JOURNAL OF TROPICAL PHARMACY AND CHEMISTRY

https://jtpc.ff.unmul.ac.id

Volume 9.1

Research Article

The Accuracy of The Malnutrition Screening Tool (MST) for Identifying Malnutrition Risk in Stroke Patient

Yunisa Astiarani[1,*], Vetinly[1],Marcellinus Michael[1],Linda Suryakusuma[2,3]

[1]Department of Public Health and Nutrition, School of Medicine and Health Sciences, Atma Jaya Catholic University of Indonesia, Jakarta, Indonesia

[2]Department of Neurology, School of Medicine and Health Sciences, Atma Jaya Catholic University of Indonesia, Jakarta, Indonesia

[3]Atma Jaya Hospital, Jakarta, Indonesia

*Correspondence email : yunisa.astiarani@atmajaya.ac.id

Abstract (in English)

Malnutrition in stroke patients is associated with poor clinical outcomes, making early nutritional assessment essential, as it is a modifiable risk factor. The Malnutrition Screening Tool (MST) offers a rapid and simple approach for nutritional screening; however, its application in stroke populations remains limited. This study aimed to evaluate the diagnostic accuracy of the MST compared with the Subjective Global Assessment (SGA) in stroke patients. A cross-sectional study was conducted involving 96 acute stroke patients at Atma Jaya Hospital, Jakarta, using retrospective medical records. The MST was employed for nutritional screening, while nutritional status was determined using the SGA. Bivariate analyses assessed associations between patient characteristics, MST scores, Body Mass Index (BMI), hemoglobin levels, and total lymphocyte count (TLC) with SGA classification. Logistic regression was used to determine the independent association between MST scores and nutritional status, and the Area Under the Curve (AUC) was calculated to evaluate MST validity. Results showed that 25% of patients were malnourished according to the SGA. Age, BMI, hemoglobin, TLC, and MST scores were significantly associated with nutritional status ($p < 0.05$). An MST score ≥ 2 increased the odds of malnutrition by 3.115 ($p < 0.05$). The MST demonstrated 75.0% sensitivity, 51.4% specificity, and an AUC of 0.674, indicating adequate diagnostic performance, though complementary assessment tools are recommended.

Keywords: Malnutrition, Malnutrition Screening Tool, Nutrition Status, Stroke, Subjective Global Assessment.

Accepted: 1 August 2025
Approved: 20 August 2025
Publication: 1 September 2025

Citation : Y. Astiarani, V. Vetinly, M. Michael, L. Suryakusuma, "The Accuracy of the Malnutrition Screening Tool (MST) for Identifying Malnutrition Risk in Stroke Patient," Journal of Tropical Pharmacy and Chemistry (JTPC), vol. 9, no. 1, pp. 25–29, Sept. 2025, doi: 10.30872/jtpc.v9i1.292.

 Doi: 10.30872/jtpc.v9i1.292

1 Introduction

Malnutrition in stroke patients has been consistently linked to adverse clinical outcomes [1], [2]. Pre- and post-stroke malnutrition are associated with prolonged hospital stays, poorer functional recovery, and increased mortality rates within 3–6 months following a stroke [3],[4]. The prevalence of malnutrition in acute stroke cases varies widely, ranging from 12.2% to 62%, primarily due to heterogeneity in study populations, stroke subtypes, nutritional parameters, and definitions of malnutrition [5]. Nevertheless, early nutritional assessment in acute ischemic stroke has been shown to improve clinical outcomes, highlighting the importance of timely intervention [6]. Unlike other risk factors, malnutrition is modifiable, enabling healthcare providers to take corrective action [3].

Despite its significance, nutritional interventions for acute stroke remain underemphasized in clinical practice. Nutritional assessment in stroke patients poses challenges, including the lack of a universally accepted definition of malnutrition and the absence of a standardized gold standard for evaluation [2], [7]. Simple metrics such as Body Mass Index (BMI) are often impractical for immobilized stroke patients. In contrast, the Subjective Global Assessment (SGA) offers a comprehensive approach to nutritional evaluation. Originally developed for surgical patients, the SGA assesses recent dietary intake, weight changes, gastrointestinal symptoms, and clinical findings, and it is now recognized as a reliable method for diagnosing malnutrition and guiding nutritional management [8],[9]. However, while the SGA is considered a gold standard for inpatient nutritional assessment, there remains a need for simpler, faster tools specifically suited for newly hospitalized stroke patients to ensure timely nutritional interventions.

