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Artikel Penelitian

HUBUNGAN SKOR *SUBJECTIVE GLOBAL ASSESSMENT* DENGAN KADAR LIMFOSIT TOTAL PADA PASIEN TUBERKULOSIS

CORRELATION OF SUBJECTIVE GLOBAL ASSESSMENT SCORE WITH TOTAL LYMPHOCYTE COUNT AMONG TUBERCULOSIS PATIENTS

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A B S T R A K

Malnutrisi dan tuberkulosis (TB) memiliki hubungan dua arah, di mana status gizi yang buruk berkontribusi terhadap gangguan fungsi imun dan progresivitas penyakit. *Subjective Global Assessment* (SGA) merupakan alat penilaian status gizi klinis yang tervalidasi, sedangkan kadar limfosit total (*total lymphocyte count*, TLC) mencerminkan kompetensi sistem imun. Penelitian ini bertujuan untuk menganalisis hubungan antara skor SGA dan TLC pada pasien tuberkulosis. Penelitian deskriptif potong lintang dilakukan pada 34 pasien TB dewasa yang berobat di klinik tuberkulosis Rumah Sakit Pendidikan Universitas Sumatera Utara pada periode Oktober–Desember 2025. Status gizi dinilai menggunakan SGA, sedangkan data TLC diperoleh dari rekam medis. Analisis hubungan dilakukan menggunakan uji korelasi Spearman. Median TLC adalah 1.873,64 sel/µL (rentang 742,72–9.874,23). Berdasarkan klasifikasi SGA, 29,4% pasien tergolong gizi baik, 44,1% malnutrisi sedang, dan 26,5% malnutrisi berat. Terdapat korelasi positif sedang yang bermakna secara statistik antara skor SGA dan TLC (r = 0,40; p = 0,019). Kesimpulan: Terdapat hubungan positif yang bermakna antara skor SGA dan TLC pada pasien tuberkulosis. Hasil ini menegaskan pentingnya penilaian status gizi secara komprehensif sebagai bagian dari tata laksana terpadu tuberkulosis.

A B S T R A C T

Malnutrition and tuberculosis (TB) have a bidirectional relationship, in which poor nutritional status contributes to impaired immune function and disease progression. Subjective Global Assessment (SGA) is a validated clinical tool for nutritional assessment, while total lymphocyte count (TLC) reflects immune competence. This study aimed to investigate the correlation between SGA score and TLC among tuberculosis patients. A descriptive cross-sectional study was conducted among 34 adult TB patients attending the tuberculosis clinic at Universitas Sumatera Utara Teaching Hospital between October and December 2025. Nutritional status was assessed using SGA, and TLC values were obtained from medical records. Data were analyzed using Spearman's rank correlation test. The median TLC was 1,873.64 cells/µL (range 742.72–9,874.23). Based on SGA classification, 29.4% of patients were well nourished, 44.1% were moderately malnourished, and 26.5% were severely malnourished. A statistically significant moderate positive correlation was observed between SGA score and TLC (r = 0.40; p = 0.019). Conclusion: There was a significant positive correlation between SGA score and TLC in tuberculosis patients. These findings highlight the importance of comprehensive nutritional assessment as part of integrated tuberculosis management to identify patients at risk of immune impairment.

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INTRODUCTION

Tuberculosis (TB) remains the leading cause of death from a single infectious disease worldwide.[1–3] In 2019, TB accounted for approximately 1.4 million deaths globally. The World Health Organization (WHO) estimated that 10.4 million people developed TB and 1.7 million died from the disease in 2017.[4] According to the *Global Tuberculosis Report 2024*, there were about 10.6 million new TB cases worldwide, with 1.3 million deaths. Indonesia is among the three countries with the highest TB burden, making TB a major public health concern. Patients with TB often present with complex clinical conditions, requiring a multidisciplinary approach, including careful monitoring of nutritional status.[3]

Malnutrition and TB have a bidirectional relationship.[5,6] Tuberculosis (TB) infection increases metabolic demands and reduces dietary intake, while malnutrition impairs cellular immunity, which plays a crucial role in controlling *Mycobacterium tuberculosis* (Mtb) infection. Undernutrition substantially increases susceptibility to TB, raising the risk by six to ten times, and is a key factor in the progression from latent to active TB. Low body mass index (BMI) has been consistently associated with TB reactivation, with the risk of TB increasing by approximately 13.8% for every unit decrease in BMI.[7] Currently, malnutrition is recognized as a leading risk factor for TB, surpassing HIV, and was responsible for an estimated 2.3 million TB cases in 2019.[5]

In clinical practice, nutritional status in TB patients is commonly assessed using the Subjective Global Assessment (SGA), a validated clinical tool that combines medical history and physical examination to classify patients as well nourished, moderately malnourished, or severely malnourished.[8–15] Meanwhile, total lymphocyte count (TLC) is a simple and widely available immunological parameter used to reflect immune competence, particularly in patients with malnutrition and chronic infectious diseases. A low lymphocyte count indicates impaired immune function and has been associated with poor clinical outcomes and increased susceptibility to opportunistic infections.[16]

Despite the clinical relevance of both SGA and TLC, studies examining the relationship between nutritional status assessed by SGA and immune status reflected by TLC in patients with TB remain limited, especially in teaching hospital settings. Therefore, this study aims to investigate the correlation between SGA score and TLC among tuberculosis patients at Universitas Sumatera Utara Teaching Hospital. Understanding this relationship is expected to provide valuable insights into the interaction between nutritional status and immune response in TB patients and to support evidence-based nutritional management in comprehensive TB care.

