GLIM criteria: Internal consistency analysis and comparison with the Subjective Global Assessment

Criterios GLIM: análisis de su consistencia interna y comparación con respecto a la valoración global subjetiva

Critérios GLIM: Análise de sua consistência interna e comparação com relação à avaliação subjetiva global

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Summary

Background: The Global Leadership Initiative on Malnutrition (GLIM) criteria, created to establish a global consensus on diagnostic criteria for disease-related malnutrition (DRM), needs to be validated in order to be used in clinical practice.

Objective: To estimate the internal consistency of GLIM criteria and compare it with the Subjective Global Assessment (SGA) of Nutritional Status as a tool for diagnosing malnutrition in hospitalized patients with nutritional risk.

Methods: 123 hospitalized adults at risk of malnutrition (MN) (Short Nutritional Assessment Questionnaire [SNAQ] ≥2) were assessed. Both SGA and GLIM criteria were used to diagnose MN. The level of concordance, validity, safety and probability ratio between SGA and GLIM were determined.

Results: The prevalence of MN detected by GLIM was 91 % with 52.03 % categorized as severe malnutrition. When using SGA, the prevalence of malnutrition was 88.62 %, with 32.52 % detected as severe. The internal consistency of GLIM was acceptable (Cronbach´s alpha: 0.6425). Agreement between tools was moderate (κ: 0.5946) or good (κ: 0.7777) according to the categorization used. When compared to SGA, sensitivity and specificity of the GLIM criteria were 99.1 % (95 % CI; 95 %-100 %) and 71.4 % (95 % CI; 41.9 %-91.6 %), respectively. The positive and

Resumen

Introducción: los criterios *Global Leadership Initiative on Malnutrition* (GLIM), creados para alcanzar un consenso mundial en cuanto a los criterios diagnósticos de la desnutrición (DN) asociada con la enfermedad, requieren ser validados para su uso en la práctica clínica.

Objetivo: estimar la consistencia interna de los criterios GLIM y compararlos con respecto a la valoración global subjetiva (VGS) con el fin de diagnosticar DN en pacientes hospitalizados con riesgo nutricional.

Métodos: se evaluaron 123 adultos hospitalizados con riesgo de DN (SNAQ ≥ 2). Se utilizaron la VGS y GLIM para diagnosticar DN. Se calculó la consistencia interna del GLIM y su concordancia, validez, seguridad y razón de probabilidad con respecto a VGS.

Resultados: la prevalencia de DN fue de 91 % según GLIM y 88,62 % según VGS, y fue grave en 52,03 % y 32,52 %, respectivamente. La consistencia interna del GLIM resultó aceptable (alfa de Cronbach: 0,6425). La concordancia entre VGS y GLIM fue moderada (κ: 0,5946) o buena (κ: 0,7777) según la categorización utilizada. GLIM obtuvo una sensibilidad del 99,1 % (intervalo de confianza [IC] 95 %: 95 %-100 %) y una especificidad del 71,4 % (IC 95 %: 41,9 %-91,6 %). El valor predictivo positivo fue 96,4 % (IC 95 %: 91,1 %-99 %) y el negativo fue 90,9 % (IC 95 %: 58,7-99,8). La

Resumo

Introdução: Os critérios Global Leadership Initiative on Malnutrition (GLIM), criados para alcançar um consenso mundial respeito dos critérios diagnósticos da desnutrição associada à doença (DN), requerem validação para seu uso na prática clínica.

Objetivo: Estimar a consistência interna dos critérios GLIM e compará-los com a Avaliação Subjetiva Global (ASG) com o objetivo de diagnosticar DN em pacientes hospitalizados com risco nutricional.

Métodos: Foram avaliados 123 adultos hospitalizados com risco de DN (SNAQ ≥2). ASG e GLIM foram usados para diagnosticar DN. Foram calculadas a consistência interna do GLIM e sua concordância, validade, segurança e razão de probabilidade em relação à ASG.

