

# The Evaluation of Relationship Between Malnutrition, Quality of Life and Depression in Cancer Patients Treated with Chemotherapy

## Kemoterapi Alan Kanseri Hastalarında Malnütrisyon, Yaşam Kalitesi ve Depresyon Arasındaki İlişkinin Değerlendirmesi

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### ABSTRACT

**Objective:** The main aim of the study was to evaluate relationship between malnutrition and quality of life in gastrointestinal (GIS) and non-gastrointestinal (non-GIS) cancer patients treated with chemotherapy.

**Methods:** This study was carried out from March to October 2015. 104 cancer patients (52 GIS and 52 non-GIS cancer cases) participated in the study. The patients aged between 19-64 years-old and treated in a medical oncology clinic. The general characteristics and disease information of the patients were recorded in a questionnaire form. Nutritional status, quality of life, anxiety and depression status were assessed using "Patient Generated-Subjective Global Assessment" (PG-SGA), "European Organization for the Research and Treatment of Cancer Quality of Life Questionnaire" (EORTC QLQ-C30) and "Hospital Anxiety and Depression Scale" (HADS), respectively.

**Results:** The percentages of malnutrition were found 64.6% and 64.3% in male, and 61.9% and 45.8% in female patients with GIS and non-GIS cancer, respectively. There was negative moderate and significant correlation between PG-SGA score and EORTC QLQ-C30 score ( $r=-.424$ ,  $p=0.000$ ). There was positive moderate and significant correlation between PG-SGA score and anxiety score ( $r=.489$ ,  $p=0.000$ ) and depression score ( $r=.514$ ,  $p=0.000$ ).

**Conclusion:** The nutritional status, quality of life, anxiety and depression level of each patient diagnosed with cancer should be evaluated comprehensive by using appropriate scales. The obtained data will guide the best nutritional therapy and psychological support.

**Keywords:** cancer; malnutrition; quality of life; anxiety; depression

### ÖZ

**Amaç:** Kemoterapi alan gastrointestinal sistem (GIS) ve gastrointestinal sistem dışı kanser hastalarında malnütrisyon ve yaşam kalitesi arasındaki ilişkinin değerlendirilmesi amaçlanmıştır.

**Materyal Metot:** Araştırmaya Mart 2015-Ekim 2015 tarihleri arasında bir üniversite hastanesinin tıbbi onkoloji kliniğinde tedavi edilen 19-65 yaş aralığında 52'si GIS ve 52'si GIS dışı olmak üzere toplam 104 kanser hastası katılmıştır. Bireylerin genel özellikleri ve hastalık bilgileri bir anket formuna kaydedilmiştir. Beslenme durumu "Hasta Odaklı Subjektif Global Değerlendirme" (PG-SGD), yaşam kalitesi "Avrupa Kanser Tedavi ve Organizasyon Komitesi Yaşam Kalitesi Ölçeği-Kanser 30" (EORTC QLQ-C30), anksiyete ve depresyon riski "Hastane Anksiyete ve Depresyon Ölçeği" (HADS) kullanılarak değerlendirilmiştir.

**Bulgular:** GIS ve GIS dışı kanser hastası erkeklerin sırasıyla %64.6 ve %64.3'ü, kadınların ise sırasıyla %61.9'u ve %45.8'i malnütrisyonlu olduğu tespit edilmiştir. PG-SGD puanı ile genel sağlık durumu/yaşam kalitesi puanı ( $r=-.424$ ,  $p=0.000$ ) arasında negatif yönde orta düzeyde ve anlamlı bir ilişki bulunmuştur. PG-SGD puanı ile anksiyete ( $r=.489$ ,  $p=0.000$ ) ve depresyon ( $r=.514$ ,  $p=0.000$ ) puanı arasında ise pozitif yönde orta düzeyde ve anlamlı bir ilişki bulunmuştur.

