# Nutritional Status of Lung Cancer Patients Receiving Chemotherapy

Hnin Lae Yin Mon, M.D.[1]
[1]Medical Oncology Department, Mandalay General Hospital, Mandalay, Myanmar 05032
Received 14 January 2026 • Revised 11 April 2026 • Accepted 20 April 2026 • Published online 1 May 2026

**Abstract:**

**Introduction:** Malnutrition is common among lung cancer patients and adversely affects treatment outcome, quality of life, and survival. Data on nutritional status in this population, particularly during chemotherapy, remain limited in Myanmar.

**Objectives:** This study aimed to assess the nutritional status of lung cancer patients using the Subjective Global Assessment score (SGA) and Body Mass Index (BMI).

**Materials and Method:** This study evaluated the nutritional status of 70 patients with lung cancer at Yangon General Hospital, Myanmar using the SGA score and BMI. Changes in nutritional status were evaluated before and after chemotherapy.

**Results:** At baseline, 66% of patients were malnourished according to SGA, increasing to 68% after chemotherapy. Most patients experienced significant weight loss, as evidenced by a decline in BMI following chemotherapy. Although the overall change in SGA categories before and after chemotherapy was not statistically significant, individual-level analysis showed that a greater proportion of patients experienced deterioration than improvement, particularly in those with metastatic disease.

**Conclusion:** Malnutrition is highly prevalent among lung cancer patients in Myanmar. Routine nutritional assessment and early nutritional intervention should be integrated into cancer care to mitigate weight loss and improve treatment outcomes.

**Keywords:** Lung cancer; Malnutrition; Chemotherapy; SGA; BMI

## Introduction

Lung cancer is the most common cancer worldwide and a leading cause of cancer-related mortality.[1] In Myanmar, the burden of lung cancer is substantial, reflecting the high prevalence of tobacco smoking.[2] Malnutrition is a frequent and serious problem among cancer patients, and its prevalence varies according to tumor site, disease stage, and treatment setting. The highest rates are reported in pancreatic cancer (80–85%), gastroesophageal cancer (65–85%), and head and neck cancer

Corresponding author: Hnin Lae Yin Mon, M.D.
Medical Oncology Department, Mandalay General Hospital, Mandalay, Myanmar 05032
E-mail: hninlae92@gmail.com
GMSMJ 2026; 6 (2): 107-116

(65–75%), while in lung cancer, the prevalence ranges from 45–60%.[3]

In lung cancer patients, malnutrition is strongly associated with cancer cachexia, driven by inflammatory cytokines, anorexia, hyper catabolism, and progressive skeletal muscle loss.[4] In contrast, in upper gastrointestinal tumors, malnutrition is related to impaired oral intake due to dysphagia or obstruction. Patients with breast cancer often have normal or increased body weight and are generally considered at lower risk of malnutrition.[9] In liver cancers, malnutrition is also common but is driven by distinct metabolic and nutritional mechanisms.[10] These differences highlight the importance of tumor-specific nutritional assessment, particularly in lung cancer, where systemic cachexia plays a central role independent of mechanical limitations to oral intake.[3-4,9]

Cancer-related malnutrition has been associated with poor treatment tolerance, increased complications, prolonged hospital stay, reduced quality of life, and decreased survival.[5] Chemotherapy can further exacerbate nutritional deterioration through adverse effects such as nausea, vomiting, anorexia, mucositis, and fatigue. Early identification of nutritional risk is therefore essential to optimize treatment outcomes in lung cancer patients.[6]

The Subjective Global Assessment (SGA) is a validated clinical tool widely used to assess nutritional status in oncology patients.[7] It is a standardized, noninvasive, and cost-effective method that incorporates information from medical history (weight loss, dietary intake, gastrointestinal symptoms, and functional capacity) and physical examination (loss of subcutaneous fat, muscle wasting, and the presence of edema or ascites).[7]

In resource-limited settings, routine nutritional assessment is often overlooked due to limited manpower and facilities, and local data on the nutritional status of lung cancer patients undergoing chemotherapy remain scarce.[6] Therefore, this study aimed to evaluate the nutritional status of lung cancer patients before and after chemotherapy using BMI and SGA, and to identify associated clinical factors.

## Method

### Study design and setting

This was a hospital-based observational study conducted at the Medical Oncology Department, Yangon General Hospital, Myanmar, between February 2019 and January 2020.

### Study population

A total of 70 patients with histologically confirmed lung cancer were enrolled. Patients of both sexes aged ≥18 years, with any histological subtype, who were scheduled to receive chemotherapy were included. Patients who were terminally ill or unable to complete at least three cycles of chemotherapy were excluded.