Nutritional screening is a critical first step in identifying malnutrition risk and should be conducted within 1 to 24 hours of hospital admission [10]. Several screening tools have been developed for hospitalized patients, each with its advantages and limitations. Among these, tools such as the Malnutrition Universal Screening Tool (MUST), Nutritional Risk Screening 2002 (NRS-2002), Mini Nutritional Assessment short form (MNA-SF), Geriatric Nutritional Risk Index (GNRI), Prognostic Nutritional Index (PNI), and Controlling Nutritional Status score (CONUT) have been applied in stroke patients [7]. However, many of these tools rely on BMI, which may be challenging to measure accurately in stroke patients, and some involve lengthy questionnaires.

In contrast, the Malnutrition Screening Tool (MST) offers a simpler approach with proven sensitivity and specificity for hospitalized adults [11],[12]. Despite its advantages, the MST has not yet been validated for detecting malnutrition risk in stroke patients. This study aims to evaluate the diagnostic value of the MST in assessing malnutrition risk compared to nutritional status determined by the SGA in stroke patients admitted to the hospital.

2 Method

A cross-sectional study was conducted on acute stroke patients admitted to Atma Jaya Hospital, Jakarta, from January 2017 to November 2021. Nutritional screening was performed using the Malnutrition Screening Tool (MST), and patients were included if they were registered in the stroke registry of the Department of Neurology, School of Medicine and Health Sciences, Atma Jaya Catholic University of Indonesia. Patients with incomplete data were excluded from the study. The research protocol received ethical approval from the Ethics Committee of the Faculty of Medicine and Health Sciences, Atma Jaya Catholic University of Indonesia, Jakarta.

The MST is a simple, quick, valid, and reliable nutritional screening tool designed to identify patients at risk of malnutrition. It comprises two questions evaluating unintentional weight loss over the past six months and decreased appetite. Each question is scored: no weight loss or appetite reduction scores 0, while weight loss is categorized into four groups: 1–5 kg (score 1), 6–10 kg (score 2), 11–15 kg (score 3), and >15 kg (score 4). Appetite reduction scores 1 point. A total score of ≥ 2 indicates malnutrition [11], [13]. BMI was calculated as weight (kg) divided by height squared (m^2) and classified as malnutrition if BMI was <18.5 kg/m^2. Laboratory data included hemoglobin levels (g/dL), categorized as normal

 Doi: 10.30872/jtpc.v9i1.292

(≥13 g/dL for males, ≥12 g/dL for females) or low. Total lymphocyte count (TLC) was recorded in cells/mm³ and categorized as normal (≥1500) or malnourished (<1500). [14]

The Subjective Global Assessment (SGA), serving as the reference standard, evaluates nutritional status based on changes in food intake, estimated weight loss, clinical history, and physical examination. SGA results were categorized into well-nourished or malnourished [15]. Associations between patient characteristics, MST scores, and nutritional assessment parameters (BMI, hemoglobin, TLC) with SGA classification were analyzed using chi-square or Fisher's exact tests, as appropriate, with a significance threshold of $p < 0.05$.

To determine the independent relationship of MST scores with nutritional status, multivariate logistic regression was applied, adjusting for covariates such as age, sex, and stroke type. The validity of the MST (sensitivity, specificity) was assessed to evaluate its comparative performance. The Area Under the Curve (AUC) was calculated as part of the validity analysis to measure its discriminatory power in detecting malnutrition. Validity thresholds followed recommended cutoffs: "poor" (sensitivity or specificity <50%, AUC <0.6), "moderate" (sensitivity and specificity >50%, AUC 0.6–0.8), and "good" (sensitivity and specificity >80%, AUC >0.8) [16]

3 Result and Discussion

Between January 2017 and November 2021, 218 stroke patients presented at Atma Jaya Hospital. Of these, 96 acute stroke patients underwent nutritional screening using the MST and had complete medical records. Based on the SGA, 25% (n=24) were classified as malnourished, a prevalence consistent with previous reports in hospitalized stroke populations, which range from 6.1% to 62% and average around 20% [17]. Malnutrition in stroke patients is widely recognized for its adverse effects on clinical outcomes, both in the short and long term. The most critical concerns are increased disability and mortality rates [5], [7]. Malnutrition in these patients can result from a combination of factors, including the heightened metabolic demands associated with the stroke event and impaired gastrointestinal function. Gastrointestinal dysfunction may stem from disruptions in oral, pharyngeal, and esophageal function, often manifesting as dysphagia [4]. These impairments reduce nutrient intake and heighten the risk of malnutrition. Additionally, malnutrition can precipitate further complications, including increased metabolic stress, heightened susceptibility to urinary tract and respiratory infections, and elevated mortality [18], [19].

