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CORRELATION BETWEEN HAND GRIP STRENGTH AND MUSCLE MASS OF INDIVIDUALS WITH VIRAL HEPATITIS WITHOUT CIRRHOSIS ASSISTED IN A REFERENCE CENTER IN THE AMAZON

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ABSTRACT

Sarcopenia is an important complication of advanced liver disease. For its evaluation, several techniques can be used. This cross-sectional, descriptive, and analytical study aimed to evaluate the relationship between hand grip strength and muscle mass in individuals with chronic liver disease. 39 patients with hepatitis B and/or C were evaluated. Sociodemographic data, hand grip strength (HGS), weight, height and body mass index, 24-hour dietary recall to assess protein intake, and bioelectrical impedance analysis were collected. A correlation was observed between HGS and muscle mass (B=0.505; CI 0.616; 2.243; p=0.001) regardless of protein intake (B=0.623; CI 0.910; 2.618; p<0.001), age (B=0.622; CI 0.896; 2.626; p<0.001), body mass index (B=0.622; CI 0.891-2.631; p<0.001) and practice of physical activity (B= 0.622; CI 0.876; 2.641; p<0.001). In addition, there was a correlation between muscle mass and protein intake (B=0.398; CI 0.016; 0.123; p=0.012), which remained regardless of age (B=0.399; CI 0.015; 0.124; p=0.013), body mass index (B=0.403; CI 0.015; 0.125; p=0.014) and the practice of physical activity (B=0.408; CI 0.013; 0.129; p=0.017). The use of HGS to verify and monitor the loss of muscle strength is suggested, as it is a simple method, easy to transport and apply, cost-effective.

Key words: Hepatitis. Hand Strength. Body Composition.

RESUMO

Correlação entre a força de preensão palmar e a massa muscular de indivíduos com hepatites virais sem cirrose atendidos em um centro de referência na Amazônia

A sarcopenia é uma complicação importante da doença hepática avançada. Para sua avaliação, várias técnicas podem ser utilizadas. Este estudo transversal, descritivo e analítico teve como objetivo avaliar a relação entre a força de preensão palmar e a massa muscular de indivíduos com doença hepática crônica. Foram avaliados 39 pacientes com hepatite B e/ou C. Foram coletados dados sociodemográficos, força de preensão palmar (FPP), peso, altura e índice de massa corporal, recordatório alimentar de 24 horas para avaliar a ingestão de proteínas e análise de impedância bioelétrica. Foi observada uma correlação entre FPP e massa muscular (B=0,505; IC 0,616; 2,243; p=0,001) independentemente da ingestão de proteínas (B=0,623; IC 0,910; 2,618; p<0,001), idade (B=0,622; IC 0,896; 2,626; p<0,001), índice de massa corporal (B=0,622; IC 0,891-2,631; p<0,001) e prática de atividade física (B=0,622; IC 0,876; 2,641; p<0,001). Além disso, houve uma correlação entre massa muscular e ingestão de proteínas (B=0,398; IC 0,016; 0,123; p=0,012), que permaneceu independentemente da idade (B=0,399; IC 0,015; 0,124; p=0,013), índice de massa corporal (B=0,403; IC 0,015; 0,125; p=0,014) e prática de atividade física (B=0,408; IC 0,013; 0,129; p=0,017). Sugere-se o uso da FPP para verificar e monitorar a perda de força muscular, pois é um método simples, de baixo custo, fácil transporte e aplicação.

Palavras-chave: Hepatite. Força de preensão da mão. Composição corporal.

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INTRODUCTION

Chronic liver diseases, especially hepatitis B and C, are considered public health problems worldwide, with 750,651 confirmed cases in Brazil, of which 36.9% refer to cases of hepatitis B and 39.8% hepatitis C, according to the 2023 Brazilian hepatitis epidemiological bulletin (Ministério da Saúde, 2023).

Hepatitis B and C are similar in the form of parenteral, sexual and vertical transmission, and can cause several complications, especially liver failure, fibrosis, cirrhosis and hepatocarcinoma (Duarte and collaborators, 2021).

Nishikawa and collaborators (2021) cite in their study that metabolic and hormonal changes resulting from chronic liver diseases contribute to increased proteolysis and decreased protein synthesis.

In this sense, an important complication of advanced liver disease is sarcopenia, characterized by progressive loss of strength, function and muscle mass, it can be classified as primary, when it occurs due to age, or secondary, resulting from a systemic disease (Cruz-Jentoft and collaborators, 2019; Van Dongen and collaborators, 2022).

Furthermore, Park and collaborators (2019) and Park, Choi and Hwang (2018) found an association between low protein intake and loss of lean mass with a higher risk of sarcopenia, both in patients with liver damage and in the elderly.

Among the risks caused by sarcopenia and the reduction in handgrip strength (HGS), the increased risk of falls and fractures stand out, that is, it hinders the ability to move and perform activities of daily living and has associations with several diseases, such as respiratory, cognitive and cardiac (Cruz-Jentoft and collaborators, 2019).

