nutrición clínica y Dietética Hospitalaria

Artículo Original

Nutr Clín Diet Hosp. 2025; 45(1):117-121
DOI: 10.12873/451liem

Comparative analysis of malnutrition screening tools in predicting mortality in critically ill patients: SGA, GLIM, and mNutric Score

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Recibido: 30/octubre/2024. Aceptado: 18/diciembre/2024.

ABSTRACT

Introduction: Malnutrition is prevalent among critically ill patients and is associated with increased mortality, prolonged hospital stays, and higher rates of complications. Several malnutrition screening tools are available, including the Subjective Global Assessment (SGA), the Global Leadership Initiative on Malnutrition (GLIM), and the modified Nutrition Risk in Critically Ill (mNutric) Score. This study aims to compare the predictive ability of these three tools in determining mortality among critically ill patients.

Methods: A retrospective cohort study was conducted in the Intensive Care Unit (ICU) of RSUP Dr. Wahidin Sudirohusodo from April 2022 to March 2023. Patients aged 18 years and older were included. Nutritional status was assessed using SGA, GLIM, and mNutric Score. Statistical analyses were performed to compare groups (e.g., survivors vs. non-survivors) and to identify independent predictors of mortality. Multivariable logistic regression was conducted to determine the independent predictive value of each malnutrition screening tool.

Result: A total of 1,106 patients were included in the analysis. The overall ICU mortality rate was 23.1%. The mNutric Score was a significant independent predictor of mortality (OR = 6.601, 95% CI: 4.183–10.416, $p < 0.001$), while neither SGA nor GLIM were significant after adjustment for confounders.

Conclusion: The mNutric Score is a superior tool for predicting mortality in critically ill patients compared to SGA and GLIM. Its use should be considered in ICU settings to identify patients at nutritional risk and guide timely interventions.

KEYWORDS

Nutritional support, intensive care, medical prognosis.

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INTRODUCTION

Malnutrition is a common concern in critically ill patients, particularly those admitted to the intensive care unit (ICU). The prevalence of malnutrition in this population is high, and it is associated with poor clinical outcomes, including increased mortality, prolonged hospital stays, and higher rates of complications[1],[2]. Identifying patients at nutritional risk early in their ICU stay is critical for improving outcomes through timely nutritional interventions[3,4].

Several tools have been developed to assess nutritional status in critically ill patients, each with varying levels of accuracy and clinical utility[5]. The Subjective Global Assessment (SGA) is one of the oldest and most widely used tools, assessing patients' nutritional status based on clinical judgment[6,7]. The more recent Global Leadership Initiative on Malnutrition (GLIM) criteria offer a standardized approach to diagnosing malnutrition, incorporating phenotypic and etiologic factors[8,9]. Meanwhile, the modified Nutrition Risk in Critically Ill (mNutric) Score was specifically designed for ICU patients, considering factors such as comorbidities and disease severity to predict nutritional risk and outcomes[10].

Given the array of tools available, determining the most reliable and effective method for predicting clinical outcomes in critically ill patients is crucial[11]. This study compares the performance of the SGA, GLIM, and mNutric Score in predicting mortality among critically ill patients. By evaluating the predictive ability of each tool, this research aims to provide insights into which screening method is most suitable for guiding nutritional interventions in the ICU setting.

METHODS

Study Design and Population

This retrospective cohort study was conducted in the Intensive Care Unit (ICU) of RSUP Dr. Wahidin Sudirohusodo, Makassar, from April 2022 to March 2023. Patients aged 18 years and older who were admitted to the ICU during the study period were included in the analysis. Individuals with incomplete medical records or missing nutritional assessment data were excluded. The study was approved by the ethics committee of the university and hospital which ensure the confidentiality of all the patient's data throughout the research process.

