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Association Between GLIM Criteria and PG-SGA in a Mixed Chemotherapy Patient Population: A Cross-Sectional Study

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Abstract

Malnutrition remains a significant clinical and public health concern, particularly for patients undergoing chemotherapy. An accurate and timely diagnosis is essential for initiating appropriate nutritional interventions. To assess the association between the GLIM criteria and PG-SGA in identifying malnutrition among patients undergoing chemotherapy in a day-care setting, and to evaluate the diagnostic performance of GLIM using PG-SGA as the reference standard. A cross sectional study was conducted on 63 chemotherapy patients in the chemo ward. Nutritional assessments were performed using the PG-SGA, NRS-2002, and GLIM criteria. Phenotypic and etiological data were collected, including body mass index (BMI), weight loss, food intake, and handgrip strength. Statistical analyses were performed using the SPSS (version 24). Pearson Chi Square test were applied to evaluate the association between PG-SGA and GLIM scores. ROC curve analysis was conducted to evaluate the diagnostic accuracy of the GLIM criteria using the PG-SGA as the reference standard. The Area Under the Curve (AUC) with 95% Confidence Interval (CI) was reported, and an optimal PG-SGA score range was determined based on the sensitivity and specificity balance. The study included 63 chemotherapy patients (mean age 60.76 ± 9.27 years; BMI 24.92 ± 6.09 kg/m²).PG-SGA scores averaged 8.49 ± 4.45. Based on the NRS 2002, 22.2% of the patients were at risk of malnutrition. The PG-SGA classified 46.0% as moderately and severely malnourished, while the GLIM identified 20.6% as malnourished. A significant association was found between the tools (Chi-square = 9.816, p = 0.002), which PG SGA being more sensitive. The GLIM showed good diagnostic accuracy (AUC = 0.660, p = 0.029). An optimal PG-SGA score of 4.5–9.5 balanced sensitivity and specificity. GLIM can effectively complement nutritional screening in oncology. The study concluded that the PG-SGA is more sensitive in detecting malnutrition, while the GLIM provides good diagnostic accuracy and significant association with the PG-SGA.

I. Introduction

Malnutrition remains a pervasive yet often underdiagnosed condition in oncology settings and significantly affects treatment outcomes, recovery, and overall quality of life in patients with cancer. Treatment-associated symptoms such as nausea, vomiting, anorexia, and changes in metabolism accelerate nutritional decline and contribute to poor treatment tolerance, increased complications, and prolonged hospital stays (Arends et al., 2017). Early identification and management of malnutrition are crucial for improving clinical outcomes.

The Global Leadership Initiative on Malnutrition (GLIM) proposed a globally standardized diagnostic framework in 2018 that integrates phenotypic and etiologic criteria to facilitate consistent clinical applications across diverse healthcare settings (Cederholm et al., 2019). Despite

its promising structure, GLIM's effectiveness of GLIM in specific subpopulations, such as patients undergoing chemotherapy, remains underexplored.

This approach was designed to harmonize global practices and enable consistent diagnoses across settings. However, its applicability in various patient populations, particularly those undergoing chemotherapy, remains to be investigated. The GLIM Criteria have been validated in various clinical oncology settings (Zhang X et al.,2020, Meza-Valderrama D et al., 2021 Gascón-Ruiz M et al.,2021).

However, the absence of a consensus on malnutrition diagnostic criteria in clinical settings highlights the need for comparative studies that assess different tools within a single patient population (Van Bokhorst-de et al.,2014, Son YG et al.,2017, McKnight CL et al., 2019). Furthermore, studies applying the GLIM Criteria to cancer patients are limited.

The Patient-Generated Subjective Global Assessment (PG-SGA), tailored for oncology patients, combines clinical and subjective parameters to evaluate nutritional status and remains the reference standard despite its time-intensive application (Ottery, 1996).

Several recent studies have examined the agreement between the GLIM criteria and PG-SGA across diverse clinical populations, supporting the need for continued validation of GLIM as a reliable diagnostic tool for malnutrition.

Rosnes et al. (2021) conducted a study at a nutrition outpatient clinic and found a fair agreement between the GLIM and PG-SGA, suggesting that the PG-SGA remains a sensitive measure, especially in patients with variable nutritional risk profiles (Rosnes et al., 2021).

Another study by Henriksen et al. (2021) emphasized that the screening tool chosen for initiating GLIM diagnosis significantly affects the level of agreement with the PG-SGA, highlighting the need for careful selection of initial screening instruments (Henriksen et al., 2021).

Further, a comparative study by Tan et al. (2024) on patients with hepatocellular carcinoma assessed malnutrition using the GLIM, NRS-2002, and PG-SGA, and found significant variation in malnutrition prevalence depending on the tool used. The study concluded that multiple risk factors should be considered for accurate assessment and early intervention (Tan et al., 2024).

