

Avaliação subjetiva global e métodos funcionais no diagnóstico nutricional de pacientes com hepatopatia crônica

Subjective global assessment and functional methods for the nutritional diagnosis of patients with chronic liver disease

Melo, Nathalia Caroline de Oliveira¹; Burgos, Maria Goretti Pessoa de Araújo¹; Pereira, Crislaine Gonçalves da Silva¹; Alves, Danielle Viana de Souza¹; Floro Arcoverde, Gabriela Maria Pereira¹; Sobrinho, Onofre Lacerda de Souza²; Alves da Silva, Silvia¹

1 Federal University of Pernambuco, Recife – PE, Brazil.

2 Hospital of the servers of the state of Pernambuco, Recife- PE, Brazil.

Recibido: 27/junio/2017. Aceptado: 2/agosto/2017.

RESUMO

Introdução: As comorbidades atreladas ao dano hepático surgem tardiamente, estando a desnutrição presente entre 10 e 100% dos pacientes, sendo o estado nutricional reconhecido como fator prognóstico.

Objetivo: Avaliar a concordância entre avaliação subjetiva global e métodos funcionais na avaliação nutricional de pacientes com doença hepática crônica.

Métodos: Estudo transversal realizado nas enfermarias de clínica médica, gastroenterologia e cirurgia geral/transplante hepático do Hospital Universitário Oswaldo Cruz, Recife - Pernambuco, de abril a setembro/2015, com adultos e idosos de ambos os sexos, hospitalizados. Realizada a avaliação subjetiva global e, para avaliação funcional, a força de preensão palmar e espessura do músculo adutor do polegar. Realizados os testes Exato de Fisher, Anova e Tukey.

Resultados: 101 indivíduos avaliados. 51,5% mulheres; Idade média de 59,2 ± 11 anos, com predomínio de idosos (52,5%). A etiologia por esquistossomose foi maioria (47,5%). A força de preensão palmar e espessura do músculo adutor do polegar apresentaram média de 18,54 ± 9,31 kg/F

e 15,66 ± 4,08mm, respectivamente, inferiores à referência para sadios e hepatopatas em acompanhamento ambulatorial; Distúrbios gastrointestinais ocorreram em 92% e ascite em 85%. Detectada maior prevalência de desnutrição pela avaliação subjetiva global, seguida da força de preensão palmar e espessura do músculo adutor do polegar (95%, 89,1% e 13,9%, respectivamente). Observados baixos níveis de concordância entre os três métodos.

Conclusão: O diagnóstico nutricional foi discrepante entre os métodos. A avaliação subjetiva global foi superior à força de preensão palmar e espessura do músculo adutor do polegar na detecção de desnutrição. Portanto, a avaliação subjetiva global é um instrumento que pode ser utilizado a nível hospitalar para avaliação do estado nutricional de hepatopatas crônicos.

PALAVRAS-CHAVE

Avaliação Nutricional; Doença Hepática; Força Muscular; Força da mão.

ABSTRACT

Introduction: Comorbidities emerge late in individuals with liver damage and malnutrition is found in 10 to 100% of such patients.

Objective: The aim of the present study was to determine the level of agreement between a subjective global assessment and functional methods for the nutritional evaluation of patients with chronic liver disease.

Correspondencia:
Nathalia Caroline de Oliveira Melo
Nathi.nutricao@gmail.com

Methods: A cross-sectional study was conducted at the Oswaldo Cruz University Hospital in the city of Recife, Brazil, between April and September 2015 involving hospitalized male and female adults and elderly individuals with chronic liver disease. The subjective global assessment was compared to functional methods (grip strength and thumb adductor thickness) using Fisher's exact test, ANOVA and Tukey's test.

Results: One hundred one individuals were analyzed (51.5% female; mean age: 59.2 ± 11 years; 52.5% elderly). The most common etiology was schistosomiasis (47.5%). Mean grip strength and thumb adductor thickness were 18.54 ± 9.31 kg/F and 15.66 ± 4.08 mm, respectively, which were lower than reference values for healthy individuals and patients with liver disease in outpatient follow up. Gastrointestinal disorders were found in 92% and ascites was found in 85%. The prevalence of malnutrition was 95%, 89.1% and 13.9% based on the subjective global assessment, grip strength and thumb adductor thickness, respectively. Low levels of agreement were found among the three methods.

