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Evaluation of the Effect of Nutritional Status in Patients with Cancer Receiving Chemotherapy on Anthropometric Measurements and Quality of Life

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ABSTRACT

The aim of this study is to determine the nutritional status, anthropometric measurements and quality of life of adult patients with cancer receiving chemotherapy, and to evaluate their interactions. In this retrospective cross sectional study, information about the patients' demographic characteristics, anthropometric measurements, nutritional status, hand grip strengths which were measured with a portable digital hand dynamometer, and the quality of life scores were obtained from the patient files. According to NRS-2002, 16.3% of the patients were at the risk of malnutrition. The body weight, body mass index, waist circumference, hip circumference, mid-upper arm circumference, hand grip strength values of the individuals who had three or higher scores from NRS-2002 were significantly lower ($p < 0.05$). Considering the evaluation of the quality of life scores based on their nutritional status, the functional and general health score was significantly lower in patients at the risk of malnutrition and their symptom score was significantly higher ($p < 0.05$). The presence of nutritional risk in cancer patients is related to the quality of life. In conclusion, the nutritional status of patients with cancer should be evaluated regularly, and early intervention regarding this is important to increase the quality of life.

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Introduction

The concept of quality of life which is an important factor for the cancer patients is a subjective and multi-dimensional term that contains emotional, cognitive and social functions regarding the personal perceptions on health status and disease symptoms. Insufficient nutrition, physical and metabolic impacts of cancer and side effects of anticancer treatments all affect patients' quality of life (1–6). Latest advancements in the discipline of oncology are effective for longer survival rates among patients, but they also cause cancer cachexia characterized with inflammation, poor nutrition, improper body weight and muscle loss (sarcopenia) arising from the anatomic and functional changes caused by cancer or cancer treatment (7, 8). Moreover, the body weight loss that arises from the nutritional disorders which may occur during the course of disease may result in a poor prognosis, increased chemotherapy toxicity, longer hospital stays and increased treatment expenses (5, 9–11). Body weight loss is regarded as the factor that is sensitive to the therapeutic intervention potentially the most. Many studies have been conducted to examine the impacts of different nutritional interventions on the quality of life of cancer patients, and they have found that sufficient nutrition positively affected quality of life and supported the treatment tolerance much better (6, 11). Insufficient nutrition may occur as a result of treatment activities for anorexia, nausea and vomiting, malabsorption, anxiety or pain, different acute and chronic symptoms limiting the appetite, and the failure to meet the needs increasing based on hyper-metabolism (2, 12). Nutritional status, among the other prognostic factors of oncology patients such as tumor type, disease stage or general physical status, have a great impact over quality of life (2). Another important point in this regard is that positive impacts can be achieved through early treatment and sufficient monitoring as poor nutrition can

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be changed contrary to other prognostic factors (4). Accordingly, assessing the nutritional status of cancer patients is critical. This status can be evaluated through the anthropometric measurements and biochemical parameters, and certain screening instruments such as Nutritional Risk Screening (NRS-2002) prepared by the European Society of Parenteral and Enteral Nutrition (ESPEN) for the patients who display high sensitivity and specificity during the hospitalization period can be recommended for the same purpose. The nutritional risk screenings aim to raise awareness and ensure early diagnosis and treatment (6). American Society of Parenteral and Enteral Nutrition (ASPEN) recommends measuring the grip strength in the efforts to determine the nutritional status (13). The European Organization for Research and Treatment of Cancer—Quality of Life Questionnaire (EORTC QLQ-C30-Version 3.0) is often used as a reliable and valid instrument to determine the quality of life of cancer patients (14). This questionnaire assesses patients' different functional scales, general health statuses, and disease symptoms (12). Considering the fact that increasing the quality of life is an objective in determining the oncology patients, this study was conducted to assess the correlation between the nutritional status of adult cancer patients treated with chemotherapy, and their anthropometric measurements and quality of life.

