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ORIGINAL ARTICLE

Nutritional status changes in patients with advanced non-small cell lung cancer receiving first-line chemotherapy

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Abstract

Objective This study aimed to assess the real-life nutritional status changes and gastrointestinal symptoms in patients with advanced non-small cell lung cancer (NSCLC) receiving chemotherapy.

Methods A total of 104 patients with metastatic NSCLC receiving first-line chemotherapy were included in this study. Unintentional weight loss, body mass index (BMI) changes, and gastrointestinal symptoms were recorded and evaluated. Biochemical parameters [hemoglobin (Hb) and albumin levels] were compared before and after two chemotherapy cycles using SPSS software.

Results Of these patients, 65.38% (68/104) experienced unintentional weight loss, whereas 30.77% and 12.5% presented with ≥ 5% and ≥ 10% degrees of weight loss, respectively, within 6 months before first-line chemotherapy was administered. Then, 48.08% (50/104) of the patients experienced unintentional weight loss after two chemotherapy cycles. The mean body weight after chemotherapy was 61.47 ± 10.37 kg, which was significantly decreased relative to that before chemotherapy ($P < 0.05$). The mean BMI after chemotherapy was 22.66 ± 3.34 kg/m^2, which was also significantly diminished with respect to that during the previous chemotherapy cycle ($P < 0.05$). The most common gastrointestinal symptoms reported among all the study patients were anorexia (80/104, 76.92%), nausea (53/104, 50.96%), constipation (49/104, 47.12%), vomiting (48/104, 46.15%), taste disorders (40/104, 38.46%), and early satiety (32/104, 30.77%). The mean Hb levels after chemotherapy were 117.06 ± 16.67 g/L, which were significantly lower than those before chemotherapy (132.73 ± 16.42 g/L) ($P < 0.05$). No significant difference was noted between the mean albumin levels before and after chemotherapy (38.29 ± 4.22 g/L vs 38.17 ± 4.54 g/L; $P = 0.798$).

Conclusion Weight loss history, gastrointestinal symptoms, and Hb level decreases are determinant factors of nutritional status in patients with advanced NSCLC and must be included in the screening, evaluation, and treatment of lung carcinoma.

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Keywords: lung cancer; gastrointestinal symptoms; weight loss; chemotherapy; hemoglobin; albumin

Non-small cell lung cancer (NSCLC) is the most common cancer and the major cause of cancer-related deaths in China and globally [1]. Systemic chemotherapy is the mainstream treatment for metastatic NSCLC without a driving gene, with an objective tumor response rate of 25–35% [2]. At cancer diagnosis, approximately 50% of patients present with some nutritional deficits [3]. This prevalence may even rise depending on the tumor location and stage. The highest prevalence is noted in patients with tumors of the gastrointestinal tract and the lungs [4].

Systemic administration of chemotherapy agents targets rapidly dividing cells, including those in the bone marrow and gastrointestinal tract epithelial lining. These direct effects of chemotherapy agents can result in gastrointestinal toxicities, which in turn affect the nutritional statuses of patients [5]. Chemotherapy-induced nausea, vomiting, diarrhea, constipation, anorexia, taste disorder, and early satiety are the symptoms commonly

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reported by patients undergoing chemotherapy [6]. A subset of these patients may experience the symptoms to an extent that limits their dietary intake, and their nutritional statuses may be compromised, leading to negative outcomes for patients and treatment facilities [7]. Malnourished patients experience decreased quality of life, diminished treatment tolerance, increased number of complications, and prolonged hospital admissions, all of which jeopardize treatment adherence and tumor control and ultimately increase the mortality and healthcare burden [8]. Therefore, detecting malnutrition early in patients with cancer has become increasingly important.

Nutritional screening includes anthropometric parameters [body mass index (BMI) and weight loss percentage] and biochemical parameters [hemoglobin (Hb) and albumin] [9-12]. Gastrointestinal symptoms, weight loss, and Hb and albumin levels often decrease in patients receiving chemotherapy [13]. An easy routine screening of malnutrition in patients with cancer should include these factors.

The current study aimed to assess the real-life nutritional status changes and gastrointestinal symptoms in patients with advanced NSCLC receiving chemotherapy.