Conclusion: Divergences were found among the methods employed for a nutritional evaluation. The detection of malnutrition was higher when using the subjective global assessment rather than grip strength and thumb adductor thickness. Thus, the subjective global assessment can be used in the hospital setting for the evaluation of nutritional status in patients with chronic liver disease.

KEY WORDS

Nutritional assessment; Liver disease; Muscle strength; grip strength.

INTRODUCTION

Hepatic cirrhosis is the final stage of chronic liver disease and its most severe manifestations occur when the functional capacity of the liver is reduced by about 80%¹ representing an important cause of morbidity and mortality throughout the world². It is estimated that for every 100,000 inhabitants in Brazil, 21% develop cirrhosis due to hepatitis C, 20% due to alcohol abuse and other causes and 17% due to hepatitis B, with a greater prevalence rate among males and individuals aged 30 years or older³. In the northeastern region of the country, hepatitis B is the most prevalent cause⁴.

Malnutrition is found in 70 to 100% of individuals with chronic liver disease and further compromises liver function⁵. The subjective global assessment (SGA) is considered the gold standard for the evaluation of nutritional status^{6,7}. According to Detsky *et al.* (1987)⁸, the SGA is practical method for the determination of nutritional status and has been validated for the identification of individuals with cirrhosis at high risk of malnutrition^{9,10}.

Studies in the international literature recommend the determination of the loss of lean mass and muscle strength for the diagnosis of malnutrition^{11,12}. Such functional methods are simple, inexpensive and efficient¹⁰. The measurement of grip strength is recommended for the assessment of muscle strength and is a sensitive clinical measure applied to diverse populations¹³ for the early determination of nutritional deprivation or repletion¹⁴ detecting 100% of malnourished individuals¹⁵. The reduction in grip strength is consistently associated with impaired functional status, an increase in postoperative complications, prolonged hospital stay and a higher mortality rate. Thus, this measure is considered a good prognostic indicator for patients with chronic liver disease¹⁶. In turn, the determination of the thickness of the thumb adductor muscle is the only direct measure of thickness that does not include adipose tissue and therefore enables a direct assessment of trophism¹⁷. Functional muscle alterations occur prior to the detection of somatic changes with the use of classical indicators, such as anthropometrics¹⁸.

The evaluation of the nutritional status in patients with chronic liver disease has become the target of recent studies, in which different methods have been applied, such as nutritional history, subjective assessments, anthropometrics and functional tests, the aim of which is the early implementation of nutritional therapy to contribute to a better clinical prognosis and improved quality of life of such patients. However, due to the peculiarities of the disease, such as water retention, functional methods should be included in the nutritional assessment.

OBJECTIVE

To evaluate a concordance between a global subjective assessment, strength adductor muscle thickness and palmar grip strength as instruments for assessing nutritional status in patients with chronic liver.

METHODS

A cross-sectional study was conducted involving male and female individuals with chronic liver disease aged 18 years or older and hospitalized in the gastroenterology, general medicine and general surgery/liver transplants wards of the Oswaldo Cruz University Hospital in the city of Recife, Brazil, between April and September 2015. Bedridden patients restricted to the bed in the supine position, individuals with hepatic encephalopathy, peripheral neuropathy, peripheral edema in the hands, individuals isolated from contact, pregnant women and individuals in the terminal phase (palliative treatment) were excluded from the study. Other patients were selected randomly upon admission to hospital. The data were collected by a single examiner and the nutritional assessment (SGA, grip strength and thumb adductor thickness) was performed within 48 hours after admission.

The SGA was performed using the questionnaire proposed by Detsky *et al.* (1987)⁸, which is based on the clinical history and physical examination. After the combination of the results, individuals are classified based on the sum of the points attributed to each evaluation as well nourished, mildly undernourished, moderately undernourished or severely undernourished.