Material and Method

This retrospective and cross-sectional study was conducted with 166 patients who were treated with chemotherapy for different cancer stages including early diagnosis and advanced stages in the Medical Oncology Unit of Tekirdağ Namık Kemal University between December 2018 and January 2019. All information about the patients routinely files during chemotherapy were retrospectively screened. Nutritional and functional assessments were used during chemotherapy as the timing of the assessment can significantly affect outcomes. Patients' demographic data (age, gender) and anthropometric measurements (height, body weight, waist, hip and mid-upper arm circumference) were recorded. Height, weight and body mass index (BMI) were calculated. Patients' grip strength values that were measured using a mobile digital hand dynamometer were recorded. To determine patients' nutritional status, NRS-2002 was used. Moreover, their quality of life was measured using the EORTC QLQ-C30-Version 3.0. In this study, it was aimed to compare the nutritional status, quality of life and anthropometric values of individuals according to age groups, although there are patients with different cancer types and stages.

Anthropometric Measurements

The height, weight, waist, hip and mid-upper arm circumference values that were measured as a standard protocol before were assessed within the study. The BMI figures were found by diving the square value of the height (m^2) into the weight. The waist circumference was measured on the midline between the lateral iliac crest and lowermost rib while patients stood on their feet. The measurement for the hip circumference was performed around the largest section of the hip from the lateral side. In addition, the mid-upper arm circumference measurement (MUACM) was performed by bending the arm at 90° from the elbow, marking the midline between the acromial bulge on the shoulder and olecranon bulge on the elbow. The arm was kept in a straight position, marked with a measure, and the circumference was measured (15). In a study conducted in Turkey, it has been shown that the upper middle arm circumference can be used to evaluate malnutrition in elderly individuals (16). In addition, muscle strength, which was determined as one of the EWGSOP-2 sarcopenia parameters published by the European Working Group on Sarcopenia in Elderly People (EWGSOP), was measured using Takai TKK 5401 (Grip-D, Takei Scientific Instruments Co. Ltd., Tokyo, Japonya) a hand dynamometer, with the patients' elbows and wrists in full extension and standing on their feet (17, 18).

Assessment of Nutrition through Screening Test

The Nutrition Risk Screening (NRS-2002) developed by the European Society of Parenteral and Enteral Nutrition (ESPEN) İN 2002 is used to assess the nutritional status of the adult people staying in hospitals (19). The test consists of two different sections as pre- and main screening. The prescreening consists of four items and is followed by the main screening if one of these items is answered as 'yes'. In the event that all items are answered as 'no', it is recommended that prescreening be performed for relevant patient every week. The prescreening and BMI question the loss of body mass in the last three months, food intake, and whether the conditions of patients are severe, and the results are determined through the 'yes-no' answers. The main screening is scored based on the nutritional irregularity (none: 0 point, mild: one point, moderate: two points, severe: three points),

disease severity (none: 0 point, mild: one point, moderate: two points, severe: three points) and being older than 70 years (one point is added if the patients are older than 70 years). In the event that the score is equal to or higher than three points, the nutritional risk is believed to be present for the relevant patient and nutritional plan should be planned as understood from the result. However, if the score is lower than three points, the screening should be repeated every week (5).

Quality of Life Assessment

The EORTC QLQ-C30-version 3.0 is often used to measure the quality of life of cancer patients. It has 30 items questioning the functional status, symptoms and general well-being. It was translated to Turkish, and its validity and reliability was approved (20, 21). Five items question the physical status while two question the roles, four question the mood, two question the cognitive level, two question the social functions, two question the general well-being and quality of life, three question the fatigue, two question the pain level, two and question nausea and vomiting. Dyspnea, insomnia, loss of appetite, constipation, diarrhea and financial problems are questioned with one item for each. The patients are asked to answer the first 28 items in a four-point Likert type form with points ranging from one (none) to four (very much). The item 29 and 30 were scored on a modified seven-point linear analogue scale. The patients are asked to assess their well-being with points ranging from one (poor) to seven (perfect) in the item 29, while they are asked to evaluate their general quality of life on the question 30. The last two items in the scale are also related to the general well-being. The score to be obtained from the scale ranges from 0 to 100. High functional scale and general well-being scale scores indicate that their quality of life is better, while high symptom scale scores indicate lower quality of life (1).