**Sonuç:** Kanser tanısı alan her hastanın beslenme durumu, yaşam kalitesi, anksiyete ve depresyon düzeyi geliştirilen uygun ölçeklerle belirli aralıklarla kapsamlı olarak değerlendirilmelidir. Elde edilen veriler hastaya en uygun beslenme tedavisi ve psikolojik desteğin verilmesi açısından yol gösterici olacaktır.

**Anahtar Kelimeler:** kanser; malnütrisyon; yaşam kalitesi; anksiyete; depresyon

### Introduction

Cancer is defined as malignant growth or tumour caused by abnormal and uncontrolled cell division (1). A long and exhausting treatment is expected for a person with a cancer diagnosis. Malnutrition is one of the most important complications of cancer treatment. The aetiology of malnutrition is multifactorial and is caused by the local effect of the tumour, the response of the organism, and the treatments (2). The prevalence of malnutrition in cancer patients is between 15-80% and 20% of patients die due to malnutrition (3-5). The reasons for variable prevalence

include the use of different methods of nutritional assessment, tumour type, stage, location and treatment (6). Malnutrition is most commonly seen in gastrointestinal system cancers. And it is more common in head, neck and lung cancers than in other types of cancer (3, 7). A comprehensive evaluation of the nutritional status is important for identifying the risk or presence of malnutrition and to plan appropriate nutritional intervention for cancer patients. However, nutritional problems are often multifactorial. It is important to assess also its physical, psychological, social and functional aspects (8). "Patient-Generated Subjective Global Assessment" (PG-SGA) has been developed to evaluate the nutritional status of cancer patients. PG-SGA identifies the individuals who need nutritional support. PG-SGA is also suggested by The Oncology Nutrition Dietetic Practice Group of the Academy of Nutrition and Dietetics (9).

Quality of life includes the patient's ideas about own global health, physical, social, financial, psychosocial status and symptoms such as pain, fatigue, appetite loss, sleep, depression. Treatments applied for cancer cause nausea, vomiting, appetite loss, food rejection, diarrhoea and constipation in the patient, which decrease the quality of life by adversely affecting the patient physically, psychologically and socially (10, 11). Assessment of quality of life is important in determining the patient's symptoms, psychological and functional problems and evaluating the response to treatment (12). It is stated that weight loss is an independent determinant of quality of life in patients receiving cancer treatment (13). In the studies, it has been found that appetite loss, early satiety and weight loss, which are directly related to nutritional status in cancer patients, have a negative impact on quality of life (14-16). In a systematic review where quality of life and nutrition relationship is evaluated, in 24 of 26 studies made in various cancer patients, it has been found that in patients with better nutritional status, quality of life was better (17).

Anxiety and depression are among the problems seen in cancer patients. The prevalence of anxiety and depression in cancer patients was reported to be 1.3-23% and 1-58%, respectively (18). It is reported that anxiety and depression are seen more frequently, especially in patients with breast and stomach cancer (19). Factors such as cancer diagnosis, staying in hospital, treatments, feel of pain, fear of death, hopelessness, financial difficulties are the main factors causing anxiety and depression in cancer patients (20). Anxiety and depression negatively affect the food consumption of the patient and cause the malnutrition scenario to become more serious (18). It is reported that cancer patients with malnutrition have more frequent problems such as fatigue, insomnia, anxiety and depression (21, 22). It has also been reported that the proinflammatory cytokines in the cancer affect the central nervous system and may increase the susceptibility of individuals to malnutrition and depression (22).

In this study; nutritional status, quality of life, anxiety and depression status of gastrointestinal system (GIS) and non-gastrointestinal system (non-GIS) cancer patients receiving chemotherapy in a medical oncology clinic of a medical faculty are aimed to be evaluated.

## Methods

### Sampling

This study included 104 cancer patient volunteers (52 GIS and 52 non-GIS cancer cases) aged between 19-64 years old, who were being treated between March 2015 and October 2015 in a medical oncology clinic of a university hospital in Turkey.