Grip strength was determined using a hydraulic hand dynamometer (Saehan®). The volunteer was positioned seated on a chair with no back or arm rests or seated on the bed with shoulder adducted and rotated neutrally, elbow flexed at 90° and forearm in the neutral position, following the technique recommended by the American Society of Hand Therapists (1992)¹⁶. The reference values were based on a descriptive study conducted by Mendes *et al.* (2013)¹³.

Thumb adductor thickness was measured using skinfold calipers (Cescorf®). The patient was seated with the dominant hand resting on the ipsilateral knee and the elbow at approximately a 90° angle on the lower limb. The calipers exercised pressure of 10 g/mm² to pinch the adductor muscle in the vertex of the imaginary triangle formed between the length of the thumb and index finger. The measurements were made in triplicate and the mean was used. The reference values were those proposed by Lameu *et al.* (2004)¹⁴ for healthy adults and elderly individuals.

The socio-demographic variables were sex, age, schooling and place of residence. The clinical variables were diagnosis, etiology and duration of the disease. These data were collected from the patient charts. Weight was measured using a platform scale (Welmy®) with a maximum capacity of 140 kg and precision of 100 g. The weight data were adjusted for ascites, as proposed by James (1989), and peripheral edema, as proposed by Martins and Riella (2001).

This study received approval from the human research ethics committee of the university hospital under process number 1.012.911/2015. All volunteers received clarifications regarding the objectives of the study and methods employed. Those who agreed to participate signed a statement of informed consent.

Data analysis was performed using the Statistical Package for the Social Sciences (version 21.0, SPSS Inc., Chicago, IL, USA). The descriptive analysis of the variables involved the calculation of frequency distributions and measures of central tendency. The Kolmogorov-Smirnov test was used to determine the hypothesis of normality and the results were expressed as percentage, mean and standard deviation values. The categorical variables were analyzed using Fisher's exact test. Continuous variables were analyzed using analysis of variance (ANOVA) followed by Tukey's test from multiple comparisons. Agreement among the nutritional assessment methods was determined using the Kappa coefficient¹⁷. The level of statistical significance was set to < 5%.

RESULTS

One hundred one patients with chronic liver disease were evaluated. Mean age was 59.2 ± 11 years and the female sex accounted for 51.5% of the sample. A total of 71.3% had an elementary school education (≤ 8 years of study) and the majority lived in urban areas. When evaluated using the SGA, nutritional status was not significantly associated with the socio-demographic data. The only exception was place of residence, as those who resided in urban areas had greater nutritional impairment ($p < 0,03$).

Table 1 displays the associations between nutritional status and clinical variables. Among the individuals with chronic liver disease due to schistosomiasis, the frequency of undernutrition was 95%. In the evaluations of grip strength and thumb adductor thickness, well-nourished individuals had better results, whereas the results were reduced as the degree of undernutrition increased. With regard to anthropometrics, a significant difference was found in moderately and severely undernourished individuals, with a continuous change in weight in the previous six months and lower ingestion of one's habitual diet.

In the investigation of the association between nutritional status according to the SGA and the measurement of grip strength no significant results were found for either males or females. However, in the evaluation according to the SGA and thickness of the thumb adductor muscle, a significant association was found with moderate undernutrition among the women ($p = 0,03$).

Table 2 displays the Kappa values for the different methods of classifying nutritional status. Poor levels of agreement were found among the SGA, grip strength and thumb adductor thickness.

DISCUSSION

In the sample studied, individuals aged ≥ 60 years and the female sex predominated, which is in disagreement with findings described by diverse authors¹⁹⁻²² who report that adult individuals and the male sex are predominant in the population with chronic liver disease. This is likely due to the fact that younger males often postpone going to a physician, whereas women represent a larger portion of the population that seeks health care.

Nascimento and colleagues²³ report similar findings with regard to place of residence, as the rural population is smaller than the urban population and greater nutritional impairment was found in urban areas. This could be explained by the greater access to alcohol, which facilitates drinking excessively, with severe repercussions to the organism²⁴. Moreover, residents of rural areas have more muscle reserve due to the greater demand for manual labor. The other socio-demographic factors were not associated with nutritional status in

Table 1. Assessment of nutritional status based on SGA according to clinical and anthropometric characteristics, Oswaldo Cruz University Hospital, Recife, Brazil, 2015.