In the study by Ooi and collaborators (2019), the authors suggest that sarcopenia may potentially worsen the prognosis of patients with chronic liver disease. In this way, sarcopenia contributes to the reduction of quality of life, loss of independence, need for special care and, if there is no multidisciplinary intervention, it can cause death (Cruz-Jentoft and collaborators, 2019). Warner and Satapathy (2023) cite that sarcopenia can also promote conditions that can worsen the liver disease.

For the assessment of sarcopenia, several techniques can be used, however, they may have limitations, such as cost, exposure to radiation, locomotion and variability in results.

Among the most effective procedures for determination, the use of dual-energy x-ray absorptiometry (DEXA), bioelectrical impedance, magnetic resonance imaging, computed tomography and dynamometry stand out, as they are capable of detecting low muscle quantity and quality (Cruz-Jentoft and collaborators, 2019).

Han and collaborators (2018) aimed to evaluate the influence of sarcopenia on liver fibrosis in individuals with chronic hepatitis B, and it was observed that patients with sarcopenia had an approximately three times greater risk of significant liver fibrosis compared to those without sarcopenia, and showed that this relationship was independent of obesity, insulin resistance, metabolic syndrome and fatty liver.

In the study by Hiraoka and collaborators (2016) the authors had as one of their objectives to evaluate sarcopenia by loss of muscle volume, determined by computed tomography, and HGS reduction in patients chronically infected by the hepatitis B and/or C virus. As a result, they observed the presence of sarcopenia in 7.1% of patients without cirrhosis, 11.8% of individuals with compensated cirrhosis (Child A) and 21.9% of individuals with decompensated cirrhosis (Child B and C).

In the study of Endo and collaborators (2023) the authors determined the natural course of sarcopenia progression in patients with chronic liver disease and the effect of cirrhosis on sarcopenia progression and observed low HGS in 22.2% of men and 22.0% of women.

In this context, the guidelines of the European Working Group on Sarcopenia in Older People (EWGSOP) state that low muscle strength is the primary parameter of HGS in patients with liver diseases without cirrhosis (Cruz-Jentoft and collaborators, 2019). Despite this, studies observed in patients with cirrhosis or in patients without liver disease demonstrate positive results in the use of HGS to assess muscle strength.

Therefore, aware of the need to identify a practical and low-cost method for identifying sarcopenia in an outpatient setting, the hypothesis arises that HGS correlates with muscle mass in individuals with viral hepatitis without cirrhosis. Thus, this study aims to evaluate the correlation between HGS and

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muscle mass in individuals with hepatitis B and/or C without cirrhosis.

MATERIALS AND METHODS

Study type and localization

This is a cross-sectional, descriptive and analytical study that was carried out from August 2020 to August 2021, at the outpatient clinic of clinical specialties of the State Reference Center for the diagnosis and treatment of liver diseases in the Amazon, Brazil.

Sample and inclusion and exclusion criteria

Non-probabilistic convenience sampling was performed with patients diagnosed with viral hepatitis B and/or C. As inclusion criteria, patients aged 20 to 74 years were selected (age range from adults to the elderly, according to the World Health Organization), residing in the capital or metropolitan region, and who had a confirmed diagnosis of hepatitis B and/or C, who agreed to take part in the study by signing the Informed Consent Form (ICF).

Thus, patients who had viral liver disease other than type B and/or C viruses were excluded; pregnant women and nursing mothers; chronic renal patients; patients with allergies and food intolerances; edematous patients (lower and upper limbs and ascites); with neoplasms; with clinical intercurrence that made it impossible to apply the research form and nutritional assessment; or who withdrew from participation, even after signing the ICF.

Therefore, as shown in Figure 1, of the total number of study participants (n=145), individuals with liver cirrhosis and those who were not residents of the capital were excluded from performing the bioimpedance test, therefore, only 39 individuals met all acceptance criteria and attended the bioimpedance test, and therefore were eligible for data collection.