Table 1 presents the participants' characteristics. Bivariate analysis revealed significant associations between nutritional status and age, BMI, hemoglobin levels, TLC, and MST scores ($p < 0.05$). Older patients, those with lower BMI, hemoglobin, TLC, and MST scores ≥2 were more likely to be malnourished, whereas gender and stroke type were not significantly associated. These findings align with previous studies examining nutritional assessments in hospitalized populations [20], [21]. Globally, numerous nutritional screening tools are available, many of which have been tailored for use in stroke patients [22]. These tools often evaluate parameters such as BMI, recent weight changes, or reductions in dietary intake, all of which are indicative of nutritional status [16]. Some tools also incorporate basic laboratory tests, such as hemoglobin levels and TLC, which are associated with inflammatory status and clinical outcomes. The evidence suggests that these parameters can serve as meaningful indicators of nutritional risk in stroke patients [7].

Table 1. Respondents Characteristics

Characteristics	SGA				Total	P
	Malnourished (n=24.25%)		Well-nourished (n=72.75%)			
	n	%	n	%		
Age Groups						
<60 y.o	8	61.5	5	38.5	13 (100.0)	0.003*
≥60 y.o	16	19.3	67	80.7	83 (100.0)	
Sex/Gender						
Male	16	26.7	44	73.3	60 (100.0)	0.626
Female	8	22.2	28	77.8	36 (100.0)	
Stroke Types						
Ischemic	19	25.7	55	74.3	74 (100.0)	0.779
Hemorrhagic	5	22.7	17	77.3	22 (100.0)	
BMI						
<18.5 Kg/m^2	9	100.0	0	0.0	9 (100.0)	<0.001*
≥18.5 Kg/m^2	15	17.2	72	82.8	87 (100.0)	
Hb						
Low	15	46.9	17	53.1	32 (100.0)	<0.001*
Normal	9	14.1	55	85.9	64 (100.0)	
TLC						
<1500 sel/mm^3	18	41.9	25	58.1	43 (100.0)	<0.001*
≥1500 sel/mm^3	6	11.3	47	88.7	53 (100.0)	
MST						
≥2	18	36.4	37	63.6	57 (100.0)	0.003*
<2	6	9.8	33	90.2	39 (100.0)	

Logistic regression (Table 2) confirmed that an MST score ≥2 was independently associated with a 3.115-fold increased risk of malnutrition after adjusting for age, gender, and stroke type ($p = 0.003$). This finding underscores the MST's utility as a practical tool for assessing nutritional risk in stroke patients upon hospital admission. Additionally, the MST stands out for its simplicity and efficiency compared to other screening tools.

Table 2. Logistic Regression Analysis of MST Scores to SGA Categories

Variables	Coefficient	P	AOR (95% CI)
MST ≥2	2.094	0.003	3.115 (2.069-8.834)
Age >60 y.o	2.336	0.002	10.335 (2.323-25.986)
Male	-0.602	0.296	0.548 (0.177-1.694)
Ischemic Stroke	1.203	0.100	3.331 (0.796-13.949)

AOR=Adjusted Odd Ratio; CI=Confidence Interval

The diagnostic accuracy of each nutritional parameter is shown in Table 3. MST demonstrated the highest sensitivity (75.0%) and specificity (51.4%) among screening measures, with an AUC of 0.674, indicating moderate validity. BMI had the highest PPV (100%), while TLC had the highest NPV (88.7%). A systematic review of the MST highlighted its moderate levels of validity, inter-rater reliability, and agreement in identifying malnutrition risk in adults. The tool's strength of evidence is classified as Level I, with robust support and generalizability [13]. However, its moderate sensitivity and specificity, with an AUC of 0.674, indicate that while the MST is effective, its use in stroke patients may benefit from supplementation with additional assessment tools or instruments to enhance diagnostic accuracy and clinical decision-making.

 Doi: 10.30872/jtpc.v9i1.292

Table 3. Comparison of The Validity of Nutritional Assessment Tools

Variables	Sensitivity	Specificity	PPV	NPV	P	AUC (95% CI)
MST	75.0	51.4	31.6	84.6	0.011	0.674 (0.556-0.791)
IMT (Kg/m^2)	37.5	0.0	100.0	82.8	0.006	0.618 (0.547-0.828)
Hb (g/dL)	62.5	23.6	46.9	85.9	0.004	0.604 (0.567-0.822)
TLC ($cell/mm^3$)	75.0	34.7	41.9	88.7	0.003	0.701 (0.582-0.821)

PPV=Positive Predictive Value; NPV=Negative Predictive Value; AUC=Area Under the Curve; CI=Confidence Interval.