Variable and Data Collection

For each patient, demographic information, including age, gender, and admission type was collected from electronic medical records. Nutritional status was assessed using the three screening tools mentioned above. The Subjective Global Assessment (SGA) categorized patients into three groups based on a combination of medical history (weight loss, dietary intake, gastrointestinal symptoms, functional status) and physical examination findings (muscle wasting, subcutaneous fat loss, and fluid retention). Patients were classified as well-nourished (SGA A), moderately malnourished (SGA B), or severely malnourished (SGA C)[12,13]. The Global Leadership Initiative on Malnutrition (GLIM) criteria diagnosed malnutrition based on the presence of one phenotypic and one etiologic criterion. Phenotypic criteria included weight loss greater than 5% within 6 months or more than 10% beyond 6 months, a body mass index (BMI) below 20 kg/m² for patients under 70 years or below 22 kg/m² for patients over 70 years, and reduced muscle mass determined through clinical assessment or imaging. Etiologic criteria included reduced food intake or assimilation of less than 50% of energy requirements for more than one week and the presence of acute or chronic disease-related inflammation. Patients were classified as having no malnutrition, moderate malnutrition if one phenotypic and one etiologic criterion were met, or severe malnutrition if severe phenotypic and one etiologic criterion were met[14,15]. The modified Nutrition Risk in Critically Ill (mNutric) Score assessed nutritional risk based on factors such as age, APACHE II score, SOFA score, comorbidities, and hospital length of stay before ICU admission. A score below 5 indicated low risk, whereas a score of 5 or above indicated high risk[16].

Statistical Analysis

Descriptive statistics were used to summarize the characteristics of the study population. Categorical variables were presented as frequencies and percentages, while continuous variables were summarized using means and standard deviations or medians with interquartile ranges, depending on the distribution of the data. The association between nutritional status and mortality was analyzed using bivariate methods, including chi-square tests for categorical variables and independent t-tests or Mann-Whitney U tests for continuous variables. To determine the independent predictive value of each malnutrition screening tool for mortality, multivariable logistic regression was performed. A p-value of less than 0.05 was considered statistically significant for all analyses, and SPSS 25.0 (IBM Corp., Armonk, NY) was used for data analysis.

RESULTS

In this study, a total of 1,189 patients were admitted to the ICU from April 2022 to March 2023 and initially considered for inclusion in the analysis is illustrated in Fig 1. However, after applying the exclusion criteria, 83 patients were excluded from the study because they were younger than 18 years old. This left 1,106 patients who met the inclusion criteria and were eligible for further analysis.

Baseline characteristic of the population was provided in Table 1. The median age of the patients was 55 years (IQR: 45–63), and 58% were male. Most patients were admitted for medical reasons (72%), while the remainder were surgical admissions (28%). The median body mass index (BMI) was 23.4 kg/m² (IQR: 21.0–26.5). Regarding nutritional status, the Subjective Global Assessment (SGA) classified 33.6% of patients as well-nourished (SGA A), 45.8% as moderately malnourished (SGA B), and 20.6% as severely malnourished (SGA C). Using the Global Leadership Initiative on Malnutrition (GLIM) criteria, 48.2% of patients were classified as not malnourished, 33.9% as moderately malnourished, and 17.9% as severely malnourished. The mNutric Score identified 37.2% of patients as having a low risk of malnutrition (mNutric score < 5) and 62.8% as high risk (mNutric score ≥ 5). In patients classified by the mNutric Score, those with a high risk of malnutrition (mNutric score ≥ 5) had a mortality rate of 36.5%, compared to 12.3% in the low-risk group ($p < 0.001$).

The multivariable logistic regression results were summarized in Table 2. In the multivariable logistic regression analysis, after adjusting for age, sex, BMI, and admission type, the mNutric score remained a significant independent predictor of mortality (OR = 6.601, 95% CI: 4.183–10.416, $p < 0.001$). Neither the SGA (OR = 1.058, 95% CI: 0.762–1.468, $p = 0.738$) nor the GLIM (OR = 0.946, 95% CI: 0.762–1.174, $p = 0.612$) were significant predictors of mortality after adjustment for confounders.

