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Title: Nutritional Status and Actual Dietary Practice of Lung and Gastrointestinal Cancer Patients at Nghe An Oncology Hospital: A Cross-Sectional Study

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Clinical Question Box

What is the nutritional status of patients with lung cancer and gastrointestinal cancer in Vietnam?

Patients with lung and gastrointestinal cancers at Nghe An Oncology Hospital exhibited a high prevalence of malnutrition, with 72% classified as malnourished—52% severely and 20% moderately—based on the Patient-Generated Subjective Global Assessment (PG-SGA). Their dietary intake fell significantly below recommended levels, with their median energy intake being only 72% of the Vietnamese Recommended Nutrient Intake. Deficiencies concerning protein, several vitamins, and essential minerals such as calcium and iron were noted.

Abstract

Introduction: Malnutrition remains a prevalent and critical issue among hospitalized cancer patients, particularly those with lung and gastrointestinal (GI) cancers. In low- and middle-income countries such as Vietnam, cancer-related malnutrition may be further aggravated by limited access to nutritional support services. However, data on the nutritional status of Vietnamese cancer patients is limited. This study aimed to assess lung and GI cancer patients' nutritional status and actual dietary intake at Nghe An Oncology Hospital.

Methods: A cross-sectional descriptive study was conducted from February to June 2023. Adult inpatients with confirmed lung or GI cancer were randomly selected. Nutritional status was evaluated using the Patient-Generated Subjective Global Assessment (PG-SGA), categorizing patients as well-nourished (A), moderately malnourished (B), or severely malnourished (C). Dietary intake was assessed via a 24-hour dietary recall and analyzed using the Vietnamese food composition tables. Nutrient intake was compared with the Vietnamese Recommended Nutrient Intake (RNI) standards.

Results: Among 100 patients, 72% were classified as malnourished, with 52% falling into PG-SGA category C and 20% in category B. Nutritional status showed no significant differences based on sex, cancer type, or duration since diagnosis. The median daily energy intake was 1,305 kcal, accounting for 72% of the RNI. Despite a lower absolute intake, females achieved a higher percentage of their RNI than males. Intake of protein, carbohydrates, and lipids met 80%, 70%, and 90% of the RNI, respectively. Intakes of vitamins A and C exceeded RNI, particularly among male patients, while vitamins B1, B2, and niacin were consumed below recommended levels. Mineral intake was also insufficient: calcium met 65% of RNI, iron 48%, and magnesium 80%.

Conclusion: The study revealed a high prevalence of malnutrition among hospitalized cancer patients, along with substantial gaps between actual dietary intake and nutritional requirements.

55 **Keywords:** Nutritional Status, Diet, Neoplasms, Malnutrition, Vietnam

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Introduction

Malnutrition is a common and serious clinical issue among hospitalized patients, particularly those with chronic and severe illnesses.[1] Among them, cancer patients—especially those with lung and gastrointestinal malignancies—face a higher risk due to both the disease itself and its associated treatments.[2,3] The prevalence of malnutrition in lung cancer patients has been reported at 45%, varying based on treatment type and disease stage.[4] In gastrointestinal (GI) cancer patients, malnutrition rates vary widely, with some studies indicating prevalence as high as 61%.[5] In low- and middle-income countries, this prevalence may be even higher due to limited access to nutritional support and cancer care services.[6] Malnutrition negatively impacts quality of life, weakens immune response, reduces tolerance to anti-cancer drugs, and lowers survival rates.[7] It also increases post-surgical complications, prolongs hospital stays, and raises healthcare costs.[8] In severe cases, malnutrition can lead to cachexia, a condition marked by significant loss of lean muscle mass, muscle wasting, and impaired immune, physical, and mental functions. Cancer cachexia is further associated with poor treatment response, a higher risk of side effects, and worsened outcomes and quality of life.[9]