This study, however, is not without its limitations. First, its cross-sectional design precludes the establishment of causal relationships between MST scores and nutritional status as determined by SGA. Second, the assessment of nutritional status was confined to the initial 24 hours of hospital admission, limiting the ability to observe changes in nutritional status or clinical outcomes over time. Third, as a retrospective review of the stroke registry, the study relied on the completeness of medical records, which ultimately constrained the sample size. Finally, the exclusive use of MST as the nutritional screening tool in the Emergency Department (ED) for adult patients prevented comparisons with other screening tools that might offer complementary insights

4. Conclusion

The prevalence of malnutrition among stroke patients upon hospital admission in this study was 25%. In conclusion, while the MST proves to be a valuable, efficient, and reliable tool for initial nutritional screening in stroke patients, its moderate diagnostic accuracy suggests that it should be used alongside other instruments to provide a comprehensive assessment of nutritional risk. Future studies are encouraged to explore the longitudinal impact of malnutrition on clinical outcomes and to evaluate the utility of integrating multiple nutritional assessment tools in the management of stroke patients. This approach may help optimize care and improve both short- and long-term outcomes for this vulnerable patient population.

5. Declarations

5.1 Acknowledgements (Optional)

We extend our gratitude to Atma Jaya Hospital and the Department of Neurology, School of Medicine and Health Sciences, Atma Jaya Catholic University, for their support and access to data

5.2 Author contributions

YA conceived and designed the study, coordinated data analysis, and drafted the manuscript. V contributed to data collection, analysis, and manuscript drafting. MM assisted with data collection and analysis. LS provided resources, supervised the study, and contributed to manuscript review and editing. All authors read and approved the final manuscript.

5.3 Ethics

This study obtained approval from the Health Research Ethics Committee of the School of Medicine and Health Sciences, Atma Jaya Catholic University of Indonesia, approval number 06/09/KEP-FKUAJ/2017. All research procedures complied with the principles of the Declaration of Helsinki.

5.4 Conflict of Interest

The authors declare that we have no conflict of interest

5.5 Funding Statement

There is no funding for this research or publication

6. Bibliography

[1] M. K. Kang *et al.*, "Geriatric nutritional risk index predicts poor outcomes in patients with acute ischemic stroke-automated undernutrition screen tool," *PLoS One*, vol. 15, no. 2, p. e0228738, 2020.

[2] H. Naito *et al.*, "Prognostic role of the controlling nutritional status score in acute ischemic stroke among stroke subtypes," *J Neurol Sci*, vol. 416, p. 116984, Sep. 2020, doi: 10.1016/j.jns.2020.116984.

[3] H. Tang *et al.*, "Malnutrition and risk of mortality in ischemic stroke patients treated with intravenous thrombolysis," *Frontiers in Aging Neuroscience*, vol. 14, p. 834973, 2022.

[4] O. Di Vincenzo *et al.*, "High Nutritional Risk Is Associated with Poor Functional Status and Prognostic Biomarkers in Stroke Patients at Admission to a Rehabilitation Unit," *Nutrients*, vol. 15, no. 19, Art. no. 19, Jan. 2023, doi: 10.3390/nu15194144.

[5] Y. Kim *et al.*, "The association between malnutrition status and hemorrhagic transformation in patients with acute ischemic stroke receiving intravenous thrombolysis," *BMC Neurol*, vol. 23, no. 1, p. 106, Mar. 2023, doi: 10.1186/s12883-023-03152-3.

[6] S. Mancin, M. Sguanci, D. Andreoli, M. Piredda, and M. G. De Marinis, "Nutritional assessment in acute stroke patients: A systematic review of guidelines and systematic reviews," *International Journal of Nursing Studies*, vol. 158, p. 104859, Oct. 2024, doi: 10.1016/j.ijnurstu.2024.104859.

[7] O. Di Vincenzo *et al.*, "The Assessment of the Risk of Malnutrition (Undernutrition) in Stroke Patients," *Nutrients*, vol. 15, no. 3, p. 683, Jan. 2023, doi: 10.3390/nu15030683.