### Questionnaire form

The general characteristics of the patients (age, gender, etc.), comorbidities and number of medications were obtained through face-to-face interviews with patients. Information on serum albumin and total protein levels from cancer type, stage, duration and treatment information and biochemical findings were obtained from patients' file.

### Evaluation of nutritional status

PG-SGA was used to assess nutritional status. With PG-SGA, the patient's body weight changes in last 1 month or 6 months, the last 1 month of food intake (normal, less/more than normal, liquid/solid, etc.), daily symptoms of the gastrointestinal tract (appetite loss, nausea, vomiting, etc.), function and activity status, fever status and duration, and steroid usage were recorded. Physical examination (fat depots, muscle and fluid status) was evaluated by the physician. The nutritional status was described as SGA-A if the patient was well-nourished, SGA-B if the patient was moderately nourished or at malnutrition risk and SGA-C if the patient was severely malnourished. SGA-B and SGA-C were considered to be malnourished in this study (9).

### Quality of Life Questionnaire

EORTC QLQ-C30 (European Organization for the Research and Treatment of Cancer Quality of Life Questionnaire-Cancer 30) was used to assess the quality of life. This questionnaire, developed by Aaronson et al. (23), consists of 30 questions and information on global health status, functional status (physical, role, emotional, cognitive, and social) and symptoms (fatigue, nausea and vomiting, pain, dyspnoea, insomnia, appetite loss, constipation, diarrhoea, financial difficulties). The validity and reliability study of EORTC QLQ-C30 questionnaire in Turkey was conducted by Güzelant et al. (24). The lowest total score that can be obtained from the questionnaire is 0, the highest score is 100. The high score obtained from the functional and global health sections indicates that the quality of life of the patients is better. However, the high score from the symptom section indicates that the quality of life of the patients is worse.

### Anxiety and Depression Scale

In this study, Hospital Anxiety and Depression Scale (HADS) was used to assess the anxiety and depression status of the patients. It was developed by Zigmond and Snaith (25) to determine the risk of anxiety and depression and to measure the level and severity in the patient. The reliability and validity study of the scale was made

in Turkey by Aydemir and Köroğlu (26). The cut-off points of the Turkish version of HADS have been determined as 10 for the anxiety subscale (HAD-A) and 7 for the depression subscale (HAD-D).

### Statistical analysis

The data obtained as a result of the study have been evaluated by using SPSS 22 statistical package program (27). The normality test of the numerical data was checked by the Kolmogorov Smirnov test. The analysis of quantitative data showing normal distribution was made with "Student's t-test", the analysis of the quantitative data not showing normal distribution was made with "Mann Whitney U test". In the evaluation of qualitative data, "Pearson Ki-square" was used. The evaluation of the relationship between some findings of the patients was made with the "Spearman correlation coefficient". As a result of the analyses, values of  $p < 0.05$  was accepted as statistically significant (28).

### Results

A total of 104 cancer patients between the ages of 19 and 64 were enrolled in the study, 52 of whom were GIS, and 52 of whom were non-GIS. The age average of male subjects with GIS and non-GIS cancer was  $54.1 \pm 8.9$  and  $54.3 \pm 11.1$  years respectively, and the age average of female subjects with GIS and non-GIS cancer was  $55.0 \pm 6.8$  and