Statistical Analyses

The study data were analyzed using the Statistical Package for Social Sciences (SPSS) for Windows 20.0 statistics package program on computer. Normality tests of the data were determined with Kolmogorov-Smirnov test. The figures in the tables are presented in percentage values, while mean figures are presented with standard deviation values. The normal distributions were tested with Student's t test, and non-normal distributions were tested using Mann-Whitney U test. For the categorical data, chi-square test was performed. Spearman's correlation analysis was used to determine the correlations between patients' anthropometric measurement values and quality of life. The statistical significance level was $p < 0.05$.

Results

The mean age of 166 patients receiving chemotherapy was 59.4 ± 13.4 years. Additionally, anthropometric measurements and mean hand grip strength values of all patients and individuals under the age of 65 and individuals aged 65 and older are presented (Table 1).

The percentages of cancer types and the number of people by age groups (<65 and ≥65+) and gender of 166 patients with different cancer stages are shown. Lung cancer is the majority of male patients according to both age groups (40%, 31.4%, respectively); the majority of female patients were breast cancer patients (32.8%, 40.6%, respectively) (Table 2).

According to NRS, 16.3% of the patients were at the risk of malnutrition. It was found that 85.2% of the patient with the risk of malnutrition were aged

Table 1. General characteristics of the patients.

	Total $\bar{x}$ ± SD	<65 years old (year) $\bar{x}$ ± SD	≥65 years old (year) $\bar{x}$ ± SD
N	166	99	67
Age (year)	59.4 ± 13.4	51.3 ± 10.7	71.3 ± 6.2
Sex			
Male, % (N)	42.2% (70)	35	35
Female, % (N)	57.8% (96)	64	32
Body weight (kg)	72.6 ± 16.6	73.5 ± 18.2	71.2 ± 13.8
Body height (cm)	164.5 ± 9.4	164.9 ± 10.0	163.8 ± 8.5
Body mass index (kg/m^2)	26.9 ± 6.2	27.0 ± 6.5	26.7 ± 5.8
Waist circumference (cm)	93.6 ± 13.2	93.3 ± 14.7	94.1 ± 10.6
Hip circumference (cm)	104.3 ± 11.4	104.8 ± 12.4	103.5 ± 9.8
Waist-to-Hip ratio	0.89 ± 0.06	0.88 ± 0.07	0.90 ± 0.05
Mid-upper arm circumference (cm)	28.6 ± 3.9	28.8 ± 4.1	28.2 ± 3.6
Right arm hand grip strength (kg)	20.6 ± 8.3	21.3 ± 7.5	19.5 ± 9.4
Left arm hand grip strength (kg)	19.8 ± 7.9	20.5 ± 7.4	18.7 ± 8.4

Table 2. Percentage of cancer types by age groups and gender.

	<65		≥65		
Type of cancer	Male % (N)	Female % (N)	Male % (N)	Female % (N)	Total % (N)
Lung	40 (14)	14.1 (9)	31.4 (11)	15.6 (5)	23.5 (39)
Breast	0 (0)	32.8 (21)	0 (0)	40.6 (13)	20.5 (34)
Prostate	28.6 (10)	0 (0)	25.7 (9)	0 (0)	11.4 (19)
Gastric	11.4 (4)	15.6 (10)	20 (7)	15.6 (5)	15.7 (26)
Colorectal	11.4 (4)	17.2 (11)	14.3 (5)	18.8 (6)	15.7 (26)
Thyroid	2.9 (1)	12.5 (8)	5.7 (2)	9.4 (3)	8.4 (14)
Others	5.7 (2)	7.8 (5)	2.9 (1)	0 (0)	4.8 (8)
Total % (N)	21.1 (35)	38.6 (64)	21.1 (35)	19.3 (32)	100 (166)

Table 3. Comparison of some findings based on the NRS-2002 score.