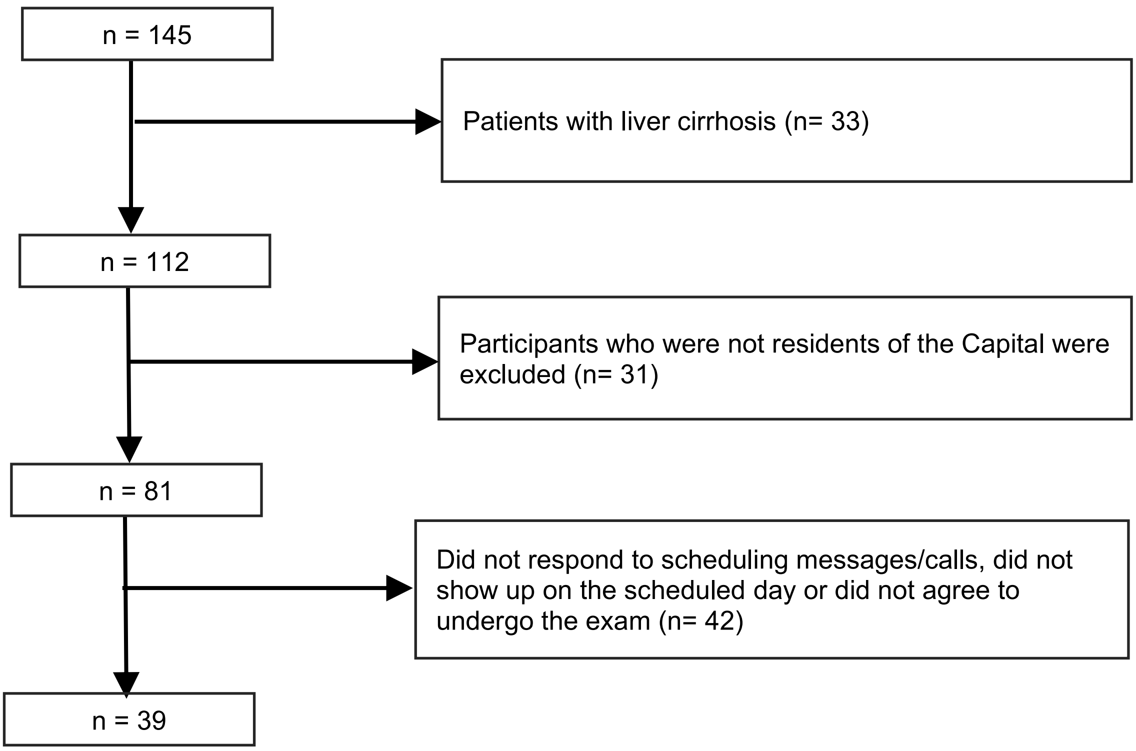

Figure 1 - Participant eligibility flowchart.

Data collection

For data collection, a survey form was applied containing questions about socioeconomic parameters, such as gender, education level, marital status and family income in minimum wages; and on the practice of physical activity, being classified according to criteria established by the Surveillance Survey of Risk and Protective Factors for Chronic Diseases by Telephone Inquiry (VIGITEL) (Ministério da Saúde, 2018).

Then, to measure the current individual's weight and height, parameters were used as proposed by the Food and Nutritional Surveillance System (SISVAN) (Ministério da Saúde, 2011), using a WISO® platform-type scale with capacity to 180 kg and accuracy of 100g, with attached stadiometer. The body mass index (BMI) was calculated using the formula Weight (kg) / Height squared (m^2).

To measure the HGS, a (Jamar®) hydraulic dynamometer was used, following the standardization performed by the American Society of Hand Therapists.15 Three measurements were taken to obtain the mean value, in the non-dominant hand (NDH) and dominant hand (DH), and the results were classified as recommended by the European Consensus on Sarcopenia, being considered with low HGS, when the result obtained was less than 16Kg for women and less than 27kg for men (Cruz-Jentoft and collaborators, 2019).

As for the evaluation of body composition, an (InBody® model 230) scale was used, which performs the measurement by Direct Segmental Multi-frequency Bioimpedance DSM-BIA, through a tetrapolar electrode system and frequency 20, 100 kHz. The patients were previously instructed about the necessary preparation, namely: fasting for at least two hours; not having practiced physical activity in the last 24 hours; do not drink alcohol for 24 to 48 hours; emptying the bladder 30 minutes before the test and, in the case of women, not having their menstrual period. Values for body weight (kg), body fat in grams and percentage, and body muscle mass (kg) were obtained.

In addition, two 24-hour recalls were applied, in a simple way and without induction, asking about the consumption of food and drinks ingested (estimated in household measures) in the 24 hours prior to the interview, with the purpose of evaluating protein intake. The first was carried out at the time of attendance, and the second, when the patient returned in person, both being carried out on weekdays, with the exception of Monday. For the analysis, household measures were transformed into grams or milliliters with the aid of the (Avanutri®) program.

Data analysis

For statistical analysis, the Statistical Package for Social Sciences software, version 21, was used. The descriptive results were expressed in absolute frequency and proportion. Spearman's correlation test was used to test the correlation between the HGS and the individuals' body composition, in addition to the correlation between muscle mass and protein intake.

Variables that showed statistically significant correlation in the bivariate analyzes were included in the multiple linear regression model. In the first regression analysis, HGS was considered as the dependent variable and muscle mass (kg), protein intake (g), age (years) was considered as covariates; BMI (kg/m^2) and the practice of physical activity (practitioner or non-practitioner). For the second regression analysis, muscle mass (kg) was considered as the dependent variable and protein consumption (g), age (years), BMI and physical activity practice (practitioner or non-practitioner) as covariates. A $p<0.05$ level of statistical significance was considered.