$49.9 \pm 11.7$  years, respectively. No statistically significant difference was found between the two cancer groups in terms of age average ( $p > 0.05$ ). 52.5% of the male subjects participating in the study were GIS, 47.5% of them were non-GIS, 46.7% of female subjects were GIS and 53.3% were non-GIS cancer patients. The three most common cancers in male patients were lung (30.5%), colorectal (33.9%) and stomach (11.8%), respectively. The three most common cancers in female patients were breast (31.1%), colorectal (22.2%) and gynaecologic (15.5%) cancers. The rate of patients with cancer stage IV was 59.6%. It was determined that 90.4% of the patients received chemotherapy and 9.6% received chemoradiotherapy (Table 1 and Table 2). Serum albumin levels in male patients with GIS and non-GIS cancer were  $3.7 \pm 0.5$  and  $3.6 \pm 0.6$  g/dL, respectively, and serum total protein levels were  $6.6 \pm 0.6$  and  $6.5 \pm 0.8$  g/dL, respectively. No significant difference was found in serum albumin level ( $p = 0.096$ ) and serum total protein level ( $p = 0.241$ ) between two cancer groups. Serum albumin levels of female patients with GIS and non-GIS cancer were  $3.7 \pm 0.5$  and  $3.8 \pm 0.6$  g/dL, respectively, and serum total protein levels were  $6.5 \pm 0.4$  and  $6.8 \pm 0.8$  g/dL, respectively. No significant difference was found in serum albumin level ( $p = 0.398$ ) and serum total protein level ( $p = 0.356$ ) between two cancer groups. While there was no significant difference between the two cancer groups in terms of comorbidities and the number of medications, the duration of diagnosis and the number of cures were significantly higher in women with non-GIS cancer than in women with GIS cancer (Table 2).

**Table 1:** Cancer type, stage and treatment information of the patients

	Male <sup>#</sup> (n=59)		Female <sup>#</sup> (n=45)		Total <sup>#</sup> (n=104)	
	n	%	n	%	n	%
<b>GIS cancer</b>	31	52.5	21	46.7	52	50.0
Colorectal	20	33.9	12	26.7	32	30.7
Stomach	7	11.8	2	4.4	9	8.7
Pancreas	1	1.7	5	11.2	6	5.8
Esophagus	2	3.4	-	-	2	1.9
Liver/bile	1	1.7	2	4.4	3	2.9
<b>Non-GIS cancer</b>	28	47.5	24	53.3	52	50.0
Lung	18	30.5	-	-	18	17.3
Breast	-	-	14	31.2	14	13.3
Gynecological	-	-	7	15.5	7	6.8
Head and neck	6	10.2	1	2.2	7	6.8
Others	4	6.8	2	4.4	6	5.8
<b>Cancer stage</b>						
I	1	1.7	-	-	1	1.0
II	12	20.3	7	15.6	19	18.3
III	11	18.6	11	24.4	22	21.1
IV	35	59.4	27	60.0	62	59.6
<b>Treatment</b>						
Chemotherapy	54	91.5	40	88.9	94	90.4
Chemoradiotherapy	5	8.5	5	11.1	10	9.6

<sup>#</sup> The distribution is calculated based on the column percentage

**Table 2:** Clinical information and SGA classification

	GIS cancer		Non-GIS cancer		P <sub>1</sub>	P <sub>2</sub>
	Male (n=31) $\bar{X} \pm SS$	Female (n=21) $\bar{X} \pm SS$	Male (n=28) $\bar{X} \pm SS$	Female (n=24) $\bar{X} \pm SS$		
Age (year)	54.1±8.9	55.0±6.8	54.3±11.1	49.9±11.7	0.726	0.175
Duration of diagnosis (year)	1.6±2.6	1.3±1.2	1.4±2.0	2.7±2.1	0.867	<b>0.027*</b>
Number of cures	7.3±6.7	5.5±4.2	6.8±6.8	10.6±7.5	0.532	<b>0.017*</b>
Number of comorbidities	0.7±0.9	0.8±1.0	1.1±1.9	0.9±1.0	0.394	0.653
Number of medications	2.1±2.9	2.4±3.6	2.0±2.6	1.9±2.2	0.849	0.991
Serum albumin level (g/dL)	3.7±0.5	3.7±0.5	3.6±0.6	3.8±0.6	0.096	0.398
Serum total protein level (g/dL)	6.6±0.6	6.5±0.4	6.5±0.8	6.8±0.9	0.241	0.356
PG-SGA score <sup>§</sup>	11.4±6.6	12.0±8.0	12.5±5.6	9.5±5.8	0.545	0.254
<b>SGA classification<sup>#</sup></b>						
SGA-A, n	11	8	10	13		
(%)	(35.4)	(38.1)	(35.7)	(54.2)		
SGA-B, n	10	7	3	8	0.097	0.356
(%)	(32.3)	(33.3)	(10.7)	(33.3)	X <sup>2</sup> =4.676	X <sup>2</sup> =2.066
SGA-C, n	10	6	15	3		
(%)	(32.3)	(28.6)	(53.6)	(12.5)		

