pugh B n (%)*	*Child-Pugh C n (%)*	*Alcoholic n (%)*	*Non-alcoholic n (%)*	*Male n (%)*	*Female n (%)*
SGA	Moderate	14 (36,8)	12 (57,2)	6 (31,6)	21 (47,8)	11 (32,4)	18 (41,0)	14 (41,2)
	Severe	1 (2,6)[a,b]	4 (19,0)[a,c]	11 (57,9)[b,c]	13 (29,5)[h]	3 (8,8)[h]	5 (11,4)[m]	11 (32,4)[m]
%BW	Mild	0	2 (9,5)	2 (10,5)	4 (9,1)	0	1 (2,3)	3 (8,8)
	Moderate	0[a,b]	3 (14,3)[a]	6 (31,6)[b]	7 (16,0)	2 (5,9)	5 (11,4)	4 (11,8)
	Severe	0	0	1 (5,3)	1 (2,3)	0	1 (2,3)	0
BMI	Mild	0[a,b]	3 (14,3)[a]	6 (31,6)[b]	8 (18,2)[h]	1 (3,0)[h]	5 (11,3)	4 (11,6)
	Moderate	0	0	2 (10,5)	2 (4,5)	0	0	2 (6,0)
	Severe	0	0	2 (10,5)	1 (2,3)	1 (3,0)	1 (2,3)	1 (3,0)
%TST	Mild	6 (15,8)	3 (14,3)	0	2 (4,5)[i]	7 (20,6)[i]	6 (13,6)	3 (8,8)
	Moderate	11 (29,0)	6 (28,6)	4 (21,0)	11 (25,1)	10 (29,4)	17 (38,6)[o]	4 (11,8)[o]
	Severe	16 (42,1)[b]	12 (57,1)	15 (79,0)[b]	28 (63,6)	15 (44,0)	16 (36,4)[x]	27 (79,4)[x]
%MAC	Mild	8 (21,0)	7 (33,4)[d]	1 (5,3)[d]	10 (22,7)	6 (17,6)	8 (18,2)	8 (23,4)
	Moderate	7 (18,4)	5 (23,8)	6 (31,6)	10 (22,7)	8 (23,6)	11 (25,0)	7 (20,6)
	Severe	1 (2,6)[a,b]	4 (19,0)[a,c]	10 (52,6)[b,c]	12 (27,3)[h]	3 (8,8)[h]	15 (34,1)[o]	0[o]
%MAMC	Mild	5 (13,1)	5 (23,8)	3 (15,8)	10 (22,7)	3 (8,8)	9 (20,4)	4 (11,8)
	Moderate	1 (2,6)[b]	3 (14,3)	8 (42,2)[b]	8 (18,2)	4 (11,8)	11 (25,0)[o]	1 (3,0)[o]
	Severe	0[b]	1 (4,8)	4 (21,0)[b]	4 (9,1)	1 (3,0)	5 (11,4)	0
ALB	Mild	0[e]	15 (71,4)[e,f]	0[f]	9 (20,4)	6 (17,6)	6 (13,6)	9 (26,5)
	Moderate	0[b]	0[g]	10 (52,6)[b,g]	7 (16,0)	3 (8,8)	7 (16,0)	3 (8,8)
	Severe	0[b]	0[o]	9 (47,4)[b,g]	4 (9,1)	5 (14,8)	3 (6,8)	6 (17,7)
TLC	Mild	13 (34,2)	7 (33,4)	4 (21,0)	16 (36,4)	8 (23,5)	12 (27,3)	12 (35,3)
	Moderate	7 (18,4)	9 (42,8)	7 (36,8)	10 (22,7)	13 (38,3)	13 (29,5)	10 (29,4)
	Severe	0[b]	1 (4,8)[c]	6 (31,6)[b,c]	4 (9,1)	3 (8,8)	4 (9,1)	3 (8,8)

Fisher exact test or chi-square test.
[a]$p < 0.05$-B > A; [b]$p < 0.01$-C > A; [c]$p < 0.05$-C > B; [d]$p < 0.05$-B > C; [e]$p < 0.01$-B > A; [f]$p < 0.01$-B > C; [g]$p < 0.01$-C > B.
A = Child-Pugh A; B = Child-Pugh B; C = Child-Pugh C.
[h]$p < 0.05$ - alcoholic > non-alcoholic; [i]$p < 0.05$ – non-alcoholic > alcoholic.
[m]$p < 0.05$ - female > male; [o]$p < 0.01$ - male > female; [p]$p < 0.01$ - female > male.
n (%) = Number and percent of patients; SGA = Subjective global assessment; %BW = Percentage of ideal body weight; BMI = Body mass index; %TST = Percentage of ideal of triceps skinfold thickness; %MAC = Percentage of ideal of mid-arm circumference; %MAMC = Percentage of ideal of mid-arm muscle circumference; ALB = Serum albumin; TLC = Total lymphocyte count.

patients was observed in Child-Pugh C (8/19 and 4/19) than in A (1/38 and 0/38) (table II).