### Data collection and clinical variables

Demographic and relevant clinical variables were collected, including age, sex, smoking status, histological subtype, disease stage, treatment modalities (surgery and radiotherapy), and chemotherapy regimens. These variables were predefined and included in the analysis to evaluate their association with changes in nutritional status.

### Nutritional assessment

Baseline nutritional status was assessed prior to the initiation of chemotherapy using BMI and SGA score. Follow-up assessment was performed after completion of three cycles of chemotherapy. Chemotherapy consisted predominantly of platinum-based combination regimens administered every

three weeks; therefore, the interval between assessments was approximately nine weeks. However, the exact duration may have varied depending on individual patient condition and treatment delays related to chemotherapy toxicity.

Body weight and height were measured, and BMI was calculated as weight in kilograms divided by height in meters squared (kg/m$^2$). Patients were classified according to BMI categories: underweight (<18.5 kg/m$^2$), normal (18.5–24.9 kg/m$^2$), overweight (25.0–29.9 kg/m$^2$), and obese (≥30 kg/m$^2$).

The SGA score is a validated clinical tool originally developed by Detsky et al.[7] for the evaluation of nutritional status in adult patients. It incorporates information from medical history and physical examination (in Supplementary material). Based on these components, patients were classified into three categories: well nourished (SGA-A), moderately malnourished (SGA-B), or severely malnourished (SGA-C). All SGA assessments were performed by a single investigator who had received appropriate training, using a standardized assessment protocol.

Assessment of SGA changes

Individual changes in SGA classification before and after chemotherapy were assessed. Changes were categorized into three groups: "Worse," "No change," and "Improved." No change in SGA classification was recorded as "No change." Changes from SGA-A to B, A to C, or B to C were classified as "Worse." Changes from SGA-C to B, C to A, or B to A were classified as "Improved."

**Statistical analysis**

Data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 16. Categorical variables were expressed as frequencies and percentages, while continuous variables were summarized as mean ± standard deviation. Paired t-tests were used to compare mean BMI values before and after chemotherapy. Associations between categorical variables were analyzed using Fisher's exact test. A p-value of <0.05 was considered statistically significant.

**Limitations**

Multivariable analysis to adjust for potential confounders (e.g., disease stage, treatment type, and baseline nutritional status) was not performed due to the relatively small sample size and limited number of events, which may reduce the reliability of such models.

In addition, due to resource limitations, formal nutritional interventions such as oral nutritional supplements or enteral/parenteral nutrition were not routinely provided. Patients mainly received general nutritional counseling as part of standard care; however, detailed data regarding the extent and consistency of counseling were not systematically recorded, and its impact on nutritional outcomes could not be evaluated.

**Ethical considerations**

Ethical approval for the study was obtained from the Research and Ethics Committee of the University of Medicine - 1 Yangon. Written informed consent was obtained from all participants prior to enrollment, and confidentiality of participant data was strictly maintained.

**Results**

Baseline demographic and clinical characteristics

The baseline characteristics of the study population are summarized in Table 1. A total of 70 patients were included. Most patients were aged 51–60 years (40%), followed by 61–70 years (28%). The majority were male (83%) and smokers

(71%). The most common histological subtype was squamous cell carcinoma (53%), followed by adenocarcinoma (28%). A large proportion of patients presented with advanced-stage and metastatic disease (63% and 36%, respectively). Only 1% were stage II, and no patients were stage I. Regarding treatment modalities, 13% of patients received radiotherapy and 6% underwent surgical intervention. The majority were treated with palliative chemotherapy (61%). Platinum plus etoposide was the most frequently used chemotherapy regimen (72.8%). The distribution of chemotherapy regimens among lung cancer patients is summarized in Table 2.

Baseline nutritional status

At baseline, 30% of patients were underweight according to BMI, while 50% had a normal BMI. Based on SGA classification, 34% of patients were well nourished (SGA-A), 47% were moderately malnourished (SGA-B), and 19% were severely malnourished (SGA-C) (Table 3). Overall, 66% of patients were malnourished prior to chemotherapy.