PG-SGA: Patient Generated-Subjective Global Assessment, SGA: Subjective Global Assessment

\* p&lt;0.05

p<sub>1</sub>: Comparison of male patients with GIS and non-GIS, Mann-Whitney U test

p<sub>2</sub>: Comparison of female patients with GIS and non-GIS, Mann-Whitney U test

<sup>§</sup> Student's t test (in male patients)

<sup>#</sup> Pearson Chi-square test, SD: standard deviation

**Table 3:** Quality of life, anxiety and depression scores of the patients

	GIS cancer		non-GIS cancer		P <sub>1</sub>	P <sub>2</sub>
	Male (n=31) $\bar{X} \pm SS$	Female (n=21) $\bar{X} \pm SS$	Male (n=28) $\bar{X} \pm SS$	Female (n=24) $\bar{X} \pm SS$		
<b>Global health status/quality of life</b>	67.7±26.9	67.9±26.1	52.1±25.6	51.4±24.9	<b>0.026*</b>	<b>0.036*</b>
<b>Functional</b>						
Physical <sup>§</sup>	76.1±22.4	59.7±22.6	60.8±27.5	65.0±18.6	<b>0.012*</b>	0.391
Role	78.9±27.2	73.0±26.6	67.9±30.4	68.8±24.7	0.146	0.580
Emotional	80.9±22.4	76.6±22.8	72.9±15.1	70.5±27.4	0.118	0.424
Cognitive	88.2±15.6	83.3±22.4	83.3±20.8	84.7±23.0	0.314	0.838
Social	72.1±23.7	69.9±19.5	63.1±24.2	57.0±26.0	0.157	0.069
<b>Symptom</b>						
Fatigue	23.6±21.6	32.8±20.0	35.7±21.9	34.2±23.4	<b>0.038*</b>	0.824
Nausea and vomiting	10.2±20.5	16.7±23.6	13.7±18.2	17.4±30.5	0.495	0.912
Pain	16.1±28.0	25.4±23.9	25.6±24.2	31.9±29.9	0.173	0.426
Dyspnoea <sup>§</sup>	7.5±14.2	14.3±19.9	34.5±30.7	19.4±32.5	<b>0.001*</b>	0.531
Insomnia	22.6±24.9	23.8±28.2	28.6±29.7	33.3±31.1	0.403	0.290
Appetite loss	16.1±24.1	25.4±27.7	28.6±29.7	26.4±27.8	<b>0.030*</b>	0.905
Constipation	9.7±19.6	23.8±35.2	30.9±27.1	12.5±29.2	0.835	0.245
Diarrhoea	12.9±23.8	4.8±11.9	4.8±14.9	11.1±25.4	0.127	0.300
Financial difficulties	29.0±20.6	31.7±26.8	35.7±22.1	47.2±25.9	0.234	0.055
<b>HADS-Anxiety score<sup>#</sup></b>	5.0±3.6	6.7±4.0	5.5±4.2	6.7±4.0	0.626	0.534
Anxiety risk – Yes, n (%)	3 (%9.7)	4 (%19.0)	2 (%7.1)	4 (%16.7)	0.727	0.835
Anxiety risk – No, n (%)	28 (%90.3)	17 (%81.0)	26 (%92.9)	20 (%83.3)	X <sup>2</sup> =0.122	X <sup>2</sup> =0.043
<b>HADS-Depression score<sup>#</sup></b>	5.7±4.4	6.7±4.0	6.3±4.8	8.1±5.0	0.611	0.310
Depression risk – Yes, n (%)	12 (%38.7)	10 (%47.6)	13 (%46.4)	15 (%62.5)	0.549	0.316
Depression risk – No, n (%)	19 (%61.3)	11 (%52.4)	15 (%53.6)	9 (%37.5)	X <sup>2</sup> =0.359	X <sup>2</sup> =1.004