	NRS ≥3 points	NRS <3 points	*p* value
% (N)	16.3% (27)	83.7% (139)	
Age (year)	71.9 ± 15.0	57.0 ± 11.7	**<0.001***
Sex			
Male	8.4% (14)	33.7 % (56)	0.265* (X^2 = 1.239)
Female	7.8% (13)	50% (83)	
Body weight (kg)	62.7 ± 12.5	74.5 ± 16.6	**<0.001***
Body height (cm)	162.8 ± 9.2	164.8 ± 9.4	0.327[a]
Body mass index (kg/m^2)	23.8 ± 5.3	27.5 ± 6.2	**0.005***
Waist circumference (cm)	89.2 ± 10.5	94.5 ± 13.5	**0.042***
Hip circumference (cm)	99.2 ± 9.6	105.3 ± 11.5	**0.014***
Waist-to-Hip ratio	0.9	0.8	0.77
Mid-upper arm circumference (cm)	26.4 ± 3.7	29.0 ± 3.8	**0.046***
Right arm hand grip strength (kg)	17.2 ± 8.3	21.2 ± 8.2	**0.019***
Left arm hand grip strength (kg)	17.1 ± 7.6	20.3 ± 7.8	**0.046***
NRS-2002 Classification			
≥65 years old (year)	23 (85.2%)	44 (31.7%)	**<0.001**[b](X^2 = 26.914)
<65 years old (year)	4 (14.8%)	95 (68.3%)	

Mann-Whitney test.
[a]Independent samples test.
[b]The Pearson chi-square.
*$p < 0.05$ are given only when they were significant.

65 and older and that those under the age of 65 were at lesser risk of malnutrition ($p < 0.001$). The body weight, body mass index, waist circumference, hip circumference, mid-upper arm circumference, right and left arm hand grip strength were significantly lower ($p < 0.05$) (Table 3).

Considering the evaluation of the quality of life scores of the patients based on their nutritional status, the functional and general health score was significantly lower in patients at the risk of malnutrition compared to those without the risk of malnutrition, and their symptom score was significantly higher ($p < 0.05$). Subtitles of the function and symptom scores on the EORTC QLQ-C30 are presented (Table 4).

The correlation coefficients and *p* values between the patients' anthropometric measurement values and quality of life scores are presented. A strong negative correlation was found between the functional scale and symptom scale (r = −0.671, p = <0.01) while there was a weak positive correlation between the general state of health scale, right and left hand grip strength (r = 0.376, p = <0.01; r = 0.253, p = 0.001; r = 0.265, p = 0.001, respectively). A weak negative correlation was found between the symptom scale and general state of health scale, right and left hand grip strength (r = −0.342, p = <0.01; r = −0.232, p = 0.003; r = −0.255, respectively). A positive correlation was found between body weight and body mass index (very strong, r = 0.856, p = <0.01), waist/hip ratio (weak, r = 0.307, $p < 0.01$), mid upper arm circumference (strong, r = 0.795, p = <0.01), left hand grip strength (very weak, r = 0.154, p = 0.047). There was a very weak positive correlation between body mass index and waist/hip ratio (r = 0.158, p = 0.042) while there was a strong correlation between body mass index and mid upper arm circumference (r = 0.773, p = <0.01). A positive correlation was found between waist/hip ratio and mid upper arm circumference (very weak, r = 0.176, p = 0.023), right (weak, r = 0.265, p = 0.001) and left (weak, r = 0.260, p = 0.001) hand grip strength. Lastly, a strong positive correlation was found between right and left hand grip strength (r = 0.95, p = <0.01) (Table 5).

Discussion

The present study examined the correlation between the nutritional status of adult diverse cancer patients

Table 4. The patients' mean ± SD EORTC QLQ-C30 scores ($n = 166$) based on their nutritional status.