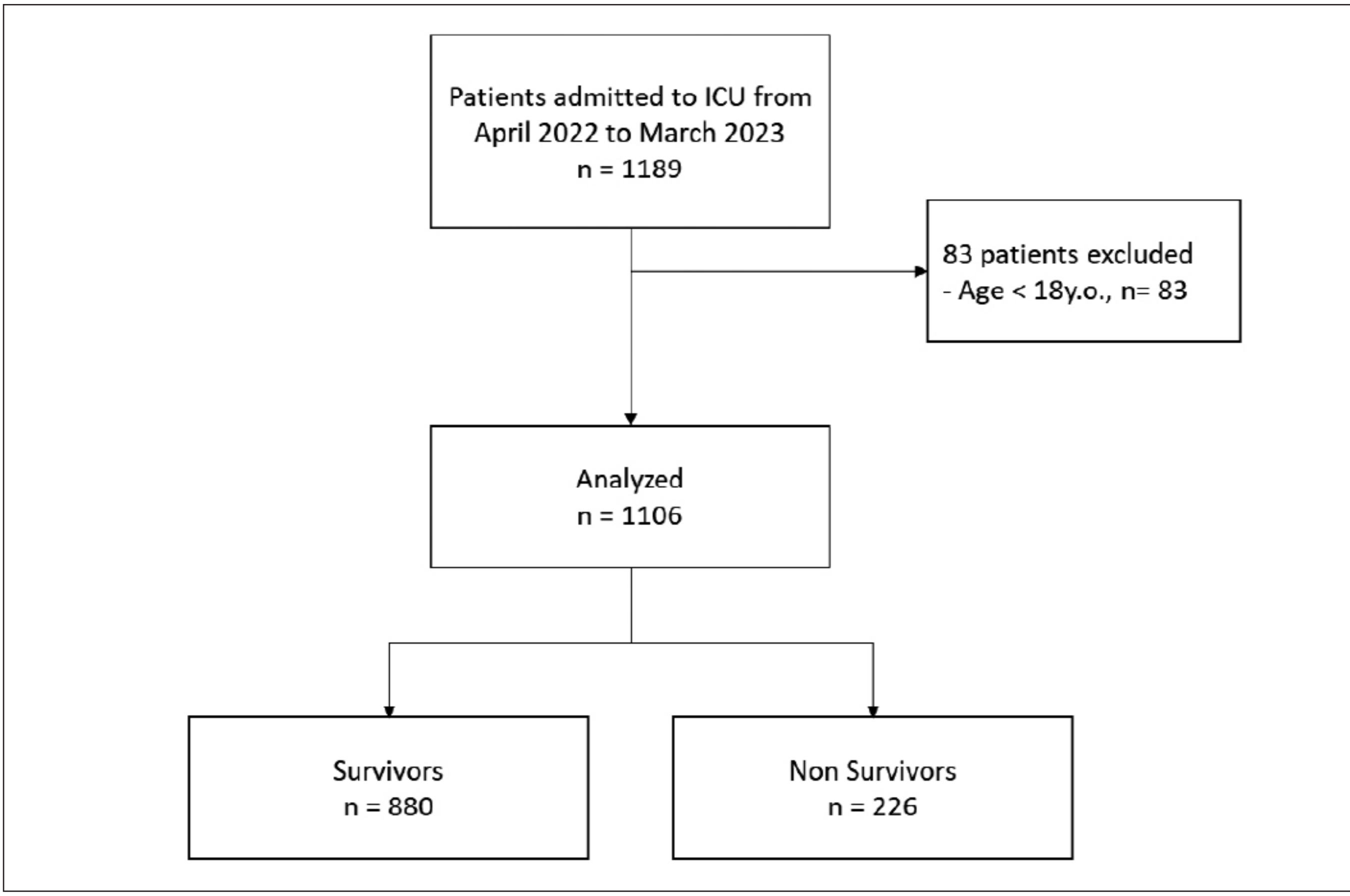

Fig. 1. Flowchart of the study patients

DISCUSSION

This study aimed to evaluate the predictive ability of three malnutrition screening tools—Subjective Global Assessment (SGA), Global Leadership Initiative on Malnutrition (GLIM), and the modified Nutrition Risk in Critically Ill (mNutric) Score—in determining mortality in critically ill patients. Our findings show that the mNutric score is a superior predictor of mortality compared to both SGA and GLIM, with significantly higher discriminatory power as demonstrated by the ROC curve analysis. These results highlight the importance of using ICU-specific tools for assessing malnutrition in critically ill patients[17,18].