These studies reinforce the importance of using a multimodal approach when screening for malnutrition in oncology settings, validating the relevance of comparing PG-SGA and GLIM, as explored in the present study.

II. Materials and Methods

A cross-sectional observational study was conducted in a chemotherapy day care unit. 63 adult patients undergoing chemotherapy, irrespective of the cancer type or stage, were enrolled in the study. The inclusion criteria were adults aged ≥18 years,

currently receiving chemotherapy and willing to participate. The exclusion criteria included patients with terminal illness and each participant underwent nutritional assessment using the following three tools:

NRS-2002 for the initial risk screening.
PG-SGA for detailed nutritional evaluation.
GLIM criteria for standardized malnutrition diagnosis.

PG-SGA scores classified patients as well nourished (0–1), moderately malnourished (2–8), or severely malnourished (>9). GLIM diagnosis was based on at least one phenotypic criteria (e.g., weight loss, low BMI, or reduced muscle mass) and one etiologic criteria (e.g., reduced food intake or disease burden).

Data were analyzed using SPSS V 24. Descriptive statistics were used to summarize demographic and clinical characteristics. Pearson's Chi-Square and Fisher's Exact tests assessed associations between tools. A Receiver Operating Characteristic (ROC) curve was plotted to assess the diagnostic performance of the GLIM using the PG-SGA as the reference standard. The area under the curve (AUC) and optimal cutoff PG-SGA score (balancing sensitivity and specificity) have been reported.

III. Results and Discussions

The study included a total of 63 chemotherapy patients, with a mean age of 60.76 ± 9.27 years and an average BMI of 24.92 ± 6.09 kg/m². The sample comprised 63.5% females (n = 40) and 36.5% males (n = 23). All patients had severe disease, according to the inclusion criteria.

The mean PG-SGA score was 8.49 ± 4.45, suggesting that nutritional intervention was required in the majority of patients. Based on PG-SGA classification, only 7.9% of patients were well nourished, while 46.0% were moderately and severely malnourished, indicating a substantial prevalence of nutritional risk in this population

Among the sample, nutritional risk status based on NRS-2022 scores was distributed as follows: 50.8% scored 2, 28.6% scored 3, 15.9% scored 4, and 4.8%, 5, reflecting a trend towards nutritional vulnerability in this cohort.

Figure 1: BMI classification (WHO Asian classification) BMI

CLASSIFICATION

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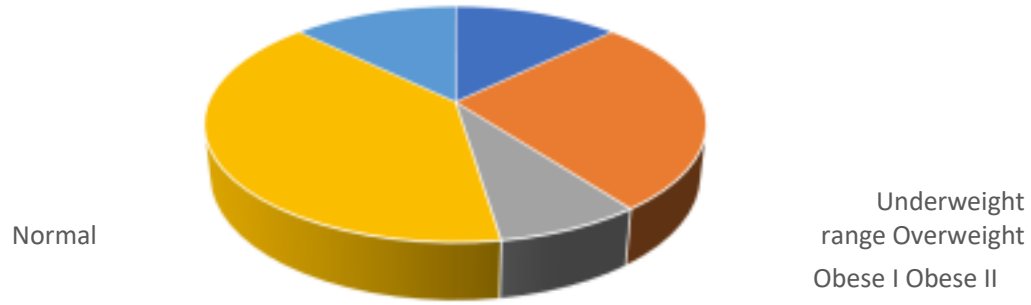
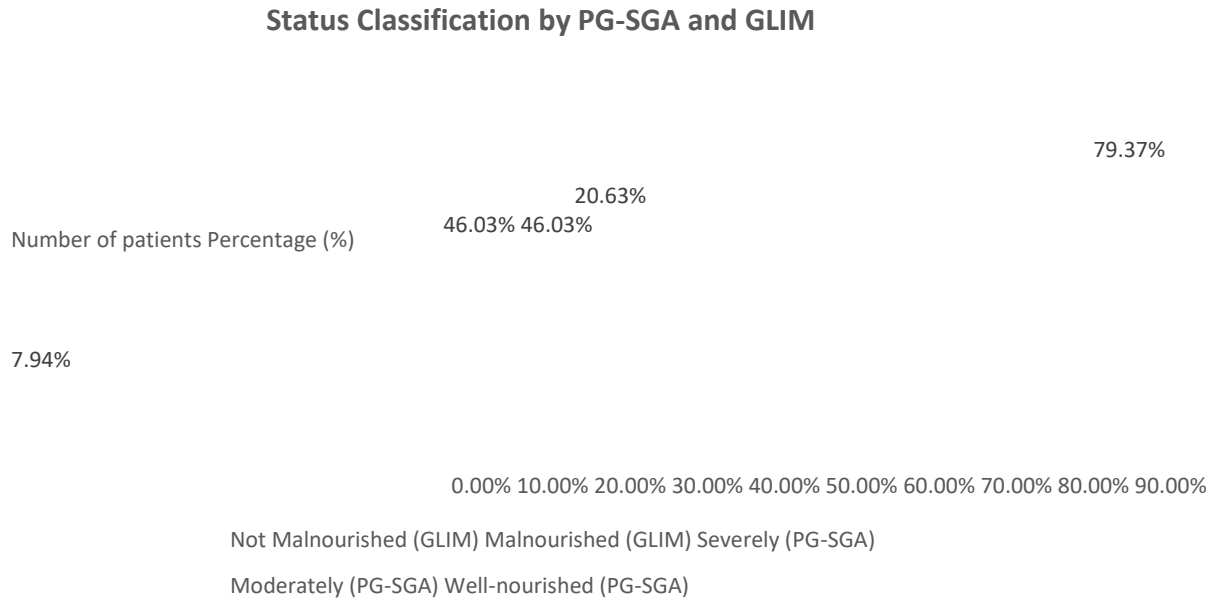