METHODS

This descriptive cross-sectional study involved 34 adult patients (aged ≥18 years, both male and female) who consecutively attended the tuberculosis clinic at Universitas Sumatera Utara Teaching Hospital, Medan, Indonesia, between October and December 2025. Ethical approval for the study was obtained from the

Health Research Ethical Committee of Universitas Sumatera Utara (No. 1012/KEPK/USU/2025).

Participants were requested to complete a structured questionnaire to obtain information on demographic characteristics and relevant medical history. Following this, each subject underwent clinical history taking and a nutrition-focused physical examination to complete the SGA, which classifies nutritional status into well-nourished, moderately malnourished, or severely malnourished. Anthropometric assessments, including measurements of body weight, height, and mid-upper arm circumference (MUAC), were performed twice, and the mean values were used for analysis. Body mass index (BMI) was calculated based on weight and height measurements. Laboratory parameters were retrieved from the patients' medical records.

Statistical analysis was conducted using SPSS software version 20. Data were analyzed using univariate and bivariate approaches. The association between variables was evaluated using Spearman's rank correlation test.

RESULTS

A total of 34 participants who met the inclusion and exclusion criteria and provided written informed consent were included in this study. The baseline characteristics included age, sex, occupation, education level, income, and comorbidities. Most participants were male, with a median age of 55 years. The most common occupation was self-employed (26.5%), and the majority had completed high school education (61.8%). More than half of the participants were classified as belonging to the vulnerable income group (55.9%). The most common comorbidity was diabetes mellitus (26.5%). The detailed characteristics of the study subjects are presented in Table 1.

Table 1. Characteristics of research subjects.

Variable	n=34
Age, year	55.0 (18.0–88.0)
Gender, n (%)	
Male	21 (61.8)
Female	13 (38.2)
Occupation, n (%)	
Housewives	6 (17.6)
Students	8 (23.5)
Employees	6 (17.6)
Entrepreneurs	9 (26.5)
Farmers	1 (2.9)
Retiree	4 (11.8)
Level of education, n (%)	
Elementary school	3 (8.8)
Junior high school	3 (8.8)
High school	21 (61.8)
Diploma	1 (2.9)
Bachelor	6 (17.6)
Monthly income, n (%)	
Vulnerable (IDR 535,548 to IDR 1.2 M)	19 (55.9)
Lower-income (IDR 1.2 M to IDR 3.5 M)	10 (29.4)
Middle-income (IDR 3.5 M to IDR 15 M)	5 (14.7)
Upper-income (> IDR 15 M)	0 (0.0)
Physical activity level, n (%)	
Sedentary	5 (14.7)
Mild active	21 (61.8)
Active	8 (23.5)
Comorbidities, n (%)	
Previous TB	1 (2.9)
Asthma	2 (5.9)
Hypertension	3 (8.8)
Diabetes mellitus	9 (26.5)
None	19 (55.9)

Table 2 shows laboratory results of the participants. The median leukocyte count among the study participants was 14,062 cells/µL, with values ranging from 5,200 to 27,770 cells/µL. The median TLC was 1,873.64 cells/µL, with a range of 742.72 to 9,874.23 cells/µL.

Table 2. Laboratory analysis

Variable	n=34
Leukocyte (per μL)	14,062 (5,200–27,770)
TLC (per μL)	1873.64 (742.72–9874.23)

Analysis of nutritional status of participants (Table 3) showed mean weight was 54.0 kg, mean height was 158.0 cm, median BMI was 20.5 kg/m^2, and mean MUAC was 25.4 cm. The SGA score ranged from A (29.4%) and B (44.1%) to C (26.5%). According to nutritional status based on TLC, more than half of the participants were classified as well-nourished (61.8%), mildly malnourished (14.7%), moderately malnourished (17.6%) and severely malnourished (5.9%).

Table 3. Nutritional status

Variable	n=34
Height, cm	158.029 ± 9.497
Weight, kg	53.996 ± 13.365
BMI, kg/m^2	20.5 (15.7–34.2)
Mid-upper arm circumference, cm	25.388 ± 3.840
SGA, n (%)	
A	10 (29.4)
B	15 (44.1)
C	9 (26.5)
Nutritional status based on TLC, n (%)	
Well-nourished	21 (61.8)
Mildly malnourished	5 (14.7)
Moderately malnourished	6 (17.6)
Severely malnourished	2 (5.9)

Table 4. Association between SGA and TLC

SGA	r	p-value
TLC	0.4	0.019[1]

[1]Spearman correlation

Table 4 shows the analysis of the relationship between SGA score and TLC among the participants. A moderate positive correlation was found between SGA score and TLC (r = 0.40), which was statistically significant (p = 0.0191).