Ethical aspects

This study is part of the project entitled "Type 2 diabetes mellitus, cardiovascular risk and factors associated with metabolic syndrome in patients diagnosed with viral hepatitis treated at a reference center in the Amazon" approved by the Ethics Committee of first opinion number 4.120.268 (29/06/2020) and last opinion number 4.946.840 (01/09/2021) (for extension of data collection), complying with the legal requirements of Resolutions 466/12 and 510/16 of the Brazilian National Health Council and the Declaration of Helsinki.

RESULTS

Of the 39 individuals who met all the requirements for participation in the research, 76.92% (n= 30) were diagnosed with hepatitis C and 23.08% (n= 9) with hepatitis B, with a mean age of 54.66± 11.71 years. It is observed in table 1 that the majority were male, corresponding to 51.28% (n= 20); 89.74% (n= 35) had no higher education; 43.59% (n= 17) were married or in a stable relationship; 58.97% (n= 23) had a family income of up to one minimum wage and most did not perform physical activity (76.93%; n= 30).

Table 1 - Characterization of socioeconomic aspects and practice of physical activity of patients assisted in a reference center in the Amazon, Brazil, 2021.

	Mean / n	SD / %
Age	54.66	11.71
Gender		
Female	19	48.72
Male	20	51.28
Education level		
No higher education	35	89.74
Higher education	4	10.26
Marital status		
Unmarried	12	30.77
Married/Union Stable	17	43.59
Divorced	7	17.95
Widower	3	7.69
Family income (MW)		
< 1	23	58.97
2 - 3	13	33.33
4 - 5	1	2.56
> 4	2	5.13
Physical activity		
No practicea	30	76.92
Practice	9	22.08

MW-Minimum wage; a did not practice any physical activity in the last three months.

Regarding the anthropometric assessment, an average body weight of 70.76 ± 9.90 kg was observed, an average height of 1.61 ± 0.08 m and an average BMI of 26.94 ± 3.82 kg/m². In table 2 can be seen that when evaluating the HGS, the majority presented normality both in NDH (56.41%; n= 22) and in DH (69.23%; n= 27). As for body composition, weight averages of 70.76 ± 9.90kg; height averages of 1.61±0.08m; 25.44 ± 5.04kg of muscle mass; 24.66 ± 8.78kg (34.11±10.07%) of body fat were observed.

Table 2 - Characterization of hand-grip strength and body composition of patients assisted in a reference center in the Amazon, Brazil, 2021.

	Mean / n	SD / %
HGS (adequate)		
NDH	22	56.41
DH	27	69.23
Body composition		
Weight (kg)	70.76	9.90
Muscle mass (kg)	25.44	5.04
Body fat (kg)	24.66	8.78
Body fat (%)	34.11	10.07

HGS- handgrip strength; NDH - non-dominant hand; DH- dominant hand.

There was a correlation between HGS (NDH) and body muscle mass (kg) (r^2= 0.584; p= 0.000), in addition to an inverse correlation between HGS (NDH) and body fat in kg (r^2= -0.421; p=0.008) and in percentage (r^2= -0.570; p= 0.000).

By inserting the variables in the multiple linear regression model shown in Table 3, it was

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found that the correlation between HGS (NDH) and muscle mass (B= 0.505; CI 0.616; 2.243; p= 0.001) remained independent of protein intake (B=0.623; CI 0.910; 2.618; p=0.000), age (B= 0.622; CI 0.896; 2.626; p= 0.000), BMI (B= 0.622; CI 0.891-2.631; p= 0.000), and practice of physical activity (B= 0.622; CI 0.876; 2.641; p= 0.000).

Table 3 - Correlation between hand grip strength and muscle mass of individuals assisted in a reference center in the Amazon, Brazil, 2021.

	B	CI 95% (minimum; maximum)	p-value
Model 1			
Muscle mass	0.505	0.616-2.243	0.001
Model 2			
Muscle mass	0.623	0.910-2.618	0.000
Protein intake	-0.297	0.910-2.618	0.054
Model 3			
Muscle mass	0.622	0.896-2.626	0.000
Protein intake	-0.292	-0.296-0.007	0.061
Age	-0.057	-0.411-0.273	0.685
Model 4			
Muscle mass	0.622	0.891-2.631	0.000
Protein intake	-0.297	-0.299-0.006	0.059
Age	-0.053	-0.409-0.280	0.706
BMI	-0.112	-1.471-0.638	0.428
Model 5			
Muscle mass	0.622	0.876 – 2.641	0.000
Protein intake	-0.282	-0.299 – 0.020	0.084
Age	-0.053	-0.420 – 0.281	0.688
BMI	-0.103	-1.467 – 0.695	0.472
Physical activity	-0.057	-11.882 – 8.088	0.702

Linear regression model; Dependent variable: Hand grip strength (NDH) (Kg); covariate: muscle mass (Kg); Protein intake (g); Age (years); BMI- body mass index (Kg/m²); Practice of physical activity; B = Regression coefficient

Table 4 - Correlation between muscle mass and protein intake of individuals assisted in a reference center in the Amazon, Brazil, 2021.