Using the GLIM criteria, 20.6% of patients were identified as malnourished, whereas 79.4% were categorized as not malnourished. A significant association was observed between the nutritional risk screening tools (Chi-square = 9.816, p = 0.002) with the PG-SGA demonstrating greater sensitivity in identifying at-risk individuals.

Figure 2: Nutritional Status Classification by PG-SGA and GLIM **Nutritional**



The Area Under the Curve (AUC) was 0.660, indicating a fair discriminatory ability. The 95%

(CI) Confidence Interval for the AUC ranged from 0.522 to 0.799, and the result was statistically significant (p = 0.029), suggesting that GLIM performs significantly better than chance in classifying patients as malnourished or not. The optimal PG-SGA score for identifying malnutrition risk was found to range from 4.5 and 9.5, offering the best balance between sensitivity and specificity.

Table 1. The Area Under the Curve GLIM

Test Result Variable(s): GLIM

Area	Std. Error[a]	Asymptotic Sig.[b]	Asymptotic 95% Confidence Interval Lower Bound	Asymptotic 95% Confidence Interval Upper Bound
0.660	0.071	0.029	0.522	0.799

a. Under the nonparametric assumption b. Null hypothesis: true area = 0.5

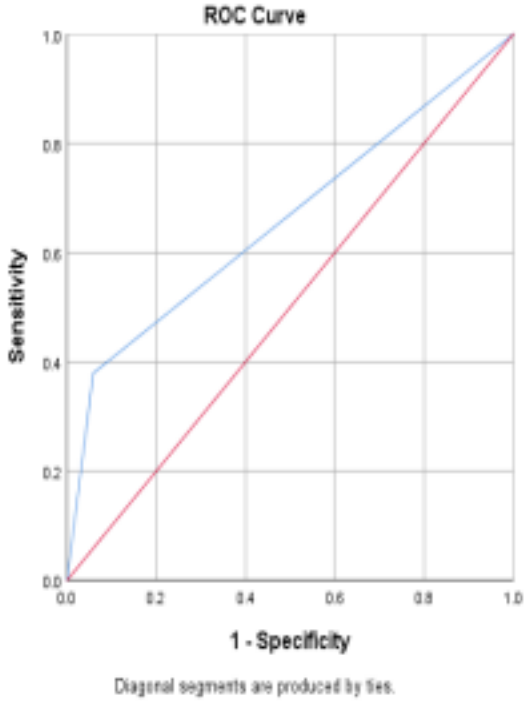
The analysis was conducted under a nonparametric assumption with the null hypothesis that the true AUC is 0.5. However, the presence of ties between the positive and negative actual state groups may have introduced a minor bias in the estimation.

Table2.Crosstabulation of the PGSGA and GLIM criteria for the diagnosis of malnutrition.

	Total	No risk	At Risk
0	0.0%		
2	6.9%		
11	37.9%		
13			

			20.6%
PGSGA_ Total	<4	Count	5 5
		Count	27 29
		% within PGSGA_	93.1% 100.0%
	4-8 >=9	Count	18 29
		% within PGSGA_	62.1% 100.0%
		Count	50 63
	% within PGSGA_		79.4% 100.0%
			100.0% 100.0%

Figure 3: The ROC curve analysis of GLIM



The subjects muscle strength status (HGS score) revealed that 66.7% of the patients perceived their muscle strength as weak, while only 25.4% reported it as normal and 7.9% as strong. In terms of dietary intake, 25.4% of the patients reported reduced food intake ("less than usual"), 69.8%

reported unchanged intake, and 4.8% reported eating more than usual. These findings suggest that the GLIM is an effective tool for nutritional screening and can complement existing assessment methods in the oncology setting. These findings underscore the high prevalence or risk of malnutrition among chemotherapy patients and highlight the importance of multi-dimensional screening using tools such as PG-SGA and GLIM.