Resultados: A prevalência de DN foi de 91% pelo GLIM e 88,62% pela ASG, sendo severa em 52,03% e 32,52% respectivamente. A consistência interna do GLIM foi aceitável (Alfa de Cronbach: 0.6425). A concordância entre ASG e GLIM foi moderada (κ: 0,5946) ou boa (κ: 0,7777) de acordo com a categorização utilizada. O GLIM obteve uma sensibilidade de 99,1% (IC 95%: 95%-100%) e uma especificidade de 71,4% (IC 95%: 41,9%-91,6%). O valor preditivo positivo foi de 96,4% (IC 95%: 91,1-99%) e o negativo de 90,9% (IC95% 58,7-99,8). A razão de verossimilhança negative likelihood ratios were 3.47 (95 % CI; 1.51-7.94) and 0.0128 (95 % CI; 0.018-0.929), respectively.

Conclusions: The GLIM diagnostic tool has fair validity and its agreement with SGA was found to be significant. GLIM is a useful tool for diagnosis of malnutrition in hospitalized adults. Further validation studies are required for its application on the general inpatient population.

Keywords: GLIM; Malnutrition; Subjective Global Assessment; Nutritional diagnostic tool; Nutrition assessment.

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Conclusiones: la herramienta GLIM posee una validez justa y concuerda moderadamente con la VGS. Se requieren estudios de validez para su aplicación en la población hospitalaria general.

Palabras clave: GLIM, desnutrición, valoración global subjetiva, diagnóstico nutricional, evaluación nutricional.

positiva foi 3,47 (IC 95%: 1,51-7,94) e negativa 0,0128 (IC 95%: 0,018-0,929).

Conclusões: A ferramenta GLIM tem uma validade razoável e concorda moderadamente com a ASG. Estudos de validade são necessários para sua aplicação na população hospitalar geral.

Palavras-chave: GLIM, desnutrição, Avaliação subjetiva global, diagnóstico nutricional, avaliação nutricional.

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INTRODUCTION

Hospital malnutrition (MN) is a frequent problem worldwide, with a documented prevalence ranging from 19 % to 80 %. In Latin America, the high prevalence is often associated with various clinical complications, imposing significant health and economic burdens. At the national level, the Argentine Association of Enteral and Parenteral Nutrition (AANEP) conducted a multicenter study in 2014, which revealed a prevalence of 48 %[1, 2].

Nutritional screening is an easily identifiable method that should be conducted in all patients within the first 24-48 hours of hospitalization to promptly identify the risk of MN. This enables the early implementation of appropriate nutritional therapy, consequently reducing the likelihood of complications, length of hospital stays, and mortality. Despite the absence of consensus on the preferred screening tool, the Short Nutritional Assessment Questionnaire (SNAQ) is a validated option, chosen in our center due to its practicality[3-5].

In those patients identified as being at risk of MN, a comprehensive nutritional assessment should be conducted to diagnose MN and determine its severity[3]. Although subjective global assessment (SGA) is a diagnostic tool used in several studies[6], there is no universally accepted gold standard tool for this purpose. Recognizing the global need for a consensus on detecting MN in the hospital setting, a committee of international leaders established the Global Leadership Initiative on Malnutrition (GLIM) criteria. However, the committee acknowledged the importance of validating these criteria in clinical practice[7]. Within the GLIM consensus, the SGA is regarded as a 'semi-gold standard' tool for diagnosing MN.

Allard *et al.*, conducted the first study to validate the GLIM criteria using SGA in hospitalized patients[8]. The study found that, compared to SGA, GLIM criteria underestimated the presence of disease-related malnutrition (DRM), but increased the likelihood of categorizing individuals as severely malnourished. In 2021, Burgel *et al.*, and Brito *et al.*, reported a sensitivity and specificity of GLIM greater than 80 % when compared to SGA, which indicates that GLIM can be effectively used in hospitalized patients[9, 10]. Additionally, Brito *et al.*, concluded that the presence of MN according to GLIM criteria was associated with an increased risk of prolonged hospitalization and mortality within a 6-month period[10].