	B	CI 95% (minimum; maximum)	p-value*
Model 1			
Protein intake	0.398	0.016 – 0.123	0.012
Model 2			
Protein intake	0.399	0.015 – 0.124	0.013
Age	-0.015	-0.140 – 0.127	0.923
Model 3			
Protein intake	0.403	0.015 – 0.125	0.014
Age	-0.016	-0.142-0.129	0.918
BMI	0.065	-0.338 – 0.513	0.679
Model 4			
Protein intake	0.408	0.013 – 0.129	0.017
Age	-0.018	-0.146 – 0.130	0.911
BMI	0.067	-0.344 – 0.526	0.674
Physical activity	-0.022	-4.180 – 3.667	0.895

Linear regression model; Dependent variable: Muscle mass (Kg); covariate: protein intake (g); Age (years); Practice of physical activity; BMI (body mass index). B = Regression coefficient

Furthermore, a correlation was found between body muscle mass (kg) and protein consumption (g) (r^2= 0.398; p= 0.012) in the bivariate correlation test. According to the significance shown in the bivariate analysis, the variables were chosen for the linear regression model shown in Table 4, which identifies the correlation between muscle mass and protein intake (B=0.398; CI 0.016; 0.123; p= 0.012), which remained regardless of age (B= 0.399; CI 0.015; 0.124; p= 0.013), BMI (B= 0.403; CI 0.015; 0.125; p= 0.014) and physical activity practice (B= 0.408 ; CI 0.013; 0.129; p= 0.017).

DISCUSSION

The present study observed a correlation between HGS and muscle mass in individuals with hepatitis B and/or C. Most participants were diagnosed with hepatitis C, had a mean age of 54.66 ± 11.71 years, were male, had no higher education, were married and had a family income of up to one minimum wage.

These results corroborate those observed in the Epidemiological Bulletin of Viral Hepatitis (Ministério da Saúde, 2023), in which from the years 2000 to 2022 there was a higher prevalence of hepatitis B (54.9%) and C (57.4%) in the male sex, and in the year 2021, it was observed that the highest detection rates occurred in the age groups of 55 to 59 years for hepatitis B over 60 years old for hepatitis C. In addition, the Bulletin also mentions that among the notified cases, the highest percentage is among those who had attended incomplete 5th to 8th grade.

As for family income, El Rouby and collaborators (2017) aimed to assess the nutritional status of patients with hepatitis C undergoing drug treatment and also observed that 71.6% of participants in their study had low family income.

Therefore, the hypothesis is suggested that people with lower family income and lower education level have less access to information about hepatitis and its forms of prevention, less access to health services and, consequently, lower vaccination coverage against HBV, contributing that way, for the infection.

Regarding the practice of physical activity, most participants reported not practicing. Similar to what was observed by Bruch and collaborators (2016) in which the authors aimed to assess the nutritional status and cardiovascular risk in patients with chronic hepatitis C, and observed that 56.9% (n=33) of the participants were inactive or irregularly physically active.

In the study by Van Dongen and collaborators (2022) the authors mention that the level of physical activity is among the factors that may contribute to the development and severity of sarcopenia in individuals with chronic liver disease.

Chen and collaborators (2020) report that increasing the practice of physical activity delays progression and potentially reverses the individual's frailty and disability.

When evaluating the HGS, the results of the present study differ from those observed by Gottschall and collaborators (2015), in which the authors aimed to evaluate and compare different methods of assessing the nutritional status of adult patients with HCV and describe inadequacies in food intake, and found only 31.7% of participants suitable for the HGS.

However, it is important to highlight that, despite the similar sample, differences may occur due to the instrument used and measurement techniques. Hanai and collaborators (2019) cite in their study that HGS is representative of whole body muscle strength and has been shown to be an independent indicator of nutritional status.

Regarding body composition, the results observed in the present study are similar to Gottschall and collaborators (2015), in which an average weight of 70.2 kg, average BMI of 26.3 kg/m^2 was observed. As for body fat, the result observed is similar to that found by Mateos-Muñoz and collaborators (2016) in which the authors analyzed body composition and nutritional deficiencies in chronic hepatitis C patients in non-cirrhotic and compensated cirrhotic stages, it was observed a mean of 29.4% of body fat.

With regard to muscle mass, Kim and collaborators (2020) evaluated the association between fibrosis changes and appendicular skeletal muscle and mass during antiviral therapy in patients with chronic hepatitis B, and observed a mean muscle mass of 20.9 ± 4.8kg, similar to the present study.

According to Silva, Bering and Rocha (2018) it is common to observe overweight or obesity in patients with chronic liver diseases, due to unfavorable changes in the lifestyle of the population in general, in relation to food consumption and/or decrease the practice of physical activity, thus contributing to the progression of the disease and a decrease in

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the quality of life of patients. Therefore, the nutritional assessment of patients with liver disease is extremely important.

Alves, Schmid, Benet (2018) mention that the high percentage of body fat observed in patients with chronic hepatitis C, for example, is considered an important risk factor for the onset of cardiovascular diseases and other associated complications.