Variables	TOTAL n (%)	Subjective Global Assessment				p-value
		Well-nourished	Undernourished			
			Mild	Moderate	Severe	
Total Group: n (%)	101 (100.0)	5 (5.0)	58 (57.4)	33 (32.7)	5 (5.0)	
Etiology:						
Alcohol	24 (23.8)	1 (4.2)	16 (66.7)	5 (20.8)	2 (8.3)	p ⁽¹⁾ = 0.074
HSS	48 (47.5)	4 (8.3)	30 (62.5)	13 (27.1)	1 (2.1)	
HBV	2 (2.0)	-	-	2 (100.0)	-	
HCV	15 (14.9)	-	3 (20.0)	10 (66.7)	2 (13.3)	
Autoimmune	3 (3.0)	-	3 (100.0)	-	-	
Pharmacological	1 (1.0)	-	1 (100.0)	-	-	
Idiopathic	7 (6.9)	-	4 (57.1)	3 (42.9)	-	
Other	1 (1.0)	-	1 (100.0)	-	-	
Duration of disease:						
< 5 years	69 (68.3)	4 (5.8)	37 (53.6)	23 (33.3)	5 (7.2)	p ⁽¹⁾ = 0.886
5 to 10 years	24 (23.8)	1 (4.2)	15 (62.5)	8 (33.3)	-	
> 10 years	8 (7.9)	-	6 (75.0)	2 (25.0)	-	
Grip strength: mean ± SD	18.54 ± 9.31	26.80 ± 11.88 ^(A)	19.61 ± 9.65 ^(A)	16.42 ± 7.91 ^(A,B)	11.80 ± 2.05 ^(B)	p ⁽²⁾ = 0.031*
Classification of grip strength:						
Well-nourished	11 (10.9)	2 (18.2)	6 (54.5)	3 (27.3)	-	p ⁽¹⁾ = 0.255
Undernourished	90 (89.1)	3 (3.3)	52 (57.8)	30 (33.3)	5 (5.6)	
Thumb adductor thickness: mean ± SD	15.66 ± 4.08	18.82 ± 2.04 ^(A)	16.66 ± 4.06 ^(A)	13.91 ± 3.73 ^(B)	12.46 ± 0.72 ^(B)	p ⁽²⁾ = 0.001*
Classification of thumb adductor thickness:						
Well-nourished	87 (86.1)	5 (5.7)	54 (62.1)	23 (26.4)	5 (5.7)	p ⁽¹⁾ = 0.016*
Undernourished	14 (13.9)	-	4 (28.6)	10 (71.4)	-	
Dry weight: mean ± SD	58.90 ± 14.70	69.80 ± 15.48 ^(A)	61.57 ± 15.40 ^(A)	54.99 ± 11.44 ^(B)	42.96 ± 6.09 ^(C)	p ⁽²⁾ = 0.001*
Change in weight in 6 months:						
Yes	83 (82.2)	1 (1.2)	45 (54.2)	32 (38.6)	5 (6.0)	p ⁽¹⁾ = 0.001*
No	18 (17.8)	4 (22.2)	13 (72.2)	1 (5.6)	-	

SGA: Subjective Global Assessment, HSS: hepatosplenic schistosomiasis, HBV: Hepatitis B virus, HCV: Hepatitis B virus, (*): Significant association at 5.0% level. (1): Fisher's exact test. (2): ANOVA. Note: Different letters between parentheses denote significant difference among SGA categories.

Table 1 continuación. Assessment of nutritional status based on SGA according to clinical and anthropometric characteristics, Oswaldo Cruz University Hospital, Recife, Brazil, 2015.