	Those with malnutrition (NRS ≥3 points)	Those without malnutrition (NRS <3 points)	*p* value*
Functional	56.0 ± 17.7	66.7 ± 16.6	**0.003***
Symptom	44.3 ± 17.4	31.6 ± 15.4	**<0.001***
General Health	51.2 ± 16.1	58.7 ± 15.2	**0.048***
Physical	40.2 ± 33.6	59.2 ± 28.4	**0.004***
Role	43.8 ± 30	66.9 ± 26.2	**<0.001***
Cognitive	55.5 ± 33.9	62.8 ± 30.1	0.33
Emotional	62.6 ± 31.6	67.2 ± 28.5	0.59
Social	61.7 ± 10.1	61.0 ± 12.2	1.00
Fatigue	60.9 ± 29.2	48.8 ± 20.8	**0.013***
Nausea-Vomiting	21.6 ± 30.5	17.1 ± 26.8	0.295
Pain	60.4 ± 31.7	41.0 ± 26.8	**0.002***
Shortness of breath	37.0 ± 40.6	20.3 ± 31.4	**0.029***
Sleep disturbance	59.2 ± 40.6	38.6 ± 41.7	**0.017***
Loss of appetite	58.0 ± 40.9	17.0 ± 30.6	**<0.001***
Constipation	24.6 ± 36.5	27.8 ± 37.1	0.708
Diarrhea	17.2 ± 28.2	9.3 ± 22.7	0.071
Financial effect	22.2 ± 29.2	26.3 ± 35	0.776

Mann-Whitney test.
*$p < 0.05$ are given only when they were significant.

Table 5. The correlation status between the patients' anthropometric measurement values and quality of life scores ($n = 166$).

		SS	GSHS	Body weight	BMI	Waist/Hip ratio	MUAC	Right HGS	Left HGS
FS	r	−0.671**	0.376**	0.142	0.028	0.066	0.083	0.253**	0.265**
	p	**<0.01**	**<0.01**	0.069	0.725	0.396	0.290	**0.001**	**0.001**
SS	r		−0.342**	−0.092	−0.013	−0.034	−0.085	−0.232**	−0.255**
	p		**<0.01**	0.239	0.863	0.662	0.279	**0.003**	0.001
GSHS	r			0.069	0.083	−0.141	0.061	0.056	0.054
	p			0.378	0.285	0.071	0.437	0.475	0.487
Body weight	r				0.856**	0.307**	0.795**	0.150	0.154*
	p				**<0.01**	**<0.01**	**<0.01**	0.053	**0.047**
BMI	r					0.158*	0.773**	−0.109	−0.099
	p					**0.042**	**<0.01**	0.162	0.205
Waist/Hip ratio	r						0.176*	0.265**	0.260**
	p						**0.023**	**0.001**	**0.001**
MUAC	r							0.088	0.100
	p							0.259	0.201
Right HGS	r								0.950**
	p								**<0.01**

Spearman test.
r = Correlation coefficient, FS = Functional scale, SS = Symptom scale, GSHS = General state of health scale, BMI = Body mass index, MUAC = Mid upper arm circumference, Right HGS = Right hand grip strength, Left HGS = Left hand grip strength.
*$p < 0.05$.
**$p < 0.01$.

receiving chemotherapy that were determined using NRS-2002, their certain anthropometric properties and quality of life scores found through EORTC QLQ-C30. The majority of the male patients included in this study had lung cancer (40% of those <65 years old, 31.4% of those ≥65 years old); the majority of female patients are breast cancer patients (32.8% of those <65 years old, 40.6% of those ≥65 years old). According to Globocan 2020 and Turkish Cancer Statistics published by the Ministry of Health of the Republic of Turkey in 2019, the most common type of cancer in men in Turkey is trachea, bronchial and lung cancer, while breast cancer in women; determined as lung cancer in both genders (22, 23).