When analyzing the linear regression model, it was observed that the correlation between HGS and muscle mass remained independent of protein intake, age, BMI and physical activity practice.

According to Cortez and collaborators (2020), HGS reduction may precede muscle mass loss, affecting morbidity and mortality in healthy people and patients with cirrhosis.

Therefore, it is suggested that HGS can be used as an early marker for assessing sarcopenia, so that a low HGS indicates reduced muscle mass. According to Hsu and Kao (2018), sarcopenia is commonly associated with several chronic diseases, including chronic liver diseases.

Sinclair and collaborators (2019) aimed to identify the sarcopenia identification tool that best predicts mortality and their respective prognosticability in patients with cirrhosis and waiting for liver transplantation. It was observed that the HGS, when used together with the model scale for end-stage liver disease, was the best predictor of mortality for these patients, suggesting its use for monitoring sarcopenia, as it is a technique without the dose radiation, as in the case of computed tomography and DEXA; no high cost; and without the difficulty of accessing other methods, in addition to being able to be used in series.

In the study by Yoh and collaborators (2020), it aimed to clarify the prognostic impact of sarcopenia related markers (HGS, muscle mass through bioimpedance and patient quality of life) in patients with chronic liver diseases, on the incidence of liver events, such as hepatic decompensation, acute-chronic hepatic failure, hepatic steatosis and hepatocellular carcinoma. The authors found that HGS can be an independent predictor for the development of liver events in these individuals.

The present study also observed a correlation between muscle mass and protein intake, which remained independent of age, type of hepatitis, BMI and practice of physical activity. Thus, it was found that protein intake contributes positively to the increase in muscle mass, so that, analogously, low intake can lead to increased malnutrition in these individuals.

The study by Park and collaborators (2019) investigated whether protein intake affects mortality, as well as complications, in patients with chronic liver disease. The authors concluded that an intake of less than 1.2 g/kg/day of protein in patients with chronic liver disease, decreases skeletal and limb muscle mass, arm circumference, HGS, as well as increases the frequency of sarcopenia.

Park, Choi and Hwang (2018) verified a dose-dependent effect of protein supplementation on muscle mass and frailty in pre-frail or malnourished frail elderly patients. It was identified that a high-protein diet of 1.5 g/kg/day, when compared to a standard diet of 0.8 and 1.2 g/kg/day, has beneficial effects in the prevention of sarcopenia and frailty.

However, Hong and collaborators (2021) concluded that elderly participants with non-alcoholic fatty liver disease, when consuming a higher amount of protein, had a significantly lower prevalence of sarcopenia, as well as factors related to sarcopenia.

Gottschall and collaborators (2015) found a trend between protein intake and HGS (p=0.054). Therefore, adequate protein consumption contributes to the maintenance of muscle mass, as well as inadequate consumption can increase the prevalence of malnutrition in these individuals.

Therefore, the use of HGS is suggested as a good predictor for assessing the muscle mass of patients with liver diseases, as it is a simple and easy method to be applied in the clinical area.

Hanai and collaborators (2019) recommends the use of HGS measurement, as it is a simple assessment, satisfactory cost-benefit, easy to transport, and suitable to be performed at the bedside to predict the health status of patients with cirrhosis.

Bering and collaborators (2018) also recommend that the use of HGS, with mid-arm muscle circumference, should be incorporated into routine clinical practice to detect low muscle mass, which may be underdiagnosed when only BMI is used.

In this sense, Chaudhari and collaborators (2021) cite that a comprehensive assessment of sarcopenia can provide ideal risk assessment tools and therapeutic strategies aimed at improving the patient's quality of life and preventing disease progression.

It is important to point out that the present study has the limitations of being a cross-sectional study with non-probabilistic convenience sampling.

In addition, data collection was carried out during the COVID-19 pandemic, which may have negatively influenced both the socioeconomic data and the assessment of the participants' body composition.

Furthermore, it was not possible to use other high-tech equipment, such as DEXA, magnetic resonance imaging, tomography or ultrasound, which would more accurately show the body composition of patients.

However, it is important to highlight that there is a scarcity of studies that evaluated the HGS of people with viral hepatitis without liver cirrhosis, and no studies carried out in the Amazon region were found.

Therefore, it is suggested that new nutritional intervention studies be carried out to assess body composition using anthropometric parameters and more precise technological equipment.

Studies are also suggested to verify the etiology of sarcopenia in patients with liver diseases, particularly viral hepatitis B and C, as well as different trials on clinical and dietary interventions in the evaluated outcomes.

CONCLUSION

The present study observed a correlation between HGS and muscle mass regardless of protein intake, age, body mass index and physical activity practice.

In addition, there was a correlation between muscle mass and protein intake, which remained independent of age, body mass index and physical activity practice.

It is suggested the use of HGS to verify and monitor the loss of muscle strength in patients with viral hepatitis, as it is a simple method, easy to transport and apply, satisfactory cost-benefit and adequate to be performed for nutritional diagnosis and care.