[8] D. R. Duerksen, M. Laporte, and K. Jeejeebhoy, "Evaluation of Nutrition Status Using the Subjective Global Assessment: Malnutrition, Cachexia, and Sarcopenia," *Nutr Clin Pract*, vol. 36, no. 5, pp. 942–956, Oct. 2021, doi: 10.1002/ncp.10613.

[9] C. Serón-Arbeloa *et al.*, "Malnutrition screening and assessment," *Nutrients*, vol. 14, no. 12, p. 2392, 2022.

[10] S. Susetyowati, A. S. Sholikhati, D. K. Cahyaningrum, A. I. Rachmawati, and A. Y. Handaya, "Comparison of Tools for Nutritional Assessment and Screening of Hospitalized Patients: A study on Surgical Patients," *Medeni Med J*, vol. 38, no. 1, pp. 70–77, Mar. 2023, doi: 10.4274/MMJ.galenos.2023.64554.

[11] T. Aloy Dos Santos, V. C. Luft, G. C. Souza, Z. de Albuquerque Santos, A. M. Keller Jochims, and J. Carnevale de Almeida, "Malnutrition screening tool and malnutrition universal screening tool as a predictors of prolonged hospital stay and hospital mortality: A cohort study," *Clin Nutr ESPEN*, vol. 54, pp. 430–435, Apr. 2023, doi: 10.1016/j.clnesp.2023.02.008.

[12] I. Paur *et al.*, "The Norwegian Directorate of Health recommends malnutrition screening tool (MST) for all adults," *Clin Nutr ESPEN*, vol. 52, pp. 28–31, Dec. 2022, doi: 10.1016/j.clnesp.2022.09.029.

[13] A. Skipper *et al.*, "Position of the Academy of Nutrition and Dietetics: Malnutrition (Undernutrition) Screening Tools for All Adults," *J Acad Nutr Diet*, vol. 120, no. 4, pp. 709–713, Apr. 2020, doi: 10.1016/j.jand.2019.09.011.

[14] M. V. Krause and L. K. Mahan, *Krause and Mahan's Food & the Nutrition Care Process*. Elsevier, 2021.

[15] L. Amalia, F. Arsanti, and G. Megawati, "Hubungan luaran subjective global assessment (SGA) dengan derajat keparahan stroke," *Neurona*, vol. 36, no. 3, 2019, Accessed: Jan. 05, 2025.

[Online]. Available: http://ejournal.neurona.web.id/index.php/neurona/article/download/71/68
[16] J. P. Allard, H. Keller, L. Gramlich, K. N. Jeejeebhoy, M. Laporte, and D. R. Duerksen, "GLIM criteria has fair sensitivity and specificity for diagnosing malnutrition when using SGA as comparator," *Clin Nutr*, vol. 39, no. 9, pp. 2771–2777, Sep. 2020, doi: 10.1016/j.clnu.2019.12.004.
[17] Y. Chen, X. Yang, Y. Zhu, X. Zhang, J. Ni, and Y. Li, "Malnutrition defined by geriatric nutritional risk index predicts outcomes in severe stroke patients: a propensity score-matched analysis," *Nutrients*, vol. 14, no. 22, p. 4786, 2022.
[18] H. Niu *et al.*, "Prognosis of patients with coexisting obesity and malnutrition after ischemic stroke: A cohort study," *Clinical Nutrition*, vol. 43, no. 5, pp. 1171–1179, May 2024, doi: 10.1016/j.clnu.2024.04.005.
[19] H. Choi *et al.*, "The Significance of an Initial Controlling Nutritional Status Score in Predicting the Functional Outcome, Complications, and Mortality in a First-Ever Ischemic Stroke," *Nutrients*, vol. 16, no. 20, Art. no. 20, Jan. 2024, doi: 10.3390/nu16203461.
[20] J. Yoon *et al.*, "Malnutrition and Associated Factors in Acute and Subacute Stroke Patients with Dysphagia," *Nutrients*, vol. 15, no. 17, p. 3739, Aug. 2023, doi: 10.3390/nu15173739.
[21] D. K. Yunda, F. Witjaksono, and F. Nurwidya, "Correlation between protein intake, fat free mass, and total lymphocyte count with quality of life in pulmonary tuberculosis patients undergoing intensive phase treatment in Pekanbaru, Riau Province," *Molecular and Cellular Biomedical Sciences*, vol. 4, no. 3, pp. 128–34, 2020.
[22] V. Huppertz *et al.*, "Impaired nutritional condition after stroke from the hyperacute to the chronic phase: a systematic review and meta-analysis," *Frontiers in Neurology*, vol. 12, p. 780080, 2022.