The mechanisms underlying cancer-related malnutrition are multifactorial. Tumor-induced metabolic changes, systemic inflammation, and anorexia contribute to an imbalance between energy intake and expenditure.[10] In GI cancer, malabsorption, obstruction, and surgical resections can directly impair nutrient absorption and intake.[11,12] In lung cancer, respiratory distress, fatigue, and the side effects of chemotherapy or radiotherapy can significantly reduce appetite and food consumption.[13] Additionally, cancer cachexia—a complex syndrome characterized by the progressive loss of skeletal muscle mass—further deteriorates nutritional status, complicating treatment outcomes.[14] A healthy diet rich in antioxidants and phytochemicals is crucial in preventing and managing chronic diseases such

as hypertension, diabetes, cardiovascular disease, cancer, and metabolic syndrome. [15] Dietary components like vitamins, polyphenols, and bioactive plant compounds help reduce oxidative stress and inflammation, which are key contributors to the development and progression of these conditions.[16] In cancer patients, where metabolic disturbances and treatment-related side effects can impair nutritional status, early and accurate nutritional assessment is essential. It helps guide timely interventions that support treatment tolerance, maintain physical function, and improve overall quality of life. [2,17]

There is limited evidence on the nutritional status and dietary practices of cancer patients in Vietnam, particularly among those undergoing chemotherapy. This study addresses that gap by focusing on patients with lung and gastrointestinal cancers treated at tertiary oncology hospitals. By evaluating their nutritional status and actual dietary intake, the study aims to identify the prevalence and determinants of malnutrition in this population. The findings are intended to inform clinical interventions, enhance supportive care strategies, and ultimately improve treatment outcomes in Vietnam and other countries with comparable healthcare systems.

Methods

Study Design and Setting

This cross-sectional descriptive study employed a quantitative approach. It was conducted from February to June 2023 at Nghe An Oncology Hospital, a tertiary referral center for cancer care in Vietnam's North Central region. The study targeted adult patients diagnosed with either lung or GI cancer who were undergoing treatment at the hospital during the study period. Convenience sampling was used to recruit participants who met the inclusion criteria and provided written informed consent. Data were collected through structured face-to-face interviews using a pretested questionnaire designed to assess nutritional status and actual dietary practices. The hospital's institutional review board approved the study protocol. All procedures complied with the ethical standards outlined in the Declaration of Helsinki (revised in Brazil, 2013), and participant confidentiality and anonymity were strictly maintained.

Sample size

The sample size was calculated in advance using the standard population proportion estimation method. Based on a previous study reporting a 58.2% prevalence of malnutrition among cancer patients undergoing chemotherapy, we used $p = 0.582$ as the estimated proportion.[18] With a 95% confidence level and a 10% margin of error, the minimum required sample size was 94. To improve reliability and account for potential incomplete responses, 100 patients were ultimately enrolled.

Participants

A total of 100 adult patients diagnosed with either lung cancer or GI cancer and admitted to the Internal Medicine Departments II and III were recruited. Patients were selected using simple random sampling by relying on the hospital's inpatient registry.

Inclusion and Exclusion Criteria

Patients were eligible if they met the following criteria: (1) a confirmed diagnosis of lung cancer or GI cancer, (2) aged 18 years or older, (3) undergoing inpatient treatment, and (4) provided informed consent to be a part of the present study. Patients were excluded if they had a mental disorder, were unconscious, or were unable to comprehend and respond to the survey questions.

Data Collection Tools and Procedures

Data were collected through structured interviews, clinical observations, and patient medical records. Trained nutritionists conducted face-to-face interviews using the Patient-Generated Subjective Global Assessment (PG-SGA) tool to assess nutritional status.[19] The PG-SGA classifies patients into three categories: well-nourished (A), moderately malnourished or at risk (B), and severely malnourished (C), based on weight loss history, dietary intake, symptoms affecting food consumption, and functional capacity.[20]

Dietary intake was assessed using the 24-hour dietary recall method, in which participants reported all foods and beverages consumed in the previous 24 hours. The data were then entered into the Eiyokun dietary analysis software, which applies the Vietnamese Food Composition Table to estimate energy intake, macronutrients, and micronutrients. Nutrient intake was evaluated against the Vietnamese Recommended Nutrient Intake (RNI) standards.[21]

Data Analysis

Data were entered and cleaned using EpiData version 3.1 and analyzed with SPSS version 22.0. Descriptive statistics, including frequency, percentage, median, and interquartile range (IQR), were used to summarize demographic characteristics, PG-SGA classifications, and dietary intake. Chi-square tests and independent t-tests were conducted to examine differences in nutritional parameters by gender. A two-tailed p-value of less than 0.05 was considered statistically significant.