Limited studies have addressed this concern in the general hospitalized population in Latin America. A prospective descriptive study conducted by Galindo M., *et al.*, demonstrated that the diagnosis of MN, based on the GLIM criteria, is a risk factor for short-term complications, including in-hospital mortality and admission to the intensive care unit (ICU). This study also identified decreased muscle mass and inflammation as independent risk factors for these complications[11].

The effectiveness of GLIM criteria in facilitating a timely and simple identification of DRM, with the final goal of implementing an adequate nutritional therapy, is not yet established. Therefore, the objective of this study is to compare the effectiveness of the GLIM criteria and the SGA in diagnosing MN in hospitalized patients at risk of MN.

METHODS

A prospective, descriptive, cross-sectional, and comparative study between two diagnostic tools for nutritional status was conducted at Center for Medical Education and Clinical Research "Norberto Quirno" (CEMIC) University Hospital, a tertiary-level center with 185 beds located in Buenos Aires. Hospitalized patients over 18 years of age, identified as being at risk of MN using the SNAQ tool (score ≥ 2) admitted between February and March 2020 were included. Patients in the ICU, pregnant women and postpartum women were excluded. Patients who were dismissed or deceased before collecting all the data and patients in palliative care were eliminated.

The calculated sample size was 120 patients, assuming a 20 % loss rate. An average of three persons for each item of the tool was used to analyze its internal consistency[12]. According to the Epidat program, with a sample of 50 patients, a power of 90 % would be achieved and a correlation coefficient of at least 0.6 would be obtained. The sampling was non- probabilistic by convenience[13]. Data was collected consecutively in all patients at risk of MN upon admission during the data collection months.

The present study complied with the international Helsinki research standards of the World Medical Association, Law 3301 of the Ministry of Health of the Government of the City of Buenos Aires, Resolution 1480/2011 of the National Ministry of Health, and all legislation and regulations to which the CEMIC Ethics and Research Committee adheres. After obtaining approval from this ethics committee, it was a requirement to sign an informed consent prior to the incorporation of the individuals into the study.

Data collection

Data was collected by trained dietitians within 24-48 hours of hospital admission. The same interviewer collected data for both tools. To reduce intra-observer bias, SGA was conducted first, as it includes subjective components, and then MN was categorized according to GLIM criteria. Most of the information was obtained directly from primary sources, such as patients or their companions' interviews. Medical records were used as a secondary source.

When feasible, subjects' weight and height were measured using an OMROM© model HN-289 digital scale or a CAM© mechanical foot scale with an altimeter. The scales had a measurement range of 80-220 cm for height and a precision of 1 mm. Then, the surveyor proceeded to complete the two diagnostic tools.

Subjective Global Assessment

The six domains included in SGA were completed using the technique described by Detsky *et al.* The patient was then categorized according to the nutritional status identified by the tool[14, 15].

GLIM Criteria

The phenotypic and etiologic criteria of the GLIM tool were completed as described in Table 1. Subjects were categorized with MN if they met at least one phenotypic criterion and one etiological criterion. The phenotypic criterion determined the severity of MN. For assessing 'reduced muscle mass', a physical examination was conducted, and complementary tools were utilized based on the patient's age:

- Grip strength assessment was performed in all patients capable of undergoing the test, regardless of age. A hand-held dynamometer (JAMAR© hydraulic model 5030J1 with a precision of 90 kg) was used. Three measurements were taken for each arm following the dynamometer>s instructions, and the average of the three measurements was calculated[16].
- Mid-arm muscle circumference was measured in individuals under 75 years old, following the technique described by Canicoba M., *et al*. An inextensible Lufkin© measuring tape with a precision of 1 mm and a Slim Guide© skinfold caliper with a measurement range of 0-85 mm and a precision of 1 mm were used. The Third National Health and Nutrition Examination Survey (NHANES III) reference tables were used to calculate percentile values based on sex and age[17, 18].
- Calf circumference was measured in individuals over 65 years old following the technique described by Canicoba M., *et al*., using an inextensible Lufkin© measuring tape with a precision of 1 mm[18, 19].