According to NRS-2002 results, 16.3% of patients displayed malnutrition risk (NRS score ≥3) and those aged 65 years and older had higher malnutrition risk. Of the people carrying malnutrition risk, 85.2% consisted of those aged 65 years and older. Sarcopenia can develop with the aging process without any disease condition (primary sarcopenia), as well as in the presence of a chronic inflammatory condition such as cancer (secondary sarcopenia). In this context, both primary sarcopenia and secondary sarcopenia may have a negative impact on the functional status and prognosis of these patients. Sarcopenia, which is defined as age-related physiological muscle wasting and weakness and is common in individuals with cancer, may accompany cancer cachexia and a

poor prognosis. The rate of cachexia increases with the advancing age of cancer patients (24). Cancer cachexia is a hypermetabolic syndrome characterized by loss of muscle and/or fat mass accompanied by weight loss and chronic inflammation. The terms cachexia and sarcopenia are two different conditions, describing debilitating muscle deficiency disorders that reduce the patient's function and physical performance. While the majority of cachectic patients are also sarcopenic due to loss of muscle and muscle strength; sarcopenic patients are not cachectic when there is no weight loss or the current change in muscles is physiological rather than any disease (9, 18, 25).

A systematical compilation consisting of 71 studies that questioned the nutritional status of cancer patients through various nutritional screening instruments indicated that the mean percentage of patients under the malnutrition risk or suffering from malnutrition was 51% (range between 7 and 94%). Moreover, 28 studies in the compilation were conducted with people aged 65 years and older, or with people whose mean age was equal to or higher than 70 years, and these studies indicated that the mean percentage of patients under the malnutrition risk or suffering from malnutrition was 54% (20). The difference between the results of these studies might have arisen from different screening methods, ages of patients included in the study, different cancer types, treatment types and/or treatment stages.

It is a well-known fact that anthropometric measurements are important for the assessment of a patient's nutritional status. On the other hand, although it is used for anthropometric measurements to reflect nutritional status in older adults, calf circumference measurements can be used as a diagnostic tool in environments where no other muscle mass diagnosis method is available today (18). In this retrospective study, upper middle arm circumference; ıt was preferred because it is a determinant method in determining the nutritional status during the data collection period and calf circumference measurements are not routinely performed (16, 26). This study found that the body weight, BMI and waist, hip and mid-upper arm circumferences of the patients under malnutrition risk were lower than those who did not have such a risk. No significant difference based on gender, height and waist/hip rate was found between the people suffering from malnutrition and those who did not have such issues. According to the retrospective study conducted by Xia Zhou et al. (21) to examine the prognostic value regarding the nutritional status of 187 people who had metastatic or recursive esophagus squamous epithelial cell carcinoma and received chemotherapy, there was a correlation between NRS score, weight loss and BMI, but no significant correlation was present between gender and age. Alkan et al. (16) conducted a study with 104 cancer patients and found a significant negative correlation between PG-SGA score, body weight, BMI, MUACM and mid-upper arm area. The strength and muscular activities mostly worsen due to the poor nutritional activities of cancer patients, which may adversely affect cancer treatment. Therefore, collective use of objective and subjective methods results in the assessment and planning of personal nutritional status (22). In addition to nutritional screening tools, evaluating hand grip strength is a simple, rapid and noninvasive method which has been often used recently and which is regarded as a significant indicator for determining the nutritional status of the individuals prior to anthropometric and biochemical changes that may appear (27). The right and left hand grip strengths of patients with the risk of malnutrition were significantly lower in this study. Similarly, there are studies that have shown that patients with the risk of malnutrition had lower hand grip strength in the literature (13, 27–29). There are also studies that did not correlate hand grip strength with nutritional status (17, 30). The fact the results of the studies are different might be due to the fact that patients included in the study had different ages, cancer types, treatment types and/or were in different treatment stages and that nutritional risk screening tools were different or that there is no consensus on the hand grip strength measurement protocols. Decreasing hand grip strength was associated with bad quality of life (31). A weak positive correlation was found between the functional scale and right and left hand grip strength in this study. on the other hand, a weak negative correlation was found between the symptom scale and right and left hand grip strength.

