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SUBJECTIVE GLOBAL ASSESSMENT AND THE ROYAL FREE HOSPITAL GLOBAL EVALUATION IN CHRONIC LIVER DISEASE

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ABSTRACT

Introduction: Malnutrition in patients with chronic liver disease is common. Its prognostic value for life is indisputable due to its impact on morbidity and mortality. However, to date there is no ideal method for nutritional assessment in this pathology. Objective: to compare the Subjective Global Assessment (SGA) and the Royal Free Hospital Global Assessment (RFH-GA) as a nutritional assessment tool in adults with liver disease. Methods: Cross-sectional, field and correlational study. The non-probabilistic random sample was made up of 65 subjects, to whom both nutritional evaluation methods were applied. For SGA, the Detski form was used and for the evaluation with the Royal Free Hospital the Morgan algorithm was used. Results: In the SGA, 52 subjects presented malnutrition (55.4% reflected moderate malnutrition and 24.6% severe malnutrition). In the RFH-GA, it was found that 47 subjects presented malnutrition (46.2% moderate malnutrition and 26.2% severe malnutrition). Regarding gender, in the SGA, women predominated in moderate malnutrition in both methods; and in the RFH-GA, men predominated in severe malnutrition. The SGA presented a sensitivity of 97%, specificity of 60%; AUC 0.80; (95% CI 0.66 to 0.97), RFH-GA had a sensitivity of 95%, specificity 84% AUC 0.89 (95% CI 0.79 to 1.00). Conclusions: The SGA and RFH-GA methods demonstrated a sensitivity greater than 90%. However, the RFH-GA seems to better classify patients with normal nutritional status, reflecting a greater specificity in relation to that observed in the SGA.

Keywords: Nutritional assessment, liver cirrhosis, nutritional status

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INTRODUCTION

The liver is a vital organ that has various functions in the metabolic processes of macro- and micronutrients, such as protein synthesis. It has (1) activity as a detoxifying and immune organ that detects and eliminates pathogens, a great regenerative and vascular capacity (2). It should be noted that when some pathogenic factors affect the liver, certain functions are altered, producing liver disease, which can be acute or chronic (1,2).

Chronic liver disease (CLD) is a continuous and progressive process of liver fibrosis, with architectural distortion of the tissue and formation of regeneration nodules. As it progresses it leads to the activation of hepatic stellate cells, which lead to an excessive tissue repair response, which favors liver fibrosis, cirrhosis and finally liver cancer (3,4). During the course, complications such as edema, jaundice, portal hypertension, malnutrition, esophageal varices, ascites and encephalopathy may appear (5).

The age group in which CLD predominates is between 40 and 60 years (6), according to Lebroc et al. They found in their study that between 52 and 67 years was the average age at the diagnosis of liver cirrhosis (7). On the other hand, among the most frequent causes that lead to chronic liver failure are liver disease associated with alcohol consumption (60-70%), followed by non-alcoholic fatty liver, biliary obstruction and hemochromatosis (5-10%). (5).

In Central European countries, alcohol and viral hepatitis contribute equally to the disease burden, with alcohol being the predominant cause in Western countries. Two-thirds of patients with liver disease died before the age of 65 years. (8-10). It has been reported that 844 million people in the world suffer from cirrhosis, with a mortality rate of approximately 2 million per year. Of those affected, about 20% have compensated cirrhosis and between 65% to 95% of those who suffer from this pathology have protein-calorie malnutrition (11).

In this sense, an important aspect that must be evaluated and monitored in patients with chronic liver disease is the nutritional status, since, in the evolution of the disease, protein-calorie malnutrition is the most observed at any stage of the disease and it is associated with a high morbidity and mortality (12). Its origin is multifactorial and three factors that contribute to it can be identified, such as the limitation or reduction of food intake, alteration in the digestion and absorption of nutrients, and interference in nutrient metabolism (13,14).