Results

Demographic and Clinical Characteristics

Of the 100 patients, 67% were male and 33% female (Table 1). The majority (90%) resided in rural or mountainous areas. The median age was 64 years (IQR: 55–71), with males generally older than females. While females had lower average height and body weight, there was no statistically significant difference in body mass index (BMI) between the sexes. The median BMI was 20.4 kg/m² (IQR: 18.0–22.5) for males and 19.5 kg/m² (IQR: 17.7–21.5) for females. No significant sex-based differences were observed in the PG-SGA category, diagnosis, disease duration, cancer stage, or performance status. The study population comprised patients with lung cancer (45%) and GI cancer (55%). Approximately 62% had been diagnosed within the past year. Advanced-stage cancers (stage 3 or 4) accounted for 69% of cases, indicating a high prevalence of late-stage diagnosis. Treatment modalities included chemotherapy (for 76% of the patients), surgery (for 40% of the patients), and radiotherapy (for 28% of the patients).

Nutritional Status by PG-SGA

The nutritional status assessed by PG-SGA is presented in Table 2. Based on the PG-SGA classification, 72% of the patients were malnourished, with 20% classified as Category B and 52% as Category C. Only 28% were categorized as well-nourished (PG-SGA A). There were no statistically significant differences in nutritional status between male and female patients ($p = 0.565$) or between patients with GI or lung cancer ($p = 0.598$). Similarly, no significant difference was observed based on the time since diagnosis ($p = 0.674$).

Macronutrient Dietary Intake

The patient's daily energy intake is presented in Table 3. The median calorie intake was 1,305 kcal (IQR: 1079–1542), representing a median of 72% of the RNI. Although total energy intake was lower in females than males, the RNI percentage achieved was significantly higher

in females (84% vs. 68%, p = 0.005). The median protein intake was 53.5 g/day (IQR: 41–69), corresponding to 80% of the RNI. Lipid intake was 39.3 g/day (IQR: 29–50), with a median of 90% of the RNI. The median carbohydrate intake was 178 g/day (IQR: 143–205), reaching 70% of the RNI. Notably, the percentage of RNI achieved for total protein and carbohydrates was higher in females than in males (102% vs. 75% for protein and 80% vs. 64% for carbohydrates, respectively).

Vitamin Dietary Intake

Table 4 presents the patients' daily vitamin intake. The median intakes of vitamins A, B1, B2, PP (niacin), and C were 1480 mcg (IQR: 961–2062), 0.89 mg (IQR: 0.65–1.37), 0.91 mg (IQR: 0.58–1.51), 8.5 mg (IQR: 6.7–11.7), and 71 mg (IQR: 41–106), respectively. These correspond to median percentages of the RNI of 247% for vitamin A, 74% for B1, 70% for B2, 53% for PP, and 101% for vitamin C. Male patients had significantly higher intakes of vitamins A and C compared to females, with median RNI percentages of 256% vs. 200% for vitamin A (p = 0.028) and 112% vs. 80% for vitamin C (p = 0.049).

Minimal Dietary Intake

Table 5 presents the patients' daily mineral intake. The median intakes of calcium, phosphorus, iron, magnesium, and zinc were 625 mg (IQR: 388–1382), 830 mg (IQR: 580–1341), 8.3 mg (IQR: 6.7–10.6), 164 mg (IQR: 106–231), and 4.4 mg (IQR: 3.2–5.7), respectively. These corresponded to median percentages of the RNI as follows: 65% for calcium, 119% for phosphorus, 48% for iron, 80% for magnesium, and 90% for zinc. There were no statistically significant differences in mineral intakes relative to the RNI between male and female patients.

Discussion

The present study offers a comprehensive evaluation of the nutritional status and dietary intake of cancer patients undergoing treatment at Nghe An Oncology Hospital, carried out in 2023. Using the PG-SGA tool, it was found that 72% of patients were malnourished, with more than half classified as severely malnourished (category C). This high prevalence aligns with previous research in similar oncology settings, particularly in low- and middle-income countries, where access to nutritional screening and support may be limited.[22,23] The present study highlights the gap between actual dietary intake and the RNI, particularly concerning calories, protein, and several micronutrients. While previous research often focused on either macronutrients or subjective nutritional assessments, our analysis integrated both approaches and considered detailed intake data for vitamins and minerals, offering a more comprehensive view of cancer-related undernutrition in Vietnam.