Baseline BMI was significantly associated with baseline SGA classification ($p = 0.010$) (Table 4). Patients with normal BMI were more likely to be classified as SGA-A, whereas

**Table 1** Baseline demographic and clinical characteristics of lung cancer patients (n = 70)

| Characteristics | Number (%) |
|---|---|
| Age ≤50 | 9 (13) |
| Age 51–60 | 28 (40) |
| Age 61–70 | 20 (28) |
| Age >70 | 13 (19) |
| Male | 58 (83) |
| Female | 12 (17) |
| Smoker | 50 (71) |
| Non-smoker | 20 (29) |
| Squamous cell carcinoma | 37 (53) |
| Adenocarcinoma | 20 (28) |
| Large cell carcinoma | 9 (13) |
| Small cell carcinoma | 4 (6) |
| Stage I | - (-) |
| Stage II | 1 (1%) |
| Stage III | 25 (36) |
| Stage IV | 44 (63) |
| Radiotherapy – Yes | 9 (13) |
| Radiotherapy – No | 61 (87) |
| Surgery – Yes | 4 (6) |
| Surgery – No | 66 (94) |
| Adjuvant Chemotherapy | 4 (6) |
| Chemoradiotherapy | 23 (33) |
| Palliative Chemotherapy | 43 (61) |

**Table 2** Distribution of chemotherapy regimens among lung cancer patients

| Regimen | Number | Percentage |
|---|---|---|
| Platinum + etoposide | 51 | 72.8% |
| Platinum + gemcitabine | 10 | 14.2% |
| Platinum + paclitaxel | 6 | 8.5% |
| Platinum + pemetrexed | 2 | 2.8% |
| MVP | 1 | 1.4% |
| Total | 70 | 100% |

underweight patients were more frequently classified as SGA-B or SGA-C. No other demographic or clinical variables showed a significant association with baseline SGA status.

**Table 3** Distribution of Subjective Global Assessment (SGA) categories before and after chemotherapy (n=70)

| SGA category | Before chemotherapy n (%) | After chemotherapy n (%) |
|---|---|---|
| SGA-A | 24 (34.3) | 22 (31.4) |
| SGA-B | 33 (47.1) | 31 (44.3) |
| SGA-C | 13 (18.6) | 17 (24.3) |

**Table 4** Association between baseline BMI and baseline SGA classification (n=70) Changes in BMI after chemotherapy

| Baseline BMI (kg/m²) | SGA-A n (%) | SGA-B n (%) | SGA-C n (%) |
|---|---|---|---|
| <18.5 | 1 (4.2) | 14 (42.4) | 6 (46.2) |
| 18.5–24.9 | 17 (70.8) | 12 (36.4) | 6 (46.2) |
| 25–29.9 | 5 (20.8) | 6 (18.2) | 1 (7.7) |
| ≥30 | 1 (4.2) | 1 (3.0) | 0 (0.0) |

After completion of the third cycle of chemotherapy, the proportion of underweight patients increased to 37%, while the proportion of overweight and obese patients decreased. Mean BMI significantly declined from 21.3 ± 4.2 kg/m² before chemotherapy to 20.2 ± 3.2 kg/m² after chemotherapy ($p < 0.001$) (Table 5).

**Table 5** Comparison of mean body mass index (BMI) before and after chemotherapy

| BMI (kg/m²) | Mean ± SD | Paired t statistic | p value |
|---|---|---|---|
| Before chemotherapy | 21.3 ± 4.2 | | |
| After chemotherapy | 20.2 ± 3.2 | 4.813 | <0.001 |

**Table 6** Changes in SGA score after chemotherapy (n = 70)

| Change in SGA score | Number of patients | Percentage (%) |
|---|---|---|
| No change | 52 | 74 |
| Worse | 11 | 16 |
| Improved | 7 | 10 |
| Total | 70 | 100 |

Changes in SGA after chemotherapy

Following chemotherapy, 31% of patients were classified as SGA-A, 44% as SGA-B, and 24% as SGA-C (Table 3). The overall distribution of SGA categories before and after chemotherapy did not differ significantly (p = 0.446). However, individual-level analysis demonstrated meaningful changes in nutritional status.

Most patients (74%) showed no change in SGA classification. Nutritional deterioration was observed in 16% of patients, while 10% demonstrated improvement (Table 6).

Factors associated with individual changes in nutritional status

Disease stage was significantly associated with individual changes in SGA status (p = 0.043). Patients with advanced disease were more likely to experience deterioration in nutritional status. Other factors, including age, sex, histological type, surgery, radiotherapy, and chemotherapy type, were not significantly associated with changes in SGA status.

**Discussion**

This study provides important local data on the nutritional status of lung cancer patients in Myanmar, where structured nutritional assessment is not routinely integrated into oncology care. A significant proportion of patients presented at an advanced stage. Approximately two-thirds of patients (66%) were malnourished at baseline, with further deterioration observed during chemotherapy. The prevalence of malnutrition observed in this study is consistent with reports from other oncology populations, where rates ranging from 40–80% have been documented.[3] The predominance of advanced-stage disease in our cohort may partly explain the high baseline prevalence of malnutrition.