The pathophysiological factors that lead patients with cirrhosis to varying degrees of malnutrition are complex and very difficult to be fully understood. As cirrhosis progresses, malnutrition becomes more pronounced (15). Hence the importance of evaluating the nutritional status of these patients, with the aim of identifying whether malnutrition exists and directing therapeutic measures to prevent the complications that arise from it (16). Nutritional evaluation in chronic liver disease should be based on anthropometric methods, which allow the evaluation of body size and proportions. Likewise, non-anthropometric methods were used, such as: the evaluation of body composition with a specific focus on muscle mass, functional evaluation, dietary evaluation, as well as applying screening tools that allow identifying nutritional risk (17,18).

In this order of ideas, within the most used methods for detecting malnutrition or nutritional risk, one of the most used is the Royal Free Hospital Global Assessment (RFH-GA), as it is a reproducible nutritional assessment method that correlates with other measures of body composition and predicts complications and post-transplant survival (19,20). Likewise, the Subjective Global Assessment (SGA) is considered another diagnostic tool for the nutritional status of these patients. It has a sensitivity of 96-98% and a specificity of 82-83% (21-23).

With this method, Nunes et al. (24) evaluated 130 patients with chronic liver disease (80 men and 50 women aged between 22 to 89 years) through outpatient consultation. They found a prevalence of malnutrition of 44%, of which 31% presented moderate malnutrition and 10% were severely malnourished; Likewise, Sharma et al. (25), in an unicenter cross-sectional observational study, 251 cirrhotic patients (199 men and 52 women) with an average age of 51 years were evaluated. They applied the SGA and reported that 65% of the subjects presented malnutrition (42% moderate malnutrition and 23% severe malnutrition).

The Royal Free Hospital Global Assessment (RFH-GA) was developed specifically for use in patients with liver cirrhosis, it is a global scheme that incorporates subjective and objective variables (26). Regarding its application, Gottschall et al. (27) carried out research where they applied different methods (BMI, SGA, grip strength (HGS), RFH-GA) to evaluate the nutritional status of 94 adult patients with the hepatitis C virus. The results obtained reflected that the prevalence of malnutrition was highest in the grip strength (HGS) 60.6% followed by RFH-GA 53.2%, while the methods that identified malnutrition the least were the VGS 16% and the BMI with 6.4%. These authors concluded that both grip strength (HGS) and RFH-VG can be good methods to detect malnutrition in subjects with liver disease.

In accordance with the above, it is necessary to carry out studies that provide evidence on the most appropriate method for the nutritional diagnosis of these patients. The present study aimed to compare the Subjective Global Assessment (SGA) and the Royal Free Hospital Global Assessment (RFH-GA) as a nutritional assessment tool in adults with liver disease.

METHODS

This research was of a field, correlational and non-experimental cross-sectional design. The population was made up of patients who attended the outpatient Nutrition consultation of the Gastroenterology Service of the University Hospital of Maracaibo, Zulia state, Venezuela, during the months of May to November 2019, from which a non-probabilistic random sample was selected. made up of 65 patients.

This research was approved by the Academic Committee of the Clinical Nutrition Specialty of the Division of Graduate Studies of the Faculty of Medicine of the University of Zulia and by the Ethics Committee of the University Hospital of Maracaibo. Research procedures were carried out in accordance with the Declaration of Helsinki (28). All subjects signed the informed consent. The **Inclusion criteria included: a)** both genders, b) age between 25-65 years and c) with a diagnosis of chronic liver disease. The **Exclusion criteria were a)** Patients with a diagnosis of liver failure or cancer b) patients with any acute complication of the disease (gastrointestinal bleeding, peritonitis, infections, encephalopathy).

Procedures:
To collect data from the selected subjects, the following evaluations were carried out: clinical, anthropometric and dietary using the respective forms.

Nutritional assessment
For the SGA, the form of Detski et al. was used. (29) that classifies nutritional status into three categories based on five parameters: (weight change, dietary intake relative to usual, gastrointestinal symptoms, functional capacity and metabolic stress of the underlying diagnosis) and three physical examination parameters (loss of subcutaneous fat, loss of muscle mass, and edema/ascites). The components are then combined to obtain a rating of (A) well nourished, (B) moderately malnourished, and (C) severely malnourished.