Data analysis

The collected data was recorded in a self-developed database and analyzed using the statistical package Stata 11.0 and VCC Stat Beta 3.0 software. For the des-

Table 1. "GLIM criteria" for the diagnosis of malnutrition[7]

	Phenotypic criteria			Etiological criteria	
	Weight loss (%)	**Low Body Mass Index (kg/m²)**	**Reduced muscle mass***	**Reduced food intake (or absorption)**	**Inflammation**
Moderate malnutrition	> 5 % within past 6 months, or > 10 % beyond 6 months	< 20 if < 70 years, or < 22 if > 70 years	Mild to moderate deficit	50 % of energy requirement > 1 week, or any reduction for > 2 weeks, or any chronic gastrointestinal condition that adversely impacts food assimilation or absorption	Acute disease/ injury or chronic disease-related
Severe malnutrition	> 10 % within the past 6 months or > 20 % beyond 6 months	< 18.5 if < 70 years, < 20 if 70 years	Severe deficit		

*Grip strength, mid-arm muscle circumference, calf circumference and physical examination were measured. The following cut-off points were considered to determine "reduced muscle mass":
- Decreased grip strength: < -2 SD according to the sex and age of the dynamometer used[20-23].
- Decreased mid-arm muscle circumference: Mild to moderate between percentiles (pc) 5-10, and severe pc < 5[18].
- Decreased calf circumference: ≤ 30.5 cm[18, 19].
When measurements of muscle mass belonged to different categories, the physical examination of the patient and the professional criteria were considered in order to differentiate between mild/moderate and severe deficit.

SD: standard deviation.

criptive analysis of the characterization variables, the relative frequency was calculated for categorical variables, while the mean and standard deviation (SD) were calculated for continuous variables.

The internal validity of the GLIM criteria was assessed through the internal consistency of the items using Cronbach's alpha. Most authors suggest an acceptable range for reliability coefficients between 0.65 and 0.8, and values below 0.5 are considered unacceptable[24-27].

Concordance between the diagnostic categories obtained through the SGA and GLIM criteria was assessed using the kappa test (κ). The diagnostic categories compared were «without MN», «moderate MN,» and «severe MN.» Additionally, concordance was calculated considering two categories: «without MN» and «with MN.» The strength of agreement is classified as very weak when κ values are below 0.20, weak between 0.21 and 0.40, moderate between 0.41 and 0.60, good between 0.61 and 0.80, and very good with values above 0.80. The significance level was set at p-values < 0.05[28, 29].

All individuals belonging to the SGA categories "B" and "C" and GLIM categories "moderate MN" and "severe MN" were categorized as "MN"'. The validity of the GLIM criteria in predicting MN was assessed using specificity and sensitivity measures compared to SGA. The classification was based on the following cut-off points: "good" if both values were > 80 %, «fair» if one value was > 80 % and both were > 50 %, and «poor» if at least one value was < 50 %[30].

The safety of GLIM was analyzed using positive predictive value (PPV) and negative predictive value (NPV). Additionally, the positive likelihood ratio (LR+) and negative likelihood ratio (LR-) were calculated. LR+ values of 10 were considered to indicate "highly relevant utility," while values between 5 and 10 were considered as "moderate utility." For LR-, values below 0.1 were considered as "highly relevant utility," and values between 0.1 and 0.2 were considered as "moderate utility"[31-33].

RESULTS

The study included 123 hospitalized patients at risk of MN, with a mean age of 70 years (SD + 16.26), ranging from 20 to 96 years. In terms of gender distribution, 55.28 % were female, while 44.72 % were male. Among the participants, 50.41 % were active oncologic patients, and 30.89 % were surgical patients. The characterization of the study sample is provided in Table 2. Additionally, Table 3 presents the diagnoses obtained using each tool. According to the GLIM tool, the prevalence of MN was 91.05 %, with 39.02 % classified as moderate MN and 52.03 % as severe MN. The SGA tool identified MN in 88.6 % of cases, with 56.10 % categorized as moderate MN and 32.52 % as severe MN.