HADS: Hospital Anxiety and Depression Scale

\* p&lt;0.05

p<sub>1</sub>: Comparison of male patients with GIS and non-GIS, Student's t-test

p<sub>2</sub>: Comparison of female patients with GIS and non-GIS, Student's t-test

<sup>§</sup> Mann-Whitney U test (scores of physical function and dyspnoea in male patients)

<sup>#</sup> Pearson Chi-square test, SD: standard deviation

According to the SGA, 32.3% of males with GIS cancer were evaluated as at risk of malnutrition, 32.3% severely malnourished and 10.7% of males with non-GIS cancer were evaluated as at risk of malnutrition and 53.6% severely malnourished. The percentages of malnutrition were found 64.6% and 64.3% in male patients with GIS and non-GIS cancer, respectively. No significant difference in nutritional status between two cancer types in male subjects was found ( $X^2=4.676$ ,  $p=0.097$ ). According to the SGA, 33.3% of females with GIS cancer have been evaluated as at risk of malnutrition, 28.6 % severely malnourished and 33.3 % of females with non-GIS cancer have been evaluated as at risk of malnutrition and 12.5% severely malnourished. The percentages of malnutrition were found 61.9% and 45.8% in female patients with GIS and non-GIS cancer, respectively. No significant difference in nutritional status between two cancer types in female subjects has been found ( $X^2=2.066$ ,  $p=0.356$ ) (Table 2).

The PG-SGA score average of male patients with GIS cancer and non-GIS cancer was  $11.4\pm6.6$  and  $12.5\pm5.6$ , respectively, and the PG-SGA score average of female patients with GIS and non-GIS cancer was  $12.0\pm8.0$  and  $9.5\pm5.8$ , respectively. No significant difference between the two cancer groups in terms of PG-SGA score averages was found ( $p>0.05$ ).

The global health status/quality of life score of GIS cancer patients was significantly higher than non-GIS cancer patients ( $p<0.05$ ). When the functional scales were evaluated, it was found that the physical function scores of male patients with GIS cancer were significantly higher than those of male patients with non-GIS cancer ( $p<0.05$ ). When the symptom scales were evaluated, it has been determined that fatigue, dyspnoea and appetite loss scores of male subjects were significantly higher in non-GIS cancer patients ( $p<0.05$ ) (Table 3).

According to the Hospital Anxiety and Depression Scale, the percentage of male subjects with GIS and non-GIS cancer who were at risk for anxiety were 9.7% and 7.1%, respectively, and the percentage of female subjects were 19.0% and 16.7% respectively. The percentage of male subjects with GIS and non-GIS who were at risk for depression were determined as 38.7% and 46.4%, respectively, and the percentages of female subjects have been determined as 47.6% and 62.5%, respectively. No significant difference between two cancer types in terms of anxiety and depression risk rate has been found ( $p>0.05$ ) (Table 3).