For the evaluation with the Royal Free Hospital SGA, the Morgan et al. algorithm was used. (30), which includes an algorithm that includes: Body Mass Index (BMI) greater and less than 20 kg/m2, arm muscle circumference (greater and less than the 5th percentile) and dietary intake (is is classified as adequate, inadequate and insignificant depending on whether it meets the requirements or is less or more than 500 kcal/day). After the respective calculations it was classified into 3 categories: adequately fed, moderately malnourished (or suspected of being so) and severely malnourished.

Anthropometric indicators:

Weight: The patient with the minimum of clothing possible was weighed on the scale balanced at zero. The subject remained standing motionless in the center of the scale with the body weight distributed between both feet (31). The estimate of dry weight in ascites was estimated according to the severity of ascites formulated by Carvalho et al (32), subtracting 2 kg in patients with grade 1 ascites, 4 kg with grade 2 and 8 kg with grade 3. To obtain body weight, a platform scale from the Health Ometer brand Continental Scale Corporation, Bridgeview, Illinois, USA, calibrated in kg (0.1 kg), was attached with a stadiometer calibrated in cm (0.1 cm).

Size: They stood with their heels together forming a 45° angle. The heels, buttocks, back and occipital region were in contact with the vertical surface of the stadiometer. The recording was taken in cm, with a forced inspiration of the subject, and with a slight traction of the anthropometrist from the lower jaw, keeping the subject with the head in the Frankfurt Plane (31).

Body Mass Index: The Quetelec equation was applied that includes (BMI): mass (kg)/height (m2), according to which the patients were classified BMI according to the Campillo criteria (33), with the point of cut-off of 22 kg/m² patients without ascites, adapting it to the WHO classification, in the following cut-off points: Deficit <22, Normal: 22 – 24.9 Overweight: 25-29.9 Obesity I: 30-34, 9 Obesity II: 35.0 to 39.9 and obesity III: 40 or more.

Mid-arm circumference: the level of the midpoint between the acromial and radial points was measured. To take this perimeter, the length of the arm was measured from the beginning; with the right forearm bent forward (at a 90° angle) perpendicular to the body and with the back of the hand facing away from the body. The length was determined by placing the tape on the superior vertex of the acromion of the scapula to the olecranon of the ulna (and head of the radius). The individual remained relaxed, uncovered (no sweater, shirt, etc.), upright, in profile, arms resting on his thighs. Next, the subject's arm was extended to pass the measuring tape horizontally (around the arm), without pressure, and making contact with the skin. At that moment the perimeter reading was taken (31). Taking into account the different cut-off points for its assessment: the corresponding percentile (34).

Dietary indicators:

Dietary intake: for the dietary evaluation, the 24-hour reminder was used. It consisted of collecting the most detailed information possible regarding the foods and drinks consumed (type, quantity, method of preparation, etc.), for three non-consecutive days (2 business days and one weekend day). The interview was conducted by a clinical nutritionist who emphasized the quantities and types of foods, as well as special preparations (recording measurements and ingredients used). The size of the portions of the preparations commonly used by each patient were estimated with the help of modeled foods and measuring equipment provided by said professional (35). To calculate the contribution of energy and nutrients, a computer program was used with data from the Food Composition Table of Venezuela (36). Individual consumption of energy were expressed in Kcal/day and macronutrients in grams of protein/day, grams of fat/day and grams of carbohydrates/day (37).

Analysis of data
The statistical program Statistical Package for the Social Sciences (IBM SPSS), version 23 for Windows, was used. These data were previously entered into a database created in Microsoft Excel for Windows. To verify the normal distribution of the data, the Kolmogorov test was applied. -Smirnov. The qualitative variables were expressed in the form of absolute and relative frequencies. The mean was used as a measure of central location, as well as the standard deviation.

To determine the suitability characteristics of the studied methods, they were grouped by pathology. To compare the methods, they were regrouped into two bivariate variables ESR and HRF-GA, grouping at-risk and malnourished patients into a single group. Differences between means were analyzed using the t for independent samples or the Mann-Whitney test. In the statistical analysis, the sensitivity (S), the specificity (Sp), the positive predictive value (PV +) and the negative predictive value (PV-), and the positive (RV+) and negative (RV-) likelihood ratio were calculated. They were compared using the ROC (Receiver operating characteristic) curve (38). The Cronbach method was applied for reliability. Values of $p<0.05$ were considered statistically significant results.