Table 2. Sample characteristics (n = 123)

Characteristics	n	%	95 % CI
Age			
- Under 65 years	29	23.57	16.59-32.24
- Greater or equal than 65 years	94	76.42	67.75-83.40
Sex			
- Female	68	55.28	46.06-64.16
- Male	55	44.72	35.83-53.93
Cancer patient	62	50.41	41.29-59.48
Surgical patient	38	30.89	23.04-39.95
Diagnosis on admission			
- Digestive system	28	22.7	15.89-31.37
- Nephro-urological system	25	20.3	13.82-28.72
- Respiratory system	19	15.4	9.78-23.32
- Musculoskeletal system	18	14.6	9.13-22.41
- Other systems (hematopoietic, reproductive, rheumatological, nervous, lymphatic, and metabolic)	34	27.6	20.14-36.56
Nutritional status according to SGA			
- Well nourished	14	11.38	6.59-18.67
- Moderate malnutrition	69	56.10	46.87-64.93
- Severe malnutrition	40	32.52	24.51-41.63
Nutritional status according to GLIM			
- Without malnutrition	11	8.94	4.77-15.79
- Moderate malnutrition	48	39.02	30.48-48.26
- Severe malnutrition	64	52.03	42.88-61.05

*n: number of patients.
CI: confidence interval; GLIM: Global Leadership Initiative on Malnutrition; SGA: Subjective Global Assessment.

The GLIM tool demonstrated acceptable internal consistency, with a Cronbach's alpha value of 0.6425. Regarding the "total item correlation," the variable with stronger correlation with the GLIM alpha was "reduced muscle mass" (0.8326), while "reduced intake" (0.4416) showed a lower correlation (Table 4). The item "inflammation" was excluded from the analysis as it was present in 100 % of the sample. The concordance between GLIM and VGS was moderate, with a value of κ: 0.5946 (95 % confidence interval [CI]: 0.46-0.52; $p < 0.00001$) when considering three categories, and it was good with a value of κ: 0.7777 (95 % CI: 0.68-0.86; $p < 0.00001$) when considering two categories of the tools.

Table 3. 2 × 2 contingency table to evaluate the diagnostic tools

GLIM	Semi-gold standard: SGA		Total
	With malnutrition (B and C): Positive	Without malnutrition (A): Negative	
With malnutrition: Positive	108	4	112
Without malnutrition: Negative	1	10	11
Total	109	14	123

GLIM: Global Leadership Initiative on Malnutrition; SGA: Subjective Global Assessment.

Table 5 presents the results corresponding to the validity of the GLIM criteria classified as fair. The LR+ estimate demonstrated moderate utility, as the GLIM is 3.47 times more likely to categorize a malnourished patient as malnourished than a patient without MN being categorized as malnourished. On the other hand, the LR- estimate showed highly relevant utility, as it is 0.01 times less likely for a malnourished patient to be categorized as malnourished, compared to a patient without MN being categorized as malnourished.

DISCUSSION

The present study is one of the first in Latin America to compare SGA with GLIM in hospitalized patients at risk of MN. The diagnostic tools were exclusively applied, as proposed in clinical practice, in patients at nutritional risk, which would explain the high prevalence of MN found. The SNAQ has demonstrated both validity and reliability in hospitalized patients, exhibiting sensitivity and specificity levels exceeding 75 %. However, it is not exempt from excluding individuals from the study who could potentially be malnourished, which may lead to an overestimation of GLIM's true performance[34-36].

Table 4. Cronbach's alpha results

GLIM items	n	Item-total correlation	Correlation if item is removed	Mean covariance between items	Cronbach's alpha if item is removed
Unintentional weight loss	123	0.7718	0.4960	0.1017	0.5662
Low BMI	123	0.7037	0.4401	0.1275	0.5246
Reduced muscle mass	123	0.8326	0.6151	0.0770	0.4147
Low dietary intake or reduced absorption	123	0.4416	0.2314	0.2028	0.6961
Total items of the GLIM tool				0.1271	0.6425

n: number of patients.
BMI: Body Mass Index; GLIM: Global Leadership Initiative on Malnutrition.