In addition, the importance of multidisciplinary follow-up with these individuals is also highlighted, and the establishment and strengthening of public policies that encourage changes in the lifestyle of people with viral hepatitis.

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REFERENCES

1-Alves, T.C.; Schmidt, L.; Benetti, F. Perfil nutricional e dietético de pacientes com hepatite C: uma revisão integrativa da literatura. Revista interdisciplinar de promoção da saúde. Vol. 1. 2018. p. 144-152.

2-Bering, T.; Diniz, K.D.; Coelho, M.P.P.; Vieira, D.A.; Soares, M.M.S.; Kakehasi, A.M.; Correia, M.I.T.D.; Teixeira, R.; Queiroz, DMM.; Rocha, GA.; Silva, LD. Association between pre-sarcopenia, sarcopenia, and bone mineral density in patients with chronic hepatitis C. J Cachexia Sarcopenia Muscle. Vol. 9. 2018. p. 255-268.

3-Bruch, J.P.; Álvares-da-Silva, M.R.; Alves, B.C.; Dall'Alba, V. Reduced hand grip strength in overweight and obese chronic hepatitis c patients. Arq Gastroenterol. Vol. 53. 2016. p. 31-35.

4-Chaudhari, R.; Fouda, S.; Sainu, A.; Pappachan, J.M. Metabolic complications of hepatitis C virus infection. World J Gastroenterol. Vol. 27. 2021. p. 1267-1282.

5-Chen, H.W.; Ferrando, A.; White, M.G.; Dennis, R.A.; Xie, J.; Pauly, M.; Park, S.; Bartter, T.; Dun, M.A.; Ruiz-Margain, A.; Kim, W.R.; Duarte-Rojo, A. Home-based physical activity and diet intervention to improve physical function in advanced liver disease: a randomized pilot trial. Dig Dis Sci. Vol. 65. 2020. p. 3350-3359.

6-Cortez, A.F.; Almeida, V.P.; Corrêa, B.B.; Reis, B.C.C.; Reis, G.S.; Barreto, F.S.; Bastos, P.R.; Mello, C.E.B. Nutritional assessment, handgrip strength and adductor pollicis muscle thickness in patients with chronic viral hepatitis. Clin Nutr Exp. Vol. 29. 2020. p. 49-61.

7-Cruz-Jentoft, A.J.; Bahat, G.; Bauer, J.; Boirie, Y.; Bruyère, O.; Cederholm, T.; Cooper, C.; Landi, F.; Rolland, Y.; Sayer, A.A.; Schneider, S.M.; Sieber, C.C.; Topinkova, E.; Vandewoude, M.; Visser, M.; Zamboni, M. Sarcopenia: revised European consensus on definition and diagnosis. Age Ageing. Vol. 48. 2019. p. 16-31.

8-Duarte, G.; Pezzuto, P.; Barros, T.D.; Mosimann Junior, G.; Martínez-Espinosa, F.E. Protocolo Brasileiro para Infecções Sexualmente Transmissíveis 2020: Hepatites virais. Epidemiol. Serv. Saúde. Vol. 30. 2021. p. e2020834.

9-El Rouby, W.H.; Al Sabaee, H.A.A.; Iskander, L.N.; Mehrez M.I. Nutritional assessment of patients with chronic hepatitis c treated with Sofosbuvir combined with Daclatasvir. Nurs Health Sci. Vol. 6. 2017. p. 61-67.

10-Endo, K.; Kakisaka, K.; Kurod, H.; Miyasaka, A.; Takikawa, Y.; Matsumoto, T. Annual changes in grip strength and skeletal muscle mass in chronic liver disease: observational study. Scientific Reports. Vol. 13. 2023. p. 1648.

11-Gottschall, C.B.A.; Pereira, T.G.; Tabito, E.I.; Alvares-da-Silva, M.R. Nutritional status and dietary intake in non-cirrhotic adult chronic hepatitis c patients. Arq Gastroenterol. Vol. 52. 2015. p. 204-209.

12-Hanai, T.; Shiraki, M.; Imai, K.; Suetsugu, A.; Takai, K.; Moriwaki, H.; Shimizu, M. Reduced handgrip strength is predictive of poor survival among patients with liver cirrhosis: A sex-stratified analysis. Hepatology Research. Vol. 49. 2019. p. 1414-1426.

13-Hiraoka, A.; Michitaka, K.; Ueki, H.; Kaneto, M.; Aibiki, T.; Okudaira, T.; Kawakami, T.; Yamago, H.; Suga, Y.; Tomida, H.; Miyamoto, Y.; Azemoto, N.; Mori, K.; Miyata, H.; Tsubouchi, E.; Ninomiya, T.; Hirooka, M.; Abe, M.; Matsuura, B.; Hiasa, Y. Sarcopenia and two types of presarcopenia in Japanese patients with chronic liver disease. Eur J Gastroenterol Hepatol. Vol. 28. 2016. p. 940-947.