Analysis of ALB results showed a greater number ($P < 0.01$) of malnourished patients in Child-Pugh C (19/19) and B (15/21) than in A (0/38) and it was also shown that there was a greater number ($P < 0.01$) of patients with values compatible with moderate and severe malnutrition, respectively, in Child-Pugh C (10/19 and 9/19) than in A (0/38 and 0/38) and B (0/21 and 0/21). The assessment of the nutritional state by TLC showed that there was a greater number of patients with values of TLC within the range of reference proposed for the diagnostic of malnutrition in Child-Pugh C (17/19, $P < 0.01$) and B (17/21, $P < 0.05$) than in A (20/38) and that there was a greater frequency of severely malnourished patients in Child-Pugh C (6/19) than in A (0/38, $P < 0.01$) and B (1/21, $P < 0.05$) (table II).

In relating the diagnosis of the nutritional state of the patients to the HC etiology, a greater number of malnourished and severely malnourished patients was observed by SGA, respectively, among those of the group with alcoholic etiology HC (34/44, $P < 0.01$ and 13/44, $P < 0.05$), than among those with non-alcoholic etiology (14/34 and 3/44). Analysis of %BW, BMI and %MAMC showed, respectively, a greater number ($P < 0.05$) of patients with diagnosed malnutrition in the alcoholic etiology group (12/44, 11/44, and 22/44) than in the non-alcoholic group (2/34, 2/34 and 8/34). A greater ($P < 0.05$) frequency of diagnosis of mildly malnourished patients was demonstrated by BMI in the alcoholic-etiology group (8/44) than in that non-alcoholic group (1/34); by %TST a greater ($P < 0.05$) number of mildly malnourished patients was demonstrated in the non-alcoholic etiology group (7/34) than in the alcoholic group (2/44), and by %MAC a greater ($P < 0.05$) frequency of diagnosis of severely malnourished patients was observed in the alcoholic-etiology group (12/44) than in the non-alcoholic group (3/34). Analysis of levels of

ALB and of the TLC showed no significant difference in the frequency of diagnosed malnutrition regarding the alcoholic or non-alcoholic etiology of HC (table II).

By analyses of the SGA and of the %TST a greater frequency of diagnosis of severe malnourishment was verified, respectively, among women (11/34, $P < 0.05$ and 27/34, $P < 0.01$) than among men (5/44 and 16/44). By %MAC was demonstrated a greater frequency of diagnosis of malnutrition and of severe malnutrition, respectively, among the men (34/44, $P < 0.01$ and 15/44, $P < 0.01$) than among the women (15/34 and 0/34). By %MAMC a greater frequency ($P < 0.01$) of malnutrition and of moderate malnutrition was observed, respectively, among the men (25/44 and 11/44) than among the women (5/34 and 1/34). The analysis of %BW, BMI, ALB, and TLC showed no difference in the diagnosis of the nutritional state among men and women (table II).

In relating the nutritional state of the patients to the etiology of the HC and to the gender of the patients, a greater ($P < 0.01$) number of the women with diagnosis of severe malnutrition, when the etiology of the HC was alcohol (10/19) were observed by SGA than in those of non-alcoholic etiology (1/15). Analysis by BMI and %BW demonstrated a greater ($P < 0.05$) number of men with diagnosis of mild or moderate malnutrition when the etiology of the HC was alcoholic (5/25 and 5/25, respectively) than when it was not (0/19 and 0/19, respectively). Using %MAC it was demonstrated that the men who had HC of alcoholic etiology presented a greater frequency ($P < 0.05$) of diagnosis of severe malnutrition (12/25) than those whose etiology of HC was not alcoholic (3/19). Subjective global assessment (SGA) and %TST analysis of the sub-group of men and women with alcoholic etiology HC demonstrated, respectively, that the women presented a greater frequency ($P < 0.05$) of diagnosis of severe malnutrition (10/19 and 16/19) than the men (3/25 and 12/25). On the other hand, the men had a greater frequency ($P < 0.01$) of diagnosis of malnutrition (19/25-%MAMC) and of severe malnutrition (12/25-%MAC) than the women (0/19 and 3/19, respectively).