Table 5. Validity, diagnostic accuracy, safety, and likelihood ratio results of GLIM criteria using SGA as gold standard

	Result	95 % CI	Cut-off level
Cohen's Kappa (Without MN, moderate MN, severe MN)	0.5946 (p < 0.00001)	0.46-0.52	0.61-0.80
Cohen's Kappa (Without MN, with MN)	0.7777 (p < 0.00001)	0.68-0.86	0.61-0.80
Sensitivity	99.1 %	95 %-100 %	> 80 %
Specificity	71.4 %	41.9 %-91.6 %	> 80 %
LR+	3.47	1.51-7.94	5-10
LR-	0.0128	0.018-0.929	0.1-0.2
PPV	96.4 %	91.1 %-99 %	-
NPV	90.9 %	58.7 %-99.8 %	-

CI: Confidence interval; LR+: Positive likelihood ratio; LR-: Negative likelihood ratio; MN: Malnutrition; NPV: Negative predictive value; PPV: Positive predictive value.

The prevalence of MN, despite being high due to the aforementioned, was slightly higher using GLIM compared to SGA (91 % versus 88 %). Brito *et al*., obtained similar results (41.6 % vs. 33.9 %)[10]. In contrast, Allard *et al*., reported a prevalence of 33.29 % versus 45.15 %, highlighting that their study's retrospective design limited their analysis to the available GLIM data[8]. The percentage of severe MN in the present study was much higher using GLIM (52.03 % vs. 32.52 %), as observed in Allard's study (19.77 % vs. 11.73 %)[8].

On one hand, conducting a factorial analysis of each GLIM criterion reveals that if the item "reduced intake" were to be eliminated, the internal consistency would reach a level considered "good" (close to 0.7). On the other hand, the importance of the variable "reduced muscle mass" becomes evident, since, without it, the internal consistency would be even lower (alpha: 0.4147).

Therefore, it is necessary to establish cut-off points and operative criteria for evaluating muscle mass. Although anthropometry has limitations in terms of lower reliability compared to bioimpedance and dual-energy X-ray absorptiometry, in addition to the possible inter-observer bias[34], this study did not have access to such equipment. It is crucial to standardize a practical method for measuring muscle mass in clinical practice and establish its global use through protocolization[7].

Regarding the reliability of GLIM, the tools demonstrate significant agreement (p < 0.00001) in categorizing individuals into "without MN," "moderate MN," and "severe MN" categories, with a moderate level of agreement (0.5946, 95 % CI: 0.46-0.72). Considering the confidence interval, good reliability is achieved[12]. The concordance between the tools is good (0.7777, 95 % CI: 0.68-0.86) when categorizing individuals as either "with MN" or "without MN".

The sensitivity of GLIM in patients at nutritional risk (99.1 %) was in accordance with the recommended values (≥ 80 %), speculating that GLIM easily detects malnourished individuals[34]. This was similarly demonstrated by Brito, *et al*. (86.6 %) and Burgel, *et al.* (86.8 %)[9, 10]. In contrast, Allard *et al*., found a lower sensitivity (61.30 %)[8]. Identifying patients with MN is crucial as it allows for appropriate nutritional treatment, leading to better outcomes, reduced complications, and lower healthcare costs[37].

The specificity of GLIM did not reach acceptable values (71.4 %). Being a diagnostic tool for MN, it should have high specificity to avoid categorizing individuals as malnourished when they are not. GLIM results can vary depending on the different tools used for measuring muscle mass[20]. Therefore, as a strategy to achieve a specificity close to 80 %, it is proposed to investigate which of the tools is the most specific and to standardize its use.

The differences in sensitivity and specificity found in other studies could be due both to the disparity in their methodology and to the sample of patients included. Furthermore, the performance of each tool in different populations and the discrepancies in measurement techniques should be taken into account[8-10].