RESULTS

Table 1 shows the distribution of subjects by age and gender groups. A total of 65 subjects (36 men and 29 women) were evaluated. In relation to the distribution of age groups, it was found that the highest prevalence in both genders corresponded to the age group between 50-65 years, representing 76.9%, with a predominance in both men and women, reflecting a significant response in comparison. with the other two age groups.

TABLE 1
DISTRIBUTION OF SUBJECTS BY AGE GROUP AND GENDER

		Gender		
Age groups	**Total** (n=65)	Male (n=36)	Female (n=29)	p<0.05*
25-34	3 (4.6)	02 (6)	01(4)	0.00
35-49	12 (18.5)	09 (25)	03 (10)	
50-65	50 (76.9)	25 (69)	25 (86)	

**p:* determined by chi square. It is considered significant when p<0.05

Table 2 shows the anthropometric characteristics of the subjects according to gender, the average current weight in the group of men was 77±23 kg and in women it was 61.48±13 kg. Likewise, the dry weight in men was higher, at 70±34 kg, while in women it was 54.91±12 kg. The height for the male gender was recorded as 171±5.8 cm and for the female gender it was 157±8.4 cm. Regarding BMI, in the male group this corresponded to 25.8 ± 7.1 kg/m2

TABLE 2
ANTHROPOMETRIC CHARACTERISTICS OF SUBJECTS ACCORDING TO GENDER

		Gender		
	Total (n=65)	**Male** (n=36)	**Female** (n=29)	p<0.05*
Current weight (kg)	70.50 ± 21	77±23	61.48 ± 13	0.00
Dry Weight (kg)	64.10±20	70.34 ± 21	54.91 ± 12	0.00
Size (cm)	165 ±10	171±5.8	157±8.4	0.00
BMI kg/m²	23.5± 6	24.0 ± 7.1	22.2±4.0	0.80
Weight loss 3 months (cm)	5.8±5.3	5.94 ± 5.7	5.68±5.1	0.78
Upper arm circumference (cm)	26.59±5.27	27.23±6.1	25.79±3.59	0.76

Values are represented as mean ± SD.**p:* determined by student's T for a sample. It is considered significant when p<0.05

Table 3 presents the nutritional status determined by the subjective global assessment and the royal free hospital evaluation according to gender, while in the female group the BMI was 23.13±4.0 kg/m2; In relation to weight loss in the last 3 months, it was very similar in both groups, with men reflecting a weight loss of 5.94±5.7 kg while in women it was reflected at 5.68±5. .1kg; Finally, the arm circumference in the male group was observed at 27.23±6.1 cm and in the female group 25.79±3.59 cm.

TABLE 3
NUTRITIONAL STATUS DETERMINED BY THE SUBJECTIVE OVERALL ASSESSMENT AND THE ROYAL FREE HOSPITAL EVALUATION ACCORDING TO GENDER

Nutritional condition	VGS				HRF-VG			
	Gender				Gender			
	Total (n=65)	Male (n=36)	Female (n=29)	p<0.05	Total (n=65)	Male (n=36)	Female (n=29)	*p<0.05
Well nourished	13 (20)	09 (25)	04 (13.8)		18 (27.6)	11 (30.6)	07(24.2)	
Moderate malnutrition	36(55.4)	18 (50.0)	18 (62.1)	0.001	30 (46.2)	13 (36.1)	17(58.6)	0.080
Severe malnutrition	16(24.6)	09 (25.0)	07 (24.1)		17 (26.2)	12 (33.3)	05 (17.2)	

The values are represented n (%). *p: determined by Pearson's chi square. It is considered significant when p<0.05

Table 3 shows the nutritional status determined by the ESR and the RFH-GA according to gender. Observing in the SGA a total of 52 patients (80%) presented malnutrition, of which 55.4% reflected moderate malnutrition and 24.6% severe malnutrition. Regarding the male gender, 50% presented moderate malnutrition and 25% severe malnutrition and 25%; while in women 62% were observed with moderate malnutrition and 24.1% with severe malnutrition. A predominance was observed in both groups of the female gender for moderate malnutrition. Severe malnutrition predominated in men. In the same table 3 it is recorded that RFH-GA was applied to 65 patients of which 47 or 72.4% presented malnutrition, among them 46.2% had moderate malnutrition, 26.2% severe malnutrition and 27.6% had adequate nutritional status. In relation to gender distribution, 36.1% of men had moderate malnutrition, 33.3% had severe malnutrition and 30.6% reflected good nutritional status. Meanwhile, in women, 58.6% of moderate malnutrition was evident, 17.2% of severe malnutrition and 24.2% were included in the normal nutritional status.