14-Hong, J.; Shin, W.K.; Lee, J.W.; Kim, Y. Relationship Between Protein Intake and Sarcopenia in the Elderly with Nonalcoholic Fatty Liver Disease Based on the Fourth and Fifth Korea National Health and Nutrition Examination Survey. Metab Syndr Relat Disord. Vol. 19. 2021. p. 452-459.

15-Hsu, C.S.; Kao, J.H. Sarcopenia and chronic liver diseases. Expert Rev Gastroenterol Hepatol. Vol. 12. 2018. p. 1229-1244.

16-Kim, B.K.H.; Joo, D.J.; Lee, Y.H.; Kim, B.K.; Park, J.Y.; Kim, D.Y.; Ahn, S.H.; Han, K.H.; Kim, S.U. Association between liver fibrosis and appendicular skeletal muscle mass during antiviral therapy in chronic hepatitis B. Dig. Liver Dis. Vol. 52. 2020. p. 1338-1345.

17-Mateos-Muñoz, B.; Larrad-Sáinz, A.; Torrejón, M.J.; Devesa-Medina, M.J.; Matía-Martín, M.P.; Cárdenas, M.C.; Suárez, A.; Ortega-Medina, L.; Rey-Díaz-Rubio, E.; Ladero, J.M. The relation of fibrosis stage with nutritional deficiencies and bioelectrical impedance analysis of body composition in patients with chronic hepatitis C. Ann. Hepatol. Vol. 15. 2016. p. 492-500.

18-Ministério da Saúde. Boletim epidemiológico - hepatites virais. Secretaria de Vigilância em Saúde. Departamento de Vigilância, Prevenção e Controle das IST, do HIV/Aids e das Hepatites Virais. Brasília. Brasil. 2023. p. 83.

19-Ministério da Saúde. Orientações para a coleta e análise de dados antropométricos em serviços de saúde: Norma Técnica do Sistema de Vigilância Alimentar e Nutricional – SISVAN. Brasília, Brasil. 2011. p. 132.

20-Ministério da Saúde. Vigitel. Vigilância de fatores de risco e proteção para doenças crônicas por inquérito telefônico: estimativas sobre frequência e distribuição sociodemográfica de fatores de risco e proteção para doenças crônicas nas capitais dos 26 estados brasileiros em 2017. Brasília. Brasil. 2018. p. 132.

21-Nishikawa, H.; Shiraki, M.; Hiramatsu, A.; Hara, N.; Moriya, K.; Hino, K.; Koike, K. Reduced handgrip strength predicts poorer survival in chronic liver diseases: a large multicenter study in Japan. Hepatol. Res. Vol. 51. 2021. p. 957-967.

22-Ooi, P.H.; Hager, A.; Mazurak, V.C.; Dajani, K.; Bhargava, R.; Gilmuor, S.M.; Mager, D.R. Sarcopenia in chronic liver disease: impact on outcomes. Liver Transpl. Vol. 25. 2019. p. 1422-1438.

23-Park, J.H.; Jun, D.W.; Yoon, J.H.; Lee, K.N.; Lee, H.L.; Lee, O.Y.; Yoon, B.C.; Choi, H.S. Pattern and Effect of Protein Intake in Patient with Chronic Liver Disease. Gut & Liver. Vol. 13. 2019. p. 29.

24-Park, Y.; Choi, E.J.; Hwang, H.S. Protein supplementation improves muscle mass and physical performance in undernourished prefrail and frail elderly subjects: a randomized, double-blind, placebo-controlled trial. Am J Clin Nutr. Vol. 108. 2018. p. 1026-1033.

25-Silva, L.D.; Bering, T.; Rocha, G.A. The impact of nutrition on quality of life of patients with hepatites C. Curr Opin Clin Nutr Metab Care. Vol. 20. 2018. p. 420-425.

26-Sinclair, M.; Chapman. B.; Hoermann. R.; Angus, P.W.; Testro, A.; Scodellaro, T.; Gow, P.J. Handgrip strength adds more prognostic value to the model for end-stage liver disease score than imaging-based measures of muscle mass in men with cirrhosis. Liver Transp. Vol. 25. 2019. p. 1480-1487.

27-Van Dongen, C.; Paik, J.M.; Harring, M.; Younossi, Y.; Price, J.K.; Kabbara, K.; Golabi, P.; Younossi, Z.M. Sarcopenia, healthy living, and mortality in patients with chronic liver diseases. Hepatol. Commun. Vol. 6. 2022. p. 3140-3153.

28-Warner, E.R.; Satapathy, S.K. Sarcopenia in the Cirrhotic Patient: Current Knowledge and Future Directions. J Clin Exp Hepatol. Vol. 13. 2023. p. 162-177

29-Yoh, K.; Nashikawa, H.; Enomoto, H.; Iwata, Y.; Ikeda, N.A.N.; Nishimura, T.; Lijima, H.; Nishiguchi, S. Grip Strength: A Useful Marker for Composite Hepatic Events in Patients with Chronic Liver Diseases. Diagnostics. Vol. 10. 2020. p. 238.

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