A significant decline in mean BMI was observed following chemotherapy, indicating deterioration in objective nutritional status during treatment. There was also a significant association between baseline BMI and SGA classification, suggesting that lower BMI is correlated with poorer nutritional status. Although BMI is a simple and objective measure that allows precise

monitoring of changes in body weight over time, it may underestimate malnutrition, particularly in patients with normal or higher body weight.[8] In contrast, SGA provides a more comprehensive clinical assessment by incorporating weight loss, dietary intake, functional status, and physical examination findings.[7] Moreover, weight loss is a key parameter in the assessment of malnutrition in cancer patients and is included within the SGA tool.[5] Therefore, the combined use of BMI and SGA enables a more complete evaluation of nutritional status by capturing both objective and clinical dimensions of malnutrition.

The overall change in SGA categories before and after chemotherapy was not statistically significant. Although most patients did not show a change in their individual SGA classification, a greater proportion experienced deterioration than improvement, particularly in patients with metastatic disease, underscoring the vulnerability of this group. The absence of a statistically significant change in SGA categories may reflect heterogeneity in treatment response, disease characteristics, and individual patient factors, resulting in both improvement and deterioration across patients. In addition, this finding may be explained by the multidimensional nature of the SGA tool, whereby changes in individual components may not be sufficient to alter the overall classification over a relatively short follow-up period.

In lung cancer, particularly in advanced stages, deterioration in nutritional status during chemotherapy is frequently observed and is multifactorial. Contributing factors include treatment-related toxicities, reduced oral intake, increased metabolic demand, systemic inflammation, and cancer-related cachexia.[4] A large proportion of patients in our study had advanced-stage disease, which may have contributed to the greater likelihood of deterioration in nutritional status at the individual level.

SGA is a simple, inexpensive, and clinically applicable tool for assessing nutritional status in lung cancer patients and can be readily implemented in routine clinical practice, particularly in resource-limited settings. In Myanmar, where the burden of lung cancer–related mortality is high, the implementation of structured nutritional assessment and management is particularly important, as it may improve treatment tolerance, reduce complications, and enhance overall clinical outcomes. These findings highlight the importance of early nutritional assessment and timely intervention throughout treatment, particularly during chemotherapy.

This study has several limitations. It was conducted at a single center with a relatively small sample size, which may limit the generalizability of the findings. Several potential confounding factors may have influenced the observed changes in nutritional status, including treatment-related factors such as chemotherapy regimens and associated toxicities, as well as patient-related factors such as age, sex, smoking status, and histologic subtype. Furthermore, the lack of structured nutritional interventions in our setting may represent an additional confounding factor. Due to the limited sample size and number of events, multivariable analysis was not performed to adjust for these confounders, and the findings should be interpreted with caution.

Despite these limitations, this study provides valuable insight into the nutritional challenges faced by lung cancer patients undergoing chemotherapy in routine clinical practice. Further studies with larger sample sizes, longer follow-up, and incorporation of objective body composition measurements are warranted to provide additional insight. In addition, the use of more cancer-specific

tools, such as PG-SGA, may facilitate earlier identification of patients at nutritional risk by capturing patient-reported symptoms relevant to cancer-related malnutrition.[9,12]

## Conclusion

Malnutrition is highly prevalent among lung cancer patients receiving chemotherapy, both at baseline and during treatment. Most patients experienced significant weight loss, as evidenced by a decline in BMI after chemotherapy. Although most patients did not show a change in SGA classification, a greater proportion experienced deterioration than improvement, particularly in those with metastatic disease, underscoring the vulnerability of this patient group.

This single-center study with a small sample size is subject to potential confounding factors and should be interpreted with caution. Despite these limitations, it highlights important nutritional challenges in lung cancer patients undergoing chemotherapy. Larger studies with longer follow-up, along with the use of cancer-specific tools such as PG-SGA, are needed to improve early identification and management of nutritional risk, enabling timely intervention and potentially improving treatment tolerance and overall patient care. Incorporating structured nutritional screening and assessment into routine oncology practice should be encouraged, particularly for patients with advanced lung cancer.

## Acknowledgements

The author would like to express sincere gratitude to the Department of Medical Oncology, Yangon General Hospital, for their support during the conduct of this study. Appreciation is also extended to the patients who participated in the study.

## Conflict of Interest

The author declares no conflict of interest.

## Funding

This study received no external funding.