Variables	TOTAL n (%)	Subjective Global Assessment				p-value
		Well-nourished	Undernourished			
			Mild	Moderate	Severe	
Continual weight loss:						
Yes	55 (54.5)	-	22 (40.0)	28 (50.9)	5 (9.1)	p ⁽¹⁾ < 0.001*
No	46 (45.5)	5 (10.9)	36 (78.3)	5 (10.9)	-	
Weight loss > 10%:						
Yes	69 (68.3)	1 (1.4)	41 (59.4)	23 (33.3)	4 (5.8)	p ⁽¹⁾ = 0.139
No	32 (31.7)	4 (12.5)	17 (53.1)	10 (31.3)	1 (3.1)	
Change in diet						
No	21 (20.8)	5 (23.8)	14 (66.7)	2 (9.5)	-	p ⁽¹⁾ < 0.001*
< Habitual ingestion	57 (56.4)	-	37 (64.9)	20 (35.1)	-	
Change in consistency	18 (17.8)	-	7 (38.9)	6 (33.3)	5 (27.8)	
Change > 80 days	5 (5.0)	-	-	5 (100.0)	-	

SGA: Subjective Global Assessment, HSS: hepatosplenic schistosomiasis, HBV: Hepatitis B virus, HCV: Hepatitis B virus, (*): Significant association at 5.0% level. (1): Fisher's exact test. (2): ANOVA. Note: Different letters between parentheses denote significant difference among SGA categories.

Table 2. Agreement on nutritional status between SGA and functional methods, Oswaldo Cruz University Hospital, Recife, Brazil, 2015.

Methods	Agreement			
	Observed		Kappa index	
	N	%	K	95% CI
SGA and grip strength	91	90.1	0.19	- 0.09 to 0.48
SGA and thumb adductor thickness	19	18.8	0.02	0.00 to 0.03
Grip strength and thumb adductor thickness	25	24.7	0.04	0.01 to 0.07

SGA: Subjective Global Assessment; K: value of Kappa index.

the present investigation and comparisons with other studies are impossible due to the scarcity of data in the literature.

The data on etiology were in agreement the previous findings^{25,26}. However, hepatosplenic schistosomiasis stood out as the most prevalent cause of the disease in the present investigation, likely due to the fact that the study setting is a reference hospital for the treatment of chronic liver disease and is found in an epidemic region.

Ferreira and colleagues²⁶ regard the SGA as the most appropriate method for the nutritional assessment of patients

with liver disease, as this method does not require objective data. In the present study, the frequency of undernutrition was higher when the SGA was used (95%) in comparison to grip strength and thumb adductor thickness. It was also higher when compared to the findings of previous studies, in which prevalence rates range from 6.7% to 56%²⁷⁻²⁹. This could be attributed to the fact that most studies are conducted with individuals in outpatient follow up rather than hospitalized patients, among whom undernutrition is more frequent²⁴.

Grip strength was the most objective method for identifying undernourished individuals (89.1%), which is similar to findings described in previous studies²⁹⁻³¹. However, the mean grip strength value was lower than that found by all researchers in studies with the same population^{30,33}. When evaluating grip strength in accordance with nutritional status diagnosed using the SGA, significantly higher values were found among the well-nourished individuals in comparison to undernourished individual. This is in agreement with data described by different authors^{30,34} who report an direct relationship between nutritional status and functional capacity, with an increase in complications, hospital stay and mortality¹⁹, demonstrating that grip strength is an effective, practical, fast method for detecting undernutrition in patients with chronic liver disease³⁴.

Based on the use of thumb adductor thickness, well-nourished individuals were predominant, which is in disagreement with findings described by Andrade *et al*³¹ for patients hospitalized for different diseases. However, thumb adductor thickness diminished with the aggravation of undernutrition, which is similar to data described by Nunes²² in patients with cirrhosis. This result may be explained by the fact that thumb adductor thickness is a rather infrequent method in clinical practice and there is a scarcity of studies that have proposed a cutoff point for individuals with chronic liver disease³⁰.

There is a scarcity of studies that relate the prevalence of undernutrition based on grip strength and thumb adductor thickness to sex in the evaluation of patients with liver disease, which makes comparisons with other studies unviable. However, the significant association between the female sex and undernutrition diagnosed based on thumb adductor thickness was likely due to the fact that men have greater muscle mass in comparison to women²³.