DISCUSSION

This study demonstrated a statistically significant positive correlation between SGA score and TLC among tuberculosis patients treated at a teaching hospital. These findings indicate that poorer nutritional status, as assessed clinically using SGA, is associated with lower lymphocyte levels, reflecting impaired immune competence in patients with tuberculosis. This result directly addresses the study objective by confirming the relationship between clinical nutritional assessment and an immunological marker in TB patients.

The observed association is biologically plausible, given the close interaction between nutritional status and immune function. Malnutrition is known to impair cell-mediated immunity, particularly T-lymphocyte proliferation and function, which plays a central role in controlling *Mycobacterium tuberculosis* infection. Protein-energy malnutrition and micronutrient deficiencies reduce thymic output, alter cytokine production (such as tumor necrosis factor-α (TNF-α), interferon-γ (IFN-γ), and interleukin-2 (IL-2), as well as increased anti-inflammatory cytokines such as IL-10), and lead to lymphopenia, thereby increasing susceptibility to infection and worsening disease progression. Recent evidence has emphasized that immune dysfunction in TB is not solely driven by the infection itself but is strongly influenced by underlying nutritional status.[5,17–20]

Our findings are consistent with several recent studies reporting an association between

malnutrition and reduced lymphocyte counts in patients with tuberculosis. A study by Ockenga et al. highlighted malnutrition as a major determinant of immune suppression in TB, contributing to delayed recovery and poor clinical outcomes.[5] Similarly, Istianah et al. (2025) reported that patients with advanced pulmonary TB frequently exhibit reduced TLC, particularly among those with poor nutritional status.[16] Although previous studies have primarily relied on anthropometric indicators such as body mass index (BMI), our study extends existing knowledge by demonstrating that a clinical assessment tool such as SGA also correlates significantly with immune status.

The use of SGA in this study is particularly relevant in routine clinical practice. Unlike BMI or laboratory-based nutritional markers, SGA integrates medical history, dietary intake, weight changes, gastrointestinal symptoms, functional capacity, and findings from a nutrition-focused physical examination. This comprehensive approach allows clinicians to identify malnutrition even in patients with normal or borderline BMI, which is common in tuberculosis.[9] The significant correlation between SGA score and TLC observed in this study supports the role of SGA as a practical and clinically meaningful tool for identifying TB patients at risk of immune compromise.

Interestingly, although more than half of the participants were classified as well-nourished based on TLC, a substantial proportion were categorized as moderately or severely malnourished according to SGA. This discrepancy may reflect the multifactorial nature of immune responses in TB, where lymphocyte count alone may not fully capture functional immune impairment.[16,21–24] In addition, acute inflammation, infection severity, and comorbidities such as diabetes mellitus—which was prevalent in this study—may influence lymphocyte levels independently of nutritional status.

In this study, comorbid conditions, particularly diabetes mellitus, were relatively common and may act as potential confounding factors influencing immune status. Diabetes has been associated with impaired cellular immunity and reduced lymphocyte function, which may contribute to lower TLC independently of nutritional status.[25,26] Therefore, the observed association between SGA and TLC should be interpreted with caution, as the interplay between nutritional status and comorbidities may influence immune responses in tuberculosis patients.

The findings of this study have important clinical implications. Routine implementation of SGA in tuberculosis care may serve as a simple and practical tool for early identification of patients at risk of malnutrition and immune suppression. Integrating SGA into standard clinical workflows, particularly during initial assessment and follow-up visits, may help guide timely nutritional interventions, such as individualized dietary support and oral nutritional supplementation. This approach has the potential to improve immune recovery, enhance treatment response, and reduce the risk of poor clinical outcomes in tuberculosis patients.

Several limitations should be acknowledged. First, the relatively small sample

size (n = 34) may reduce the statistical power of the study and limit the generalizability of the findings to broader populations. Second, this study was conducted in a single-center setting, which may not fully represent the heterogeneity of tuberculosis patients in different healthcare settings. Third, the cross-sectional design precludes the establishment of causal relationships between nutritional status and immune parameters. Additionally, potential confounding factors such as comorbidities, particularly diabetes mellitus, which was prevalent in this study, may have influenced lymphocyte levels independently of nutritional status. Future studies with larger sample sizes, longitudinal designs, and more comprehensive analyses, including multivariate approaches and additional immunological markers, are needed to further clarify the relationship between nutritional status and immune function in tuberculosis.

CONCLUSION

This study demonstrated a significant positive correlation between SGA score and TLC among tuberculosis patients treated at a teaching hospital. These findings indicate that poorer nutritional status assessed clinically using SGA is associated with reduced immune competence, as reflected by lower lymphocyte counts. The results highlight the importance of comprehensive nutritional assessment in tuberculosis management and support the integration of routine nutritional evaluation as part of holistic TB care. Further studies with larger sample sizes and longitudinal designs are warranted to explore causal relationships and the impact of nutritional interventions on immune recovery and clinical outcomes in tuberculosis patients.

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