The high prevalence of MN may have influenced the elevated PPV (96.4 %), as it increases under conditions of higher prevalence. The NPV was also high, indicating that only 9.1 % of the patients without MN according to GLIM had MN according to SGA. Both values were higher compared to those reported by Allard *et al*. The discrepancies observed may be attributed to variations in the prevalence of MN among the studies[8, 38].

The entire study sample exhibited some degree of inflammation or stress, which may be associated with the high sensitivity and lower specificity of the tool. This finding is related to the lack of objective parameters, such as recommended supportive measures (e.g., C-reactive protein [CRP]), for its determination[8, 20].

Among the limitations of the present study, in addition to the previously mentioned use of a screened population with SNAQ, it is worth mentioning that food intake was assessed based on the patient's or caregiver's perception. Regarding the measurement of muscle mass, first-line methods recommended by GLIM, such as computed tomography (CT) and bioimpedance, were not available for this study. However, other simple and low-cost alternatives proposed by GLIM were used. Additionally, it would have been interesting to analyze each of the muscle mass measurement tools used separately, observing the performance of GLIM with each of them[7, 34].

During the course of the research, several advantages were observed in using GLIM compared to SGA. The latter involves a thorough physical examination and assessment of functional capacity, which requires more time and prior training to be conducted effectively.

It is important to highlight that the drafting of the research protocol and data collection preceded the validation guidelines of the GLIM criteria published by De van der Schueren and the GLIM Working Group[34]. Nevertheless, its use is considered valuable for the development of future research. It is worth noting that, according to the GLIM authors, for concordance validation studies such as this one, the complete objective assessment of nutritional status should be considered as the gold standard method.

Finally, it should be mentioned that by including only those patients who were at risk of MN and not the entire population, the data from this study may only be extrapolated to populations with similar characteristics and not to hospitalized patients in general.

In the absence of a gold standard tool and considering GLIM criteria as a simple, rapid, objective, and inexpensive diagnostic tool to assess nutritional status in clinical practice, it is considered necessary to conduct additional multicenter and cohort follow-up studies to determine its ability to predict adverse clinical outcomes (hospital stays, clinical complications and mortality), and thus establish its predictive validity. For future research, it is suggested to include all hospitalized patients without excluding those without risk of MN, in addition to comparing the results obtained using different methods for measuring muscle mass, in order to establish the most convenient tool for clinical use.

CONCLUSIONS

The GLIM tool, applied in patients at nutritional risk, has acceptable internal consistency and moderate to good agreement compared to SGA, based on the utilized categorization. It also demonstrates fair validity, with higher sensitivity, but lower specificity compared to SGA. GLIM criteria achieved moderate diagnostic accuracy compared to SGA. Further studies on the tool's validity are needed for its use in the hospital setting and to enable its global application.

KEY POINTS

- The GLIM criteria were proposed with the aim of reaching a worldwide consensus in defining diagnostic criteria for DRM.
- The objective of this study is to compare the GLIM diagnostic tool with the SGA in clinical practice in order to contribute to its validation in Latin America.
- The GLIM tool showed moderate to good diagnostic accuracy and concordance compared to the SGA when used in patients at nutritional risk.
- The internal consistency of the GLIM was found to be acceptable. The item "reduced muscle mass" was found to be relevant, suggesting the need for future research evaluating the application of different methods for measuring muscle mass in the GLIM criteria.
- In conclusion, the GLIM tool, when applied to patients at nutritional risk, demonstrated fair validity with higher sensitivity and lower specificity compared to the SGA.

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Conflict of interest

The authors declare no conflicts of interest.

Statement of authorship

P. Navarro, O. Capelli, J. Adaglio, R. Barritta equally contributed to the conception and design of the acquisition, analysis, and interpretation of the data. P. Navarro and O. Capelli drafted the manuscript. All authors reviewed the manuscript, agreed to be fully responsible for ensuring the integrity and accuracy of the work, and read and approved the final manuscript.

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