Analyzing healthy individuals, Budziarek *et al*³⁴ found a strong correlation between thumb adductor thickness and grip strength, concluding that the combination of the two methods could be useful in nutritional assessments. In contrast, low Kappa coefficients were found among the three functional methods used for the classification in the present study, which is similar to findings described by Nunes²² in southern Brazil.

CONCLUSION

Based on the findings of the present study, agreement among the different evaluation methods was low and the nutritional diagnosis of hospitalized patients with liver disease was varied. The SGA led to the identification of more undernourished patients, followed by grip strength. Hence, the combination of subjective methods (SGA) and functional methods (grip strength) is suggested for the nutritional diagnosis of individuals with chronic liver disease.

REFERENCES

- Schuppan D, Afdhal N. Liver cirrhosis. *Lancet*. 2008; 371: 838-851.
- Udell JÁ, Wang CS, Tinmouth J, FitzGerald JM, Ayas NT, Simel DL, et al. Does this patient with liver disease have cirrhosis? *JAMA*. 2012; 307(8): 832-42.
- Carvalho JR, Portugal FB, Flor LS, Campos MR, Scharamm JMA. Método para estimação de prevalência de hepatites B e C crônicas e cirrose hepática – Brasil, 2008. *Epidemiol Serv Saúde*. 2014; 23(4): 691-700.
- Zaína FE, Parolim MB, Lopes RW, Coelho JCU. Prevalence of malnutrition in liver transplant candidates. *Transplant Proc*. 2004; 36(4): 923-5.
- Riggio O, Angeloni S, Ciuffa L, Nicolini G, Attili AF, Albanese C, et al. Malnutrition is not related to alterations in energy balance in patients with stable liver cirrhosis. *Clin Nutr*. 2003; 22(6): 553-9.
- Barbosa-Silva MCG, Barros AJD. Avaliação Subjetiva Global parte 1 - Revisão de sua validade após duas décadas de uso. *Arq Gastroenterol*. 2002; 39(3): 181-7.
- Lima LS, Araújo MAR, Ornelas CG, Logrado MHG. Validação de instrumento de triagem nutricional. *Acta Med Port*. 2012; 25(1): 10-14.
- Detsky AS, McLaughlin JR, Baker JP, Johnston N, Whittaker S, Mendelson RA, et al. What is subjective global assessment of nutritional status? *JPEN J Parenter Enteral Nutr*. 1987; 11: 8-13.
- Ritter L, Gazzola J. Nutritional evaluation of the cirrhotic patient: na objective, subjective or multicompartamental approach? *Arq Gastroenterol*. 2006; 43(1): 66-70.
- White JV, Guenter P, Jensen G, Malone A, Schofield M. American society for Parenteral and Enteral nutrition: characteristics recommended for the identification and documentation of adult malnutrition (undernutrition). *JPEN J Parenter Enteral Nutr*. 2012; 36: 275-83.
- Norman K, Stobaus N, Gonzalez MC, Schulzke JD, Pirlich M. Hand grip strength: outcome predictor and marker of nutritional status. *Clin Nutr* 2011; 30: 135-142
- Álvares-da-Silva MR, Silveira TR. Hand grip strength or muscle mass in cirrhotic patients: who is the best? *Nutrition*. 2006; 22(2): 218-9.
- Mendes J, Azevedo A, Amaral TF. Força de preensão da mão – quantificação, determinantes e utilidade clínica. *Arq de Medicina*. 2013; 27(3): 115-120.
- Lameu EB, Gerude MF, Campos AC, Luiz RR. The thickness of the adductor pollicis muscle reflects the muscle compartment and may be used as a new anthropometric parameter for nutritional assessment. *Curr Opin Clin Nutr Metab Care*. 2004; 7(3): 293-301.
- Pereira CA, Moreno JG, Kik RME. The use of the thumb adductor muscle thickness in nutritional assessment. *Revista Ciência & Saúde*. 2014; 7(2): 109-114.
- Fess EE. *Clinical Assessment Recommendations*, 2nd ed. Garner, NC: American Society of Hand Therapists (ASHT,ed);1992.