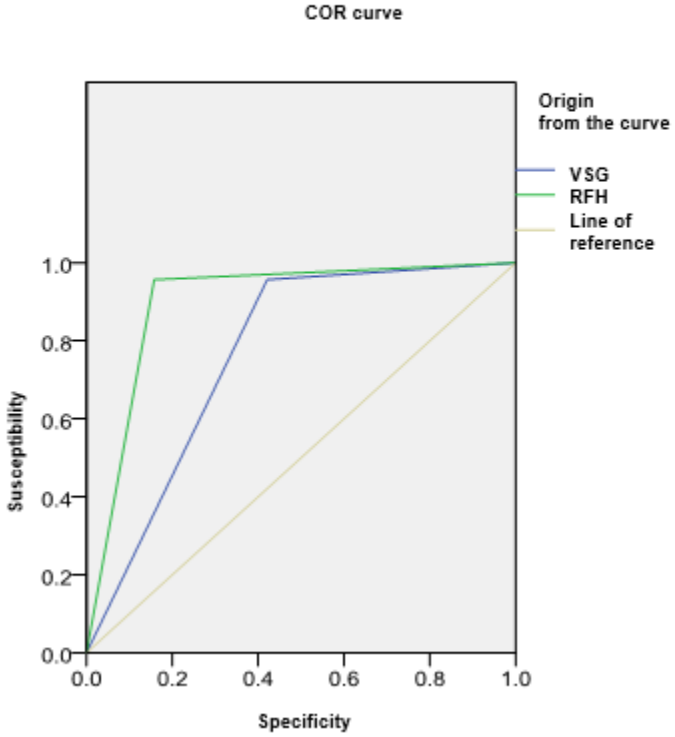
Table 4 indicates the reliability of the SGA and the RFH-VG according to Cronbach's Alpha. In the SGA, the Cronbach's Alpha was 0.81, while in the RFH-GA, it corresponded to 0.89.

TABLE 4
RELIABILITY OF THE SUBJECTIVE OVERALL ASSESSMENT AND ROYAL FREE HOSPITAL EVALUATION

According to Alfa Cronbach			VSG		HRF-VG	
			Reliability statistic		Reliability statistic	
Cases	No.	%	Cronbach's alpha	No. of items	Alpha of Cronbach	No. of items
Valid	65	100	0.819	06	0.897	04
Excluded	0	0				
Total	65	100				

Graph 1 shows the comparison of the COR curve between the SGA Method and HRF-GA, observing that the HRF-GA method has greater discriminative power for malnutrition, compared to the SGA method, since it has a sensitivity to detect malnutrition of 95%. specificity of 84%, PV+ 93%, VP- 88%, RV+ 5.93, RV- 0.16. Area under the curve 0.89, with 95% confidence interval (CI 0.79- 1.00) p<0.01; while SGA has a sensitivity to detect malnutrition of 97%, specificity of 60%; PV+ 84%; PV- 92%, RV+ 2.42, RV- 0.41; the area under the curve 0.80; with a 95% confidence interval (0.66 – 0.97) p<0.01-

FIGURE 1
COMPARISON BETWEEN THE NUTRITIONAL ASSESSMENT METHODS SUBJECTIVE GLOBAL ASSESSMENT AND THE ROYAL FREE HOSPITAL EVALUATION



DISCUSSION

Malnutrition is a common comorbidity in patients with cirrhosis. Its prognostic value is indisputable since it greatly influences the evolution of liver diseases, having a great impact on both morbidity and mortality before and after liver transplantation. Therefore, early detection and active management is essential for the well-being and survival of these patients (26). To date, there is no nutritional evaluation method that can be considered an ideal model or Gold Standard to adequately classify the nutritional status of patients with chronic liver disease (38). That is why the present research aimed to compare both nutritional assessment tools in adult patients with liver disease.