Materials and methods

This cross-sectional study was conducted at the Cancer Centre, Tongji Hospital, Tongji Medical College, Huazhong University of Science and Technology, between January 2016 and January 2017. Informed consent was obtained from all participants. Biochemical and clinical data were assessed before the first chemotherapy cycle and after the second chemotherapy cycle.

The selection criteria were as follows: age between 19 and 75 years and pathological diagnosis of stage IV NSCLC. Meanwhile, patients who underwent any surgery or radiotherapy as treatment were excluded from the study. The present research was conducted in accordance with the guidelines in the Declaration of Helsinki, and all procedures involving human subjects/ patients were approved by the ethics committee.

Data analysis

Descriptive statistics were used for the qualitative and quantitative variables, frequency, percentage, mean, and standard deviation (SD). The average distance of the groups was compared using the paired-samples *t* test. Data analysis was performed using the SPSS software, version 18 (SPSS, Inc., USA). $P < 0.05$ was considered statistically significant.

Table 1 General characteristics (mean values and standard deviations; number of patients and percentage values)

Variables	*n*		%
Sex			
Male	70		67.31
Femal	34		32.69
Age (years)			
Mean		54.57	
SD		9.32	
Weight (kg)			
Mean		62.28	
SD		10.05	
BMI (kg/m^2)			
Mean		22.98	
SD		3.19	
Weight loss (kg)			
Mean		2.38	
SD		2.85	
Weight loss			
≥ 5	32		30.77
≥ 10	13		12.50

Results

General characteristics

A total of 104 patients with advanced NSCLC [34 (32.69%) women and 70 (67.31%) men] underwent at least two chemotherapy cycles. The mean age was 54.57 (SD 14.8) years. The mean body weight was 62.28 ± 10.46 kg, and the mean BMI was 22.98 ± 3.19 kg/m^2 (Table 1).

Unintentional weight loss before chemotherapy

Over 65.38% (68/104) of the patients experienced unintentional weight loss, whereas 30.77% and 12.50% showed ≥ 5% and ≥ 10% degrees of weight loss, respectively, within 6 months before first-line chemotherapy was administered (Table 1). Unintentional weight loss > 10% in the preceding 6 months was considered a sign of malnutrition.

Gastrointestinal symptoms during chemotherapy

The most common gastrointestinal symptoms reported among all the study patients were anorexia (80/104, 76.92%), nausea (53/104, 50.96%), constipation (49/104, 47.12%), vomiting (48/104, 46.15%), taste disorders (40/104, 38.46%), early satiety (32/104, 30.77%), diarrhea (13/104, 12.50%), and dysphagia (2/104, 1.92%; Table 2).

Table 2 Gastrointestinal symptoms reported during chemotherapy

Symptoms	*n*	%
Anorexia	80	76.92
Nausea	53	50.96
Constipation	49	47.12
Vomiting	48	46.15
Taste disorders	40	38.46
Early satiety	32	30.77
Diarrhoea	13	12.50
Dysphagia	2	1.92

Weight loss and BMI changes after chemotherapy

Of all patients, 48.08% (50/104) experienced unintentional weight loss after two chemotherapy cycles. The mean body weight after chemotherapy was 61.47 ± 10.37 kg, which was significantly decreased relative to that before chemotherapy ($P < 0.05$). The mean BMI after chemotherapy was 22.66 ± 3.34 kg/m^2, which was also significantly decreased relative to that during the previous chemotherapy cycle ($P < 0.05$) (Table 3).

Hb and albumin level changes after chemotherapy

The mean Hb levels before chemotherapy were 132.73 ± 16.42 g/L, which were significantly decreased relative to those after chemotherapy (117.06 ± 16.67 g/L) ($P < 0.05$). No significant difference was noted between the mean albumin levels before and after chemotherapy (38.29 ± 4.22 g/L vs 38.17 ± 4.54 g/L; P=0.798) (Table 3).