17. Landis JR, Koch GG. The measurement of observer agreement for categorical data. *Biometrics*. 1977; 33: 159-174.
18. Carvalho L, Parise ER. Evaluation of nutritional status of non hospitalized patients with liver cirrhosis. *Arq Gastroenterol*. 2006; 43: 269-274.
19. Peng S, Plank LD, McCall JL, Gillanders LK, McIlroy K, Gane EJ. Body composition, muscle function, and energy expenditure in patients with liver cirrhosis: a comprehensive study. *Am J Clin Nutr*. 2007; 85: 1257-66.
20. Carvalho EM, Isern MRN, Lima PA, Machado CS, Biagini AP, Massarolo PCB. Força muscular e mortalidade na lista de espera de transplante de fígado. *Rev Bras Fisioter*. 2008; 12: 235-240.
21. Anastácio LR, Ferreira LG, Ribeiro HS, Lima AS, Vilela EG, Correia MITD. Weight loss during cirrhosis is related to the etiology of liver disease, *Arq Gastroenterol*. 2012; 42(3): 195-198.
22. Nunes FJ, Fernandes SA, Bertolini CM, Rabito EI, Gottschall CBA. Avaliação nutricional do paciente cirrótico: Comparação entre diversos métodos. *Scientia Medica*. 2012; 22(1): 12-17.
23. Nascimento SC, Pinto ICS, Silva CP. Comparação da força do aperto de mão com parâmetros antropométricos e subjetivos na avaliação nutricional de hepatopatas. *Acta Gastroenterol Latinoam*. 2013; 43(3): 218-226.
24. McClain CJ, Barve SS, Barve A, Marsano L. Alcoholic liver disease and malnutrition. *Alcohol Clin Exp Res*. 2011; 35(5): 815-820.
25. Álvares-da-silva MR, Silveira TR. Comparison between handgrip strenght, subjective global assessment, and prognostic nutritional index in assessing malnutrition and predicting clinical outcome in cirrhotic outpatients. *Nutrition*. 2005; 21: 113-117.
26. Ferreira LG, Anastácio LR, Lima AS, Correia MITD. Desnutrição e inadequação alimentar de pacientes aguardando transplante hepático. *Rev Assoc Med Bras*. 2009; 55: 389-393.
27. Huynh DK, Selvanderam SP, Harley HAJ, Holloway RH, Nguyen NQ. Nutritional care in hospitalized patients with chronic liver disease. *World J Gastroenterol*. 2015; 21(45): 12835-42.
28. Gottschall CBA, Alvares-da-Silva MR, Camargo ACR, Burtett RM, Silveira TR. Avaliação nutricional de pacientes com cirrose pelo vírus da hepatite C: a aplicação da calorimetria indireta. *Arq Gastroenterol*. 2004; 41(4): 220-224.
29. Guerra RS, Fonseca I, Pichel F, Restivo MT, Amaral TF. Handgrip Strength and associated factors in hospitalized patients. *JPEN J Parenter Enteral Nutr*. 2015; 39(3): 322-330.
30. Fernandes AS, Bassani L, Nunes FJ, Aydos MED, Alves AV, Marroni CA. Nutritional assessment in patients with cirrhosis. *Arq Gastroenterol*. 2012; 49(1):19-27.
31. Andrade P, Lameu EB. Espessura do músculo adutor do polegar: um novo indicador prognóstico em pacientes clínicos. *Rev Bras Nutr Clin*. 2007; 22: 28-35.
32. Aquino RC, Phillipi ST. Identificação de fatores de risco de desnutrição em pacientes internados. *Rev Assoc Med Bras*. 2011; 57(6): 637- 43.
33. Bémour C, Desjardins P, Butterworth RF. Role of nutrition in the managment of hepatic encephalopathy in end stage liver failure. *J Nutr Metab*. 2010; 1-12.
34. Budziareck MB, Pureza D, Rodrigo R, et al. Reference values and determinants for handgrip strength in healthy subjects. *Clin Nutr*. 2008; 27: 357-62.