Different research groups have evaluated different tools for the nutritional evaluation of cirrhotic patients; SGA being one of the most studied and recommended. Both the European Association for the Study of the Liver (EASL) and the European Society for Enteral and Parenteral Nutrition (ESPEN) recommend its use in the nutritional evaluation of liver patients (19,39). Taniguchi et al. (40) report that SGA is one of the most used nutritional screening tools in various diseases due to its simplicity and safety. However, its validity to evaluate nutritional status in liver diseases has been controversial.

Rosemary et al. (16); point out that the SGA is not an adequate method to measure the risk of malnutrition due to excess, since when assessing overweight or obese subjects it includes them within the well-nourished group. So, although the SGA has not been developed specifically for the nutritional evaluation of patients with liver disease, some authors consider it as a reliable, valid tool with predictive value for patients with cirrhosis (13, 41,42).

In the present study, the prevalence of both moderate and severe malnutrition, determined by ESR, differs from the figures reported by Moctezuma et al. (43); who applied the ESR to 315 patients with CLD (66% men and 34% women) with an average age of 54 years, reflecting 60% of malnourished patients, 49% moderate malnutrition and 11% with severe malnutrition.

On the other hand, Bunchhorntavakul et al. (44), evaluated 60 patients with CLD by SGA with an average age of 57.45 years (42 men and 18 women), reporting a total of 91.7% malnourished patients of which 66.7% subjects presented severe malnutrition and 25% reflected moderate malnutrition. These results were higher than those reported in the present investigation; meanwhile El-Mohsen et al. (45), evaluated 125 subjects (72 men and 53 women) with liver cirrhosis by SGA, average age of 56.8 years, finding results similar to those observed in the present research: 77.6% malnourished subjects, including 61.6% with moderate malnutrition and 16% with severe malnutrition.

On the other hand, the results obtained through RFH-GA in the present study were lower than those found by Naqvi et al. (46); who applied the RFH-GA to 298 subjects (182 male and 116 female) with chronic liver disease, reporting a total of 85.56% of malnourished subjects, 54.02% subjects with mild malnutrition

and 31.54% subjects with severe malnutrition. Landa-Galvan et al. (47); evaluated the nutritional status of 62 patients (51.6% men and 48.4% women) through different nutritional evaluation methods including the RFH-GA, reporting 45.2% subjects with malnutrition, including 35.5% with malnutrition. moderate and 9.7% with severe malnutrition, figures lower than those reported in this research work.

Regarding the RFH-GA, it could be observed that it classified fewer patients with malnutrition in relation to the SGA method. This could be because this nutritional assessment tool includes the average arm circumference, which can be a good estimator to calculate muscle reserves, since it is not affected by water retention like other areas of the body (30). It could also be explained by the fact that this assessment allows the classification of nutritional status based on dietary factors, which allows us to know specifically whether the daily dietary intake is adequate, inadequate or insignificant and whether it is contributing to the deterioration of nutritional status (19).

Regarding the validation of the SGA and RFH-GA methods for detecting the nutritional status of patients with chronic liver disease, in the present study it was found that the two tools demonstrated a sensitivity greater than 90%. However, the RFH-GA seems to better classify patients with normal nutritional status, reflecting a greater specificity in relation to that observed in the SGA. In this sense, Castellanos et al. (48) applied this method to 116 patients (57 men and 64 women) with an average age of 59 years, finding a sensitivity of 61.3%, and specificity 72.3%, results that differ from those obtained in the present research work.

CONCLUSIONS

The SGA and RFH-GA methods demonstrated a sensitivity greater than 90%. However, the RFH-GA seems to better classify patients with normal nutritional status, reflecting a greater specificity in relation to that observed in the SGA.
Finally, having simple and validated screening tools in the nutritional assessment of liver patients is very useful since it would allow the early detection of malnutrition and would favor the application of strategies aimed at avoiding or minimizing the impact of malnutrition on complications, an increase in morbidity and mortality, hospital stay and healthcare costs.

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