Discussion

The nutritional diagnosis of the HC patients attended at the ambulatory of gastroenterology at CH-FUU were assessed by using SGA, BMI, %BW, %TST, %MAC, %MAMC, ALB and TLC. These methods were chosen because they are available, they have fast application and low cost, and they can be incorporated into the routine of the nutritional assessment of the HC patients attended at ambulatories of general hospitals in developing countries. These methods of assessment of the nutritional state must be critically and criteriously analyzed due to interferences which result from chronic hepatic insufficiency.[19,20]

By SGA, 48 (61.5%) patients were diagnosed as undernourished. According to Detsky et al.,[15] the diagnosis of malnutrition by SGA is associated with the reduction of body weight; with gastrointestinal alterations, such as, diarrhea, anorexia, nausea and vomiting; with a reduction in the consistency and in the quantity of food intake; with a reduction in functional capacity, and with the increased expenditure of energy associated with HC. In SGA, weight loss has direct relationship with malnutrition. Some investigators has demonstrated that the prevalence of severe weight loss is greater in patients with malnutrition than in well nourished.[21]

The presence of depletion of the adipose tissue, of muscular mass and hydric retention, such as, ascites and swelling of the ankles was verified by the physical examination by SGA. Although these alterations might be associated with the diagnosis of malnutrition,[15] they could also arise from HC. For example, the reduction of the functional capacity of the patients could arise from the presence of voluminous ascites and/or from the spoliation of micronutrients due to the frequent and chronic use of diuretics. The presence of swelling could result from the reduction of albumin synthesis associated with chronic hepatic insufficiency.[22]

The methods of nutritional assessment based on body weight, such as, %BW and BMI diagnosed malnutrition, respectively, in 17.9% and 16.7% of the analyzed patients. These results are similar to those demonstrated in HC patients by other investigators using %BW (11.7%)[5] and BMI (11.7%).[3] However, among patients in stressful conditions and with severe HC complications, the frequency of the diagnosis of malnutrition by %BW could be greater (30.0%).[4] The identification of a smaller numbers of patients with diagnosis of malnutrition by the use of these two methods, compared with other methods utilized, is possibly related to the hydric retention associated with hepatic insufficiency, which hampers and/or impedes the identification of weight loss despite a real reduction of body tissue. In this present study, patients diagnosed as eutrophic by %BW present diminished values of %TST (92.3%) and of %MAMC (25.0%) which are compatible, respectively, with a depletion of adipose tissue and muscular mass.

Among the anthropometric methods used, %TST was the one that most frequently diagnosed malnutrition (93.6%). Although it is theoretically possible that the presence of swelling could hide a depletion in adipose tissue and that the frequency of diagnosis of malnutrition could be reduced by the %TST method, it has been reported that in patients with chronic liver disease, the upper limbs are not the preferential place of swelling,[22] principally in the case of patients who are not confined to bed. By %MAMC analysis it was observed that arm muscle mass was reduced in 38.5% of the patients. The greater frequency of diagnosis of malnutrition by %TST than by %MAMC could be associated with metabolic alterations arising from HC. In patients with chronic hepatic insufficiency, lipids are used as a preferential metabolic substrate for energy production.[22] The triceps skinfold thickness might not be representative of the overall distribution of adipose tissue in the body.[23] Besides this, individual anthropometrical variations are not considered in the calculation of %MAMC. It is taken for granted that the humerus has the same diameter in all groups of the population and that the arm has a cylindrical instead of an elliptical form.[23] Moreover, due to non-availability of reference standard for %TST and %MAMC for healthy South American Brazilian people, values described by healthy North Americans were used.[17]

Serum albumin was reduced in 34/78 patients (43.6%); 15/21 were Child-Pugh B and 19/19 Child-Pugh C. The reduction of serum albumin levels in HC patients, principally among those with moderate or severe hepatic insufficiency, could be associated with either malnutrition, due to reduction in food intake and to the worsening metabolism of nutrients, or with the hepatic dysfunction itself which compromises albumin synthesis.[22]

Total lymphocytes count values were compatible with the diagnosis of malnutrition in 69.2% of the assessed patients. However, in HC patients, non-nutritional factors, such as, hypersplenism and infections can alter the TCL.[9] The probable diagnosis of hypersplenism in the evaluated patients was more frequent among those whose hepatic function was most impaired, i.e., 0% in Child-Pugh A, 30.0% in Child-Pugh B and 80.0% in Child-Pugh C patients. The presence of hypersplenism could have contributed to the greater frequency of diagnosis of severe malnutrition by the TLC method among Child-Pugh C patients (6/19), when compared with Child-Pugh A patients (0/38, $P < 0.01$) and B (1/12, $P < 0.05$).