A negatively moderate and significant relationship was found between PG-SGA score and global health status/quality of life score ( $r = -.424$ ,  $p=0.000$ ). A positively moderate and significant relationship was found between PG-SGA score and anxiety ( $r = .489$ ,  $p=0.000$ ) and depression ( $r = .514$ ,  $p=0.000$ ) scores. A negatively weak and significant relationship was found between PG-SGA score and serum albumin ( $r = -.307$ ,  $p=0.002$ ) and total protein ( $r = -.234$ ,  $p=0.017$ ) levels. A negatively moderate and significant relationship was found between global health status score and anxiety ( $r = .511$ ,  $p=0.000$ ) and depression ( $r = -.582$ ,  $p=0.000$ ) scores. There was a positively weak and significant relationship between the global health status score and serum albumin ( $r = .319$ ,  $p=0.001$ ) and total protein ( $r = .214$ ,  $p=0.029$ ) levels. There was a negatively weak and significant relationship between anxiety and serum albumin ( $r = -.242$ ,  $p=0.013$ ) and total protein ( $r = -.236$ ,  $p=0.016$ ) levels. There was a negatively weak and significant relationship between depression and serum albumin ( $r = -.319$ ,  $p=0.001$ ) and total protein ( $r = -.300$ ,  $p=0.002$ ) levels (Table 4).

**Table 4:** The relationship between the global health status score and certain findings

Variables	Global health status score	Depression score	Anxiety score	Number of medications	Number of cures	Duration of diagnosis	Serum albumin level	Serum total protein level
PG-SGA score	<b>-.424**</b> <b>p=0.000</b>	<b>.514**</b> <b>p=0.000</b>	<b>.489**</b> <b>p=0.000</b>	.160 $p=0.105$	.044 $p=0.656$	.080 $p=0.417$	<b>-.307**</b> <b>p=0.002</b>	<b>-.234*</b> <b>p=0.017</b>
Global health status score		<b>-.582**</b> <b>p=0.000</b>	<b>-.511**</b> <b>p=0.000</b>	-.045 $p=0.652$	-.113 $p=0.252$	-.127 $p=0.200$	<b>.319**</b> <b>p=0.001</b>	<b>.214*</b> <b>p=0.029</b>
Depression score			<b>.834**</b> <b>p=0.000</b>	.129 $p=0.193$	.195* $p=0.047$	.083 $p=0.400$	<b>-.319**</b> <b>p=0.001</b>	<b>-.300**</b> <b>p=0.002</b>
Anxiety score				.112 $p=0.256$	.127 $p=0.199$	.080 $p=0.417$	<b>-.242*</b> <b>p=0.013</b>	<b>-.236*</b> <b>p=0.016</b>
Number of medications					-.093 $p=0.349$	.037 $p=0.712$	-.081 $p=0.413$	-.062 $p=0.534$
Number of cures						<b>.673**</b> <b>p=0.000</b>	-.013 $p=0.895$	-.168 $p=0.089$
Duration of diagnosis							-.045 $p=0.648$	-.154 $p=0.118$
Serum albumin level								<b>.708**</b> <b>p=0.000</b>

\*  $p<0.05$ , \*\*  $p<0.01$  PG-SGA: Patient Generated-Subjective Global Assessment



# Discussion

Cancer, like other serious diseases, can negatively impact quality of life, causing changes in the individual's metabolism and lifestyle (29). There are many researches about nutritional status in cancer patients (3, 4). The prevalence of malnutrition varies according to cancer types. In the study conducted by Hebuterne et al. (30), high malnutrition prevalence were reported in pancreatic (%66.7), oesophageal/stomach (60.2%), head and neck (48.9%), lung (45.3%), ovarian/uterine (44.8%), colon/rectal (39.3%), leukaemia/lymphoma (34.0%), breast (%20.5) and prostate (13.9%) cancer. In this study percentages of malnutrition were found 64.6% and 64.3% in male subjects with GIS and non-GIS cancer, respectively (Table 2). Effects such as vomiting, nausea, early satiety, accelerated intestine transit that are common in GIS cancer patients directly affect digestion and absorption. For this reason, GIS cancer patients are reported to be more vulnerable to malnutrition (31). Pereira Borges et al. (32) indicate that GIS cancer patients are 23 times more at risk of malnutrition than non-GIS cancer patients. However, in this study, no significant difference was found between the PG-SGA score averages and malnutrition classifications of male patients with GIS and non-GIS cancer. The reason for this can be explained by the majority of male patients with non-GIS cancer having lung and head-neck cancer.