It was found in this study that the functional, general health, physical, role scores of patients with the risk of malnutrition which was determined with the EORTC QLQ-C30 were significantly lower than the patients without the risk of malnutrition while their symptom, fatigue, pain, shortness of breath, sleep disorder, loss of appetite scores were significantly higher. No significant differences were found on cognitive, emotional, social, nausea-vomiting, constipation, diarrhea and financial state scores. Additionally, a strong negative correlation was found between the functional scale and symptom scale while there was a weak positive correlation between

the functional scale and general state of health scale. A weak negative correlation was found between the symptom scale and general state of health scale. Numerous previous studies have examined the quality of life of patients with cancer (2, 11, 32–35). Lis et al. (2) showed that a better nutritional status was found to be correlated with a better quality of life in 24 studies within their compilation, that a better nutritional status was correlated to better quality of life in patients at great risk in only one study and that nutritional status was correlated to quality of life in one study. In the study by Álvaro Sanz et al. (11), it was found that cancer patients with malnutrition, cachexia or a Nutriscore ≥ 5 points according to the Patient-Generated Subjective Global Assessment (PG-SGA) had lower quality of life which is determined using the Functional Assessment of Cancer Treatment (FACT-G). In a prospective cohort study by the National Cancer Institute in Brazil with 1039 cancer patients who could not be treated and were directed to the Palliative Care Unit, it was revealed that physical and emotional symptoms and the general quality of life of the patients with bad nutritional status were significantly bad (35). In a prospective study conducted with 747 resected cancer patients, it was found that the risk of malnutrition, somatization, depression and anxiety, which was simultaneously defined as a result of the multiple regression analysis performed, constituted 50.8% of the variance in the functional scale, 45.3% of the variance in the symptom scale and 52.2% of the variance in the general health scale, and that malnutrition and psychological symptom risks had a significant effect on the quality of life of patients with cancer (34). In a pilot study by Mulasi et al. (32) which examined the nutritional status and quality of life results, which were determined with PG-SGA, of 19 outpatients with head and neck cancer before receiving chemotherapy, and 1 and 3 mo, after chemotherapy, it was reported that well-nourished patients encountered less problems related to pain, fatigue, loss of appetite, chewing, sticky saliva, cough and social eating problems compared to undernourished patients, that there was a weak positive correlation between global quality of life and PG-SGA score, that the patients had more serious problems regarding chewing, swallowing, sticky saliva, dry mouth, speaking, social eating status and taste and smell senses at the end of a one-month follow-up, that dry mouth problems continued three months after the treatment, and that undernourished patients had worse quality of life symptoms compared to well-nourished patients. According to a study by Hinz et al. (33) conducted with 2059 patients with cancer and 4476 individuals in the control group, although these two groups had similar quality of life scores, the function and symptom subtitle mean scores of the patients with cancer (in 7 out of 8 cancer types) included in this study were significantly different than the control group.

This study has some limitations. The patients included in the study were heterogeneous in terms of cancer type, diagnosis and treatment duration to determine anthropometric measurements, hand grip strength, NRS-2002 and EORTC QLQ-C30. The fact that whether the patients included in the study had an additional disease was not evaluated. Comorbid diseases in cancer may affect the nutritional status and quality of life of the individuals.

In conclusion, although elderly individuals are at greater risk, all patients with cancer are at the risk of malnutrition. Screening the nutritional status and personal nutrition interventions might be effective in preventing the factors that negatively affect the quality of life of patients with cancer such as fatigue, loss of appetite and pain. Additionally, the malnutrition status of patients with cancer differs in studies. Therefore, instead of cancer disease-specific tools, there is a need to develop patient-specific (e.g., based on cancer type, cancer treatment, quality of life etc.) nutritional screening tools that can be universally accepted to determine nutritional status more clearly and early.

There are some limitations in this study. First, only available data were evaluated as it was a retrospective study. Second, the study contributes to the literature by reexplaining the well-known association between malnutrition and poor quality of life, but in a new location. Additionally, it may be possible to use several available nutritional screening tools together and support them with more than one anthropometric measurement (especially calf circumference measurement) in the future studies. Considering the bilateral correlation between nutrition and quality of life, more studies where these two factors are evaluated together should be conducted.

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