In relating HC etiology to the nutritional state of the patients a greater frequency of diagnosis of malnourished patients among those with alcoholic etiology was demonstrated by SGA, BMI, %BW and %MAMC than among those with non-alcoholic etiology. A greater frequency of patients diagnosed as mildly malnourished (BMI) and as severely malnourished (SGA, %MAC) was also verified when the etiology was alcoholic than when it was not. The protein-energy malnutrition is a common complication in alcoholic liver disease and correlates with disease severity.[24] The onset of malnutrition in alcoholics depends on a series of factors among which can be included the gender of the patient and the quantity of alcohol taken.[25] Despite the fact that all the HC patients included in this study had abstained from alcohol for at least one year, it is possible that the alcohol contributed to the onset of nutritional alterations during the alcoholic period, before and during the onset of HC. At a later clinical stage, the greater damage in the hepatic function could hamper and/or impede the recuperation of the nutritional state, thus, maintaining a greater number of malnourished, including severely malnourished among alcoholic-etiology HC patients. Anyway in patients with alcoholic liver disease the withdrawal from alcohol is the factor that determines the prognosis of any disease stage, and, therefore, the main therapeutic measure.[26]

Regarding the gender of the patients, a greater frequency of diagnosis of severely malnourished patients was demonstrated by SGA and %TST among the women than among the men; by %MAMC and %MAC, respectively, it was observed that there was a greater frequency of diagnosis of moderately and severely malnourished patients among the men. Similar results, showing also that the adipose tissue is more depleted among the women, and that muscular mass is more depleted among the men, were obtained by the Italian Multicentre Cooperative Project on Nutrition in Liver Cirrhosis[27] and by Carvalho and Parise.[28] The muscle wasting is common in patients with HC and is related to increased morbidity and mortality.[29] It is possible that the greater reduction of muscular mass among men with HC could be related to the onset of feminization provoked by the reduction of testosterone serum levels due to its reduced production in the testicles and to the increase of its transformation into estrogen in the liver.[30]

In relating the alcoholic etiology of HC to the gender of the patients, diagnosis of caloric malnutrition were more frequent among the women while proteic malnutrition was more frequent among the men. A depletion of adipose tissue, even when it is accentuated, is rarely associated with clinical complications. In contrast to this, a depletion of the pool of body proteins provokes an increase in morbidity and in mortality, due among other complications, to reduced resistance to infection, to delay in the wound healing, and to metabolic alterations arising from a reduction in enzyme synthesis.[9] Thus, despite men have a higher frequency of alcoholic liver disease[31] women are more sensitive to alcohol and have a greater risk of developing HC. However, when all HC patients are taken into account, the men, due to their greater frequency of protein malnutrition, could present a worse prognosis than the women.

Regarding the severity of hepatic insufficiency, more frequent diagnosis of malnutrition (SGA, BMI, %BW, %MAC, %MAMC, ALB, TLC) and of severe malnutrition (SGA, %TST, %MAC, %MAMC, ALB, TLC) were demonstrated among patients with severe hepatic insufficiency. Thus, with most of the employed methods it is possible to demonstrate that the prevalence of diagnosis of malnutrition and of severe malnutrition increases in accordance with the worsening of the hepatic function. Similar results have been demonstrated by other investigators.[3,4,5,28,32,33] This data can be very important for the preventive therapeutic nutritional orientation of patients who are in the initial stages of HC. At this clinical stage, patients can present various degrees of malnutrition, but they are still able to develop an appropriate therapeutic response to nutritional orientations directed towards the recuperation and/or maintenance of a normal nutritional state. The recuperation of the nutritional state of patients with more advanced stages of HC, who present a greater frequency of malnutrition or severe malnutrition, can be hampered by hepatic insufficiency, a complication which could negatively define their prognoses. This can happen, especially, when the patients are exposed to other clinical situations, such as, infections and/or surgical procedures associated with the worsening of the nutritional state.

The nutritional assessment of patients with hepatic cirrhosis attended at general hospital ambulatories in developing countries is difficult because an isolated analysis of results obtained from antropometric and biochemical methods could suffer interference of the hepatic complications, regardless of the nutritional status involvement. Thus, despite the initial purpose of SGA as screening test for evaluating the nutritional status, we agree with the recommendation of A.S.P.E.N.[34] to utilize this method for the diagnosis of nutritional status of patients with hepatic cirrhosis since this method allows a conjunct analysis of multiple variables.

Conclusions

There is an elevated frequency of diagnosis of malnutrition in HC patients. This frequency varies regarding the employed assessment method; it increases in accordance with the severity of hepatic insufficiency and with alcoholic etiology. There is a greater depletion of adipose tissue among the women and of muscular tissue among the men.

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