Discussion

Malnutrition affects 20–70% of patients with cancer [14]. Weight loss is an easy measure of diagnosing malnutrition and should be assessed in daily practice. However, slight changes in nutritional status can be overlooked occasionally. Declining nutritional status and weight loss originate from multiple processes and are associated with decreased responses to chemotherapy treatment and reduced survival [15]. Therefore, all patients with cancer must be evaluated for early signs of malnutrition and weight loss to provide adequate nutritional support and improve the quality of life and treatment response in these patients. Clinicians and patients must be aware of the effects of malnutrition on patient outcomes, particularly those in patients receiving chemotherapy. Changes in nutritional status have been associated with altered absorption, metabolism, and elimination of chemotherapy drugs. The prevalence of unintentional weight loss in patients with NSCLC has been reported to be 38% [16]. Moreover, most patients with advanced NSCLC also present with malnourishment [17–19]. The present study observed similar results, and 65.38% (68/104) of the patients experienced unintentional weight loss, whereas 30.77% and 12.5% of the patients manifested ≥ 5% and ≥ 10% degrees of weight loss, respectively, within 6 months before first-line chemotherapy was administered. The etiology of unintentional weight loss is not well understood and may be due to decreased food intake.

BMI is another very important nutritional index and the most practical and simplest means to assess nutritional status. However, this measure provides little information on the body composition alteration in cachexia [20]. In the present study, the mean BMI of the patients was 22.98 kg/m^2.

Gastrointestinal symptoms are noteworthy components of malnutrition in patients with cancer. Upper gastrointestinal symptoms reported by patients are important because a high prevalence of these symptoms can cause difficulty in feeding, reduction in energy intake, and worsening of nutritional status [21–23]. In the current study, the most frequent gastrointestinal symptoms were anorexia (80/104, 76.92%), nausea (53/104, 50.96%), constipation (49/104, 47.12%), vomiting (48/104, 46.15%), taste disorders (40/104, 38.46%), early satiety (32/104, 30.77%), diarrhea (13/104, 12.50%), and dysphagia (2/104, 1.92%). A similar prevalence of gastrointestinal symptoms was found in other studies [18–20].

Consistent with other reports, the Hb levels were significantly decreased after chemotherapy in our study. This result may be due to the toxic effects of the chemotherapeutic drugs on hematopoietic cells and gut epithelia that lead to malabsorption [24].

Serum albumin is the simplest and most effective variable indicating visceral protein function. Therefore, this biomarker is commonly used in assessing malnutrition. Normal serum albumin levels range between 3.5 and 5.0 g/dL in adults. Hypoalbuminemia is defined as serum albumin levels < 3.5 g/dL. Albumin is habitually included among the parameters utilized for nutritional assessment and has recently become further widespread. Serum albumin concentration has also been established as an independent prognostic variable

Table 3 Weight, BMI and biochemical parameters change during chemotherapy (Mean ± SD)

Variables	Before chemotherapy	After chemotherapy	*P*
Weight (kg)	62.28 ± 10.46	61.47 ± 10.37	0.001
BMI (kg/m^2)	22.98 ± 3.19	22.66 ± 3.34	0.004
Hb (g/L)	132.73 ± 16.42	117.06 ± 16.67	0.000
Albumin (g/L)	38.29 ± 4.22	38.17 ± 4.54	0.798

for survival in advanced NSCLC [25]. Nevertheless, scarce data are available to date on the prevalence and clinical significance of hypoalbuminemia in patients with cancer and how such conditions affect cancer treatment. In the present study, the albumin levels did not diminish after chemotherapy, unlike in other studies. The discrepancy may be due to the small sample size and short investigation time in the current work.

In this study, patients with advanced lung cancer showed a high prevalence of weight loss. Gastrointestinal symptoms, such as anorexia (80/104, 76.92%), nausea (53/104, 50.96%), constipation (49/104, 47.12%), vomiting (48/104, 46.15%), taste disorders (40/104, 38.46%), and early satiety (32/104, 30.77%), were very common during chemotherapy. Chemotherapy can induce weight loss and Hb level decreases in patients with advanced lung cancer.

In conclusion, weight loss history, gastrointestinal symptoms, and Hb level decreases are determinant factors of nutritional status in patients with advanced lung cancer and must be included in the screening, evaluation, and treatment of lung carcinoma.

Conflict of interest

The authors indicated no potential conflicts of interest.

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