Discussion

This study provides valuable insight into the comparative diagnostic value of two malnutrition screening tools, the GLIM and PG-SGA, in chemotherapy patients. Both tools demonstrated significant utility in identifying malnutrition, although the PG-SGA identified a higher proportion of malnourished individuals. This is likely due to PG-SGA's established sensitivity, which has been the cornerstone of its use in clinical oncology for assessing nutritional risk. Its ability to incorporate both subjective patient reports and objective clinical parameters (such as weight loss, dietary intake, and physical examination) contributes to its high sensitivity in detecting malnutrition even in the early stages.

In contrast, the GLIM, a relatively newer malnutrition screening tool, exhibited substantial agreement with the PG-SGA, reflecting its robust accuracy despite a slightly lower detection rate. GLIM's strength of GLIM lies in its evidence-based, standardized approach that relies on six core criteria: BMI, unintentional weight loss, reduced food intake, muscle mass, handgrip strength, and disease burden. These criteria are designed to provide a comprehensive and reproducible assessment of malnutrition, which makes the GLIM a promising tool for wider adoption. However, its relatively lower detection rate compared to the PG-SGA may be attributed to its reliance on more objective, measurable parameters, such as handgrip strength and muscle mass assessment.

These objective measures are valuable, but can be challenging to implement consistently in clinical settings, especially in resource-limited environments or for patients who have difficulty participating in physical assessments due to their illness. For example, handgrip strength may be difficult to measure accurately in patients with severe weakness or in those undergoing certain chemotherapy regimens. Similarly, assessing muscle mass requires specialized equipment, such as bioelectrical impedance analysis (BIA) or dual-energy X-ray absorptiometry (DXA), which may not always be readily available in routine clinical practice. Furthermore, the measurement of these parameters requires trained professionals, which can increase the screening time and cost. These practical limitations could contribute to the slightly lower detection rate observed for GLIM.

Interestingly, the findings of this study align with previous research that explored the agreement between the GLIM and traditional malnutrition screening tools, such as the PG-SGA, in cancer populations. Multiple studies have highlighted the moderate to substantial concordance between the GLIM and PG-SGA, underscoring the potential of the GLIM as an alternative or complementary tool for malnutrition screening. Given that cancer patients, particularly those undergoing chemotherapy, are at a high risk of malnutrition, both tools can be beneficial in ensuring that malnutrition is detected early and appropriately managed.

The complementary use of the PG-SGA and GLIM could help to address a broader range of factors associated with malnutrition, offering a more comprehensive approach to nutritional assessment. For instance, the PG-SGA's inclusion of subjective data, such as dietary intake and patient reported symptoms, could help identify patients who may not meet the GLIM criteria, but are still at risk for malnutrition. In contrast, the GLIM's reliance on objective parameters could help quantify and document the severity of malnutrition more precisely, which is important for monitoring patient progress over time and guiding therapeutic interventions.

Ultimately, the early identification of malnutrition, followed by targeted nutritional interventions, is critical for improving patient outcomes. Chemotherapy patients are at an increased risk of malnutrition due to factors such as reduced appetite, gastrointestinal symptoms (e.g., nausea and vomiting), and metabolic changes induced by cancer treatments. Malnutrition has been associated with poor treatment tolerance, reduced quality of life, and poor overall survival outcomes. By incorporating both the PG-SGA and GLIM into routine clinical practice, healthcare providers can ensure that malnutrition is identified early and that appropriate interventions, such as dietary modifications, supplementation, or nutritional support, are promptly initiated.

Future research should focus on refining these tools and exploring their potential benefits of combining them in different clinical settings. Larger multicenter studies could provide more robust evidence of the benefits and limitations of each tool, particularly in diverse patient populations. Further investigation into how these tools can be adapted to resource-limited settings could enhance their applicability and effectiveness in improving malnutrition detection and management on a global scale.

IV. Conclusion

This study demonstrates that the PG-SGA is a more sensitive tool for identifying malnutrition in patients undergoing chemotherapy, effectively detecting moderate-to-severe malnutrition. Although NRS 2002 identified fewer at-risk patients, GLIM showed good diagnostic accuracy and a significant association with PG-SGA. GLIM's objective criteria of the GLIM make it a reliable tool for nutritional screening, especially when used alongside the PG-SGA. The optimal PG-SGA score range further supports its clinical utility for identifying at-risk patients. Overall, combining the PG-SGA and GLIM can enhance the accuracy of nutritional assessment, enabling timely interventions and better management of malnutrition in oncology settings, ultimately improving patient care outcomes.

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