## References

1. Sung H, Ferlay J, Siegel RL, et al. Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J Clin. 2021; 71 (3): 209–49. doi:10.3322/caac.21660.
2. International Agency for Research on Cancer. Myanmar: Global Cancer Observatory (GLOBOCAN 2020). Lyon: IARC; 2020.
3. Arends J, Bachmann P, Baracos V, et al. ESPEN guidelines on nutrition in cancer patients. Clin Nutr. 2017; 36 (1): 11–48. doi:10.1016/j.clnu.2016.07.015.
4. Baracos VE, Martin L, Korc M, et al. Cancer-associated cachexia. Nat Rev Dis Primers. 2018; 4:17105. doi: 10.1038/nrdp.2017.105.
5. Dewys WD, Begg C, Lavin PT, et al. Prognostic effect of weight loss prior to chemotherapy in cancer patients. Am J Med. 1980; 69 (4): 491–7.
6. Arends J, Baracos V, Bertz H, et al. ESPEN expert group recommendations for action against cancer-related malnutrition. Clin Nutr. 2017; 36 (5): 1187–96. doi:10.1016/j.clnu.2017.06.017.
7. Detsky AS, McLaughlin JR, Baker JP, et al. What is subjective global assessment of nutritional status? JPEN J Parenter Enteral Nutr. 1987; 11 (1): 8–13. doi:10.1177/014860718701100108.
8. Kyle UG, Pirlich M, Schuetz T, et al. Is nutritional status assessed by body mass index? Clin Nutr. 2003; 22 (6): 545–50. doi:10.1016/S0261-5614(03)00096-0.

9. Arends J, Strasser F, Gonella S, et al. ESPEN practical guideline: Clinical nutrition in cancer. Clin Nutr. 2021; 40 (5): 2898–913. doi:10.1016/j.clnu.2021.02.005.
10. Prado CM, Purcell SA, Laviano A. Nutrition interventions to treat low muscle mass in cancer. Lancet Oncol. 2020; 21 (3): e136–e147. doi:10.1016/S1470-2045(19)30890-2.
11. Vittinghoff E, Glidden DV, Shiboski SC, et al. Regression Methods in Biostatistics: Linear, Logistic, Survival, and Repeated Measures Models. 2nd ed. New York: Springer; 2012.
12. Bauer J, Capra S, Ferguson M. Use of the scored Patient-Generated Subjective Global Assessment (PG-SGA) as a nutrition assessment tool in patients with cancer. Eur J Clin Nutr. 2002; 56 (8):779–785. doi:10.1038/sj.ejcn.1601412.

**Supplementary material**

Subjective Global Assessment (SGA) form used for nutritional assessment

**1. Nutrient Intake**

☐ No change; adequate

☐ Inadequate; duration of inadequate intake: _____

- ☐ Suboptimal solid diet
- ☐ Full fluids or oral nutrition supplements only
- ☐ Minimal intake, clear fluids, or starvation

Nutrient intake in the past 2 weeks:

- ☐ Adequate ☐ Improved but not adequate
- ☐ No improvement or inadequate

**2. Weight**

Usual weight: ____ kg Current weight: ____ kg

Non-fluid weight change in the past 6 months:

- ☐ <5% loss or weight stability
- ☐ 5–10% loss without stabilization or increase
- ☐ >10% loss and ongoing

If above not known, subjective weight loss over past 6 months:

- ☐ Non/mild ☐ Moderate ☐ Severe

Weight change in the past 2 weeks:

- ☐ Increased ☐ No change ☐ Decreased

**3. Symptoms**

- ☐ Anorexia ☐ Vomiting ☐ Dysphagia ☐ Diarrhea
- ☐ Constipation ☐ Dental problems ☐ Early satiety
- ☐ Nausea ☐ Pain on eating

Severity of symptoms:

☐ Intermittent/mild/few

☐ Constant/severe/multiple

Symptoms in the past 2 weeks:

☐ Resolved ☐ Improving ☐ No change or worsened

**4. Functional Capacity**

☐ No dysfunction

☐ Reduced capacity; duration: ____

☐ Difficulty with ambulation or normal activities

☐ Bed- or chair-ridden

Functional capacity in the past 2 weeks:

☐ Improved ☐ No change ☐ Decreased

**5. Metabolic Requirement**

☐ High metabolic requirement ☐ No ☐ Yes

**6. Physical Examination**

Loss of subcutaneous fat:

☐ No ☐ Mild/Moderate ☐ Severe

Loss of muscle mass:

☐ No ☐ Mild/Moderate ☐ Severe

Presence of edema or ascites:

☐ No ☐ Mild/Moderate ☐ Severe

**7. Global SGA Rating**

☐ SGA-A: Well-nourished

☐ SGA-B: Moderately malnourished

☐ SGA-C: Severely malnourished