An important and somewhat unexpected finding of the present study was that, although females had lower absolute intakes of energy and macronutrients, they achieved a higher RNI for energy, protein, and carbohydrates than males. This suggests that nutritional adequacy should be evaluated in absolute terms and relative to individual needs. Male patients had significantly higher intakes of vitamins A and C than females. These gender-related nutrient intake patterns are rarely reported in relevant literature, and further investigation is warranted to improve nutritional interventions.[24] Further, the absence of significant differences in nutritional status between the two cancer types or concerning disease duration and a patient's sex suggests that malnutrition is widespread across subgroups. This finding emphasizes the need for routine nutritional screening in all cancer patients. The Vietnamese RNI standards were used as a reference to assess dietary intake, recognizing that these guidelines are intended for healthy individuals. Without national cancer-specific recommendations, the RNI provided a practical baseline. However, cancer patients often have altered nutritional needs due to factors

such as age, sex, metabolic status, and treatment effects. Future studies should consider individualized assessments and refer to oncology-specific guidelines for more accurate evaluation.

From a clinical perspective, these findings highlight the urgent need to integrate nutritional care into oncology management, particularly in resource-limited settings. The high prevalence of malnutrition and inadequate intake of key nutrients—such as iron (only 48% of the RNI), calcium (65%), and B vitamins—suggests that standard dietary counseling may be insufficient. Malnutrition is linked to increased treatment toxicity, reduced therapeutic response, and a poorer quality of life.[25] Early nutritional interventions, ideally guided by routine PG-SGA screening and personalized dietary planning, could be crucial in enhancing treatment tolerance and overall patient outcomes. Certain natural compounds may help counter cancer-related malnutrition. Conjugated linoleic acids exhibit anti-inflammatory and antioxidant properties that may help preserve muscle mass and physical function.[26] Royal jelly has shown potential in improving glycemic control and liver function, while Momordica charantia L. may aid in blood pressure regulation. These effects could support metabolic balance and nutritional status in patients with GI or lung cancer undergoing chemotherapy.[16,27] However, this study has several limitations. First, its cross-sectional design limits the ability to establish causal relationships between nutritional intake and clinical outcomes. Second, dietary intake data were self-reported, which may have introduced recall bias or led to underreporting. Third, although the PG-SGA is a validated tool, it may not fully capture all aspects of nutrition-related risk, such as inflammation or muscle mass loss. Fourth, the sample was drawn from a single center, which may limit the generalizability of the findings to broader cancer populations in Vietnam or other settings. Finally, the study did not collect information on participants' socioeconomic status, such as household income or employment, which could have influenced dietary behaviors and nutritional status.

Conclusion

Malnutrition remains a significant concern among cancer patients in Vietnam, with most failing to meet basic dietary requirements. The present study's findings highlight the importance of early and comprehensive nutritional assessments, particularly in addressing gender-based dietary differences and specific nutrient deficiencies. These findings can help shape hospital-based nutrition programs and guide future interventions to improve cancer patients' nutritional and clinical outcomes in similar settings.

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Data Availability: The datasets used in the current study are available from the corresponding author upon reasonable request

Ethical Statement: The patients' consent to participate in the study was obtained, and the Institutional Review Board of Nghe An Oncology Hospital approved it.

Conflict of Interest: None

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356 Table 1. Demographic and Clinical Background of Study Participants

Items	Female (n = 33)	Male (n = 67)	p-value
Age (years)	60(52, 70)	65(57, 73)	0.203
Height (cm)	155(150, 158)	163(158, 165)	<0.001
Weight (kg)	48(42, 55)	52(46, 57)	0.062
BMI (kg/m^2)	20.4(18, 22.5)	19.5(17.7, 21.5)	0.120
CCI	6(2,6)	6(2,6)	0.157
Diagnosis			0.223
GI cancer	21	34	
Lung cancer	12	33	
Duration since onset			0.109
< 1 year	21	41	
1–5 year	7	23	
> 5 years	5	3	
Disease stage			0.130
Stage I	5	8	
Stage II	8	10	
Stage III	6	28	
Stage IV	14	21	
Chemotherapy	23	53	0.289
Surgery	16	24	0.224
Radiotherapy	7	21	0.300
PS			0.515
PS0	5	6	
PS1	17	37	
PS2	7	10	
PS3	4	14	

357 BMI: Body Mass Index; CCI: Charlson Comorbidity Index; GI: Gastrointestinal; PS:
358 Performance Status
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360 Table 2. Nutritional Status by Gender, Diagnosis, and Time Since Diagnosis