The mNutric score emerged as the strongest independent predictor of mortality. This is consistent with previous studies that have validated the mNutric score as a reliable tool for critically ill populations, where the risk of malnutrition is closely tied to disease severity, organ dysfunction, and inflammation[10,16,19]. In contrast, the SGA and GLIM tools, though widely used in general hospital settings, showed moderate predictive ability for mortality in the ICU. The SGA tool, which is based on clinical judgment and subjective criteria such as weight loss and physical examination findings, may lack sensitivity in detecting malnutrition in the critically ill, where rapid changes in nutritional status and the impact of acute illness are not fully captured[6,7]. Similarly, the GLIM criteria, while standardized and widely applicable, may not fully account for the metabolic and inflammatory alterations that occur in critical illness[8,9,15].

While this study provides valuable insights, there are limitations that should be acknowledged. First, the retrospective nature of the study may introduce selection bias, and the use of electronic medical records may result in incomplete or missing data. Additionally, the study was conducted in a single center, which may limit the generalizability of the findings to other ICU settings. Future studies should consider prospective, multicenter designs to validate the findings and explore the use of the mNutric score in other critically ill populations, including patients with specific diseases such as sepsis or trauma.

CONCLUSION

In conclusion, the mNutric score is a superior tool for predicting mortality in critically ill patients compared to SGA and GLIM. Given its strong predictive ability, the mNutric score should be considered for routine use in ICU settings to

Table 1. Baseline characteristics of the study patients

	Survivors (n=880)	Non Survivors (n=226)	p Value
Age, year	50.0 [37.0, 60.0]	55.5 [41.0, 67.0]	<0.001
Sex			<0.001
Men	401 (45.6)	131 (58.0)	
Woman	479 (54.4)	95 (42.0)	
Height, cm	160.0 [155.0, 165.0]	160.0 [155.0, 165.0]	0.105
Weight, kg	60.0 [50.0, 63.0]	60 [50.0, 64.0]	0.235
BMI, kg/m2	22.22 [20.56, 24.61]	22.22 [20.81, 23.92]	0.690
BMI Category			0.921
<18.5	94 (10.7)	21 (9.3)	
18.5 - 22.9	412 (46.8)	102 (45.1)	
23 - 24.9	192 (21.8)	53 (23.5)	
25 - 29.9	165 (18.8)	46 (20.4)	
>30	17 (1.9)	4 (1.8)	
Admission Type			<0.001
Medical	84 (37.2)	123 (14)	
Surgical	142 (62.8)	757 (86)	
mNutric Score			<0.001
Low Risk	830 (94.3)	150 (66.4)	
High Risk	50 (5.7)	76 (33.6)	
SGA			0.655
A	158 (17.9)	40 (17.7)	
B	538 (61.2)	135 (50.7)	
C	184 (20.9)	51 (22.6)	
GLIM			0.763
Not Malnourished	231 (26.3)	64 (28.3)	
Moderate	439 (49.9)	107 (47.3)	
Severe	210 (23.9)	55 (24.3)	

Data are presented as n (%) or median (interquartile range).
BMI, Body Mass Index; mNutric Score, modified Nutrition risk in critically ill; SGA, Subjective Global Assessment; GLIM, Global Leadership Initiative on Malnutrition.

Table 2. Regression Analysis of Malnutrition Tools Predicting Mortality

	OR	95% CI	p Value
mNutric Score	6.601	4.183 - 10.416	<0.001
SGA	1.058	0.762 - 1.468	0.738
GLIM	0.946	0.762 - 1.174	0.612

Adjusted for age, sex, BMI, Admission Type.
BMI, Body Mass Index; mNutric Score, modified Nutrition risk in critically ill; SGA, Subjective Global Assessment; GLIM, Global Leadership Initiative on Malnutrition.

identify patients at nutritional risk and guide timely nutritional interventions.

ACKNOWLEDGEMENTS

The author would like to express gratitude to all teachers at the Nutrition Department, Faculty of Medicine, Hasanuddin University

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