Items	PG-SGA category			p-value
	A	B	C	
Sex				0.565
Female	7	7	19	
Male	21	13	33	
Diagnosis				0.598
GI cancer	15	13	27	
Lung cancer	13	7	25	
Duration since onset				0.674
< 1 year	15	15	32	
1–5 years	10	4	16	
> 5 years	3	1	4	

361 PG-SGA: Patient-Generated Subjective Global Assessment; GI: Gastrointestinal
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363 Table 3. Macronutrient Intake and Percentage of Daily Requirement

	Total	**Femal**	**Male**	**p-value**
Total Energy(Kcal)	1305 (1079, 1542)	1235 (985, 1432)	1333 (1110, 1732)	0.015
%RNI	72% (61%, 94%)	84% (67%, 104%)	68% (58%, 85%)	0.005
Total Protein(g)	53.5 (40.7, 69.2)	56.9 (40.1, 67.2)	53.4 (40.8, 71.3)	0.445
%RNI	80% (62%, 106%)	102% (73%, 133%)	74% (55%, 98%)	0.010
Total Lipid(g)	39.3 (28.8, 50.2)	33.1 (24.7, 50.7)	39.9 (31.6, 49.6)	0.157
%RNI	90% (72%, 133%)	96% (74%, 153%)	88% (72%, 120%)	0.134
Carbohydrate(g)	178 (143, 205)	168 (136, 200)	178 (145, 209)	0.267
%RNI	70% (57%, 86%)	80% (68%, 95%)	64% (51%, 78%)	<0.001

364 RNI: Recommended Nutrient Intake

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366 Table 4. Vitamin Intake and Percentage of Daily Requirement

	Total	Female	Male	p-value
Vitamin A(mcg)	1480 (961, 2062)	1199 (696, 1728)	1535 (1053, 2182)	0.028
%RNI	247% (160%, 344%)	200% (116%, 288%)	256% (176%, 364%)	0.028
Vitamin B1(mg)	0.89 (0.65, 1.37)	0.83 (0.57, 1.24)	0.97 (0.67, 1.38)	0.206
%RNI	74% (55%, 114%)	69% (48%, 103%)	81% (56%, 115%)	0.414
Vitamin B2(mg)	0.91 (0.58, 1.51)	0.77 (0.51, 1.39)	0.97 (0.64, 1.53)	0.250
%RNI	70% (45%, 116%)	59% (39%, 107%)	75% (49%, 118%)	0.427
Vitamin PP (mg)	8.5 (6.7, 11.7)	7.8 (5.5, 11.5)	9.2 (6.8, 12.1)	0.643
%RNI	53% (42.%, 73%)	49% (34%, 72%)	57% (43%, 76%)	0.722
Vitamin C(mg)	71 (41, 106)	56 (31, 91)	78 (48, 112)	0.025
%RNI	101% (59%, 151%)	80% (44%, 130%)	112% (67%, 160%)	0.049

367 RNI: Recommended Nutrient Intake

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369 Table 5. Mineral Intake and Percentage of Daily Requirement

	Total	Female	Male	p-value
Calcium(mg)	625 (388, 1382)	508 (298, 1536)	715 (424, 1401)	0.732
%RNI	65% (41%, 138%)	51% (31%, 154%)	72% (44%, 140%)	0.939
Phosphorus(mg)	830 (580, 1341)	695(554, 1367)	874 (581, 1352)	0.733
%RNI	119% (83%, 192%)	99% (79%, 195%)	125% (83%, 193%)	0.744
Iron (mg)	8.3 (6.7, 10.6)	7.6 (6.3, 10.1)	9 (6.9, 11.2)	0.340
%RNI	48% (37%, 59%)	45% (29%, 55%)	49% (38%, 61%)	0.800
Magnesium (mg)	164 (106, 231)	163 (111, 206)	165 (101, 253)	0.609
%RNI	80% (52%,113%)	80% (54%, 101%)	81% (50%, 124%)	0.609
Zinc (mg)	4.4 (3.2, 5.7)	3.9 (3.1, 5.6)	4.6 (3.5, 5.8)	0.286
%RNI	90% (64%, 117%)	79% (62%, 114%)	93% (65%, 118%)	0.362

370 RNI: Recommended Nutrient Intake

371