61.9% and 45.8% of female subjects with GIS and non-GIS cancer were evaluated as malnourished, respectively (Table 2). Also, no significant difference has been found between the PG-SGA score averages and malnutrition classifications of female patients with GIS and non-GIS cancer. Most women with non-GIS cancer who were participating in this study had breast cancer (Table 1). It is generally stated that the rate of malnutrition and weight loss are low in breast cancer (5, 33). The duration of diagnosis and the number of cures has been found to be significantly higher in female patients with non-GIS cancer (Table 2). This may have led to a higher rate of malnutrition in female patients with non-GIS cancer.

Studies have shown that diagnosed with cancer causes depression, anxiety and stress and negatively affects quality of life. Patients face and struggle with both physical and psychological effects of cancer (34, 35). The global health status/quality of life score of GIS cancer patients was significantly higher than non-GIS cancer patients ( $p<0.05$ ). The physical function scores of male patients with GIS cancer was found as significantly higher than that of male patients with non-GIS cancer, the fatigue, appetite loss and dyspnoea scores of male patients with non-GIS were found as significantly higher than those of GIS cancer patients ( $p<0.05$ ). In this study, because of the high number of male lung cancer patients, low physical function scores, high fatigue, appetite loss and dyspnoea scores were expected results. In a systematic review, 92% of lung cancer patients were reported to have dyspnoea (36). In a study evaluating the quality of life of colorectal and lung cancer patients; it has been shown that colorectal cancer patients are more affected by stoma and defecation related problems and lung cancer patients are more affected by physical problems (such as dyspnoea) (37). In this study, the financial difficulties score of non-GIS cancer patients was significantly higher than GIS cancer patients. It has been reported in the literature that cancer patients experiencing financial difficulties face more problems

with treatment, and that poverty and lower socioeconomic level are associated with worse quality of life (38, 39).

No significant differences in the anxiety and depression risk rates between the two cancer types was found in this study ( $p>0.05$ ) (Table 4). In the study Hong and Tian (40) have conducted with 1217 cancer patients, as in this study, anxiety risk rate has been found low (6.49%), depression risk rate has been found high (66.72%). It has been stated that cancers with high rates of depression were lung (77.19%), oesophagus (75.81%) and colorectal (68.42%) cancer; cancers with high rates of anxiety were stomach (30.24%), lung (2.34%) and head and neck cancers (40). In the light of this information, it can be said that anxiety and depression are a widespread problem encountered in both GIS and non-GIS cancer patients.

When the relationship between quality of life score and certain findings was examined; a negatively moderate and significant relationship has been found between PG-SGA score and global health status/quality of life score (Table 4). Similarly, in the study of Isering et al. (41) in cancer patients, a negatively moderate and significant relationship has been found between PG-SGA score and quality of life score. In other studies, it is stated that there is a significant relationship between nutritional status and quality of life and the nutritional intervention affects the quality of life positively (42, 43). In the systematic review, it is emphasized that nutrition consultancy provided by a dietitian to cancer patients prevents malnutrition and improves the quality of life of patients (44). In this study, a negatively moderate and significant relationship was found between global health status/quality of life score and anxiety and depression scores (Table 4). Psychological stress is very common in cancer patients. Patients' feelings and thoughts about cancer have a significant impact on quality of life. Patients with low levels of anxiety and depression are reported to have better quality of life (45, 46). The number of studies examining the relationship between quality of life and serum albumin level and serum total protein level is limited. In the study conducted by Seo et al. (47), no significant relationship has been found between these variables. In this study, a positively weak and significant relationship between global health status/quality of life score and serum albumin and serum total protein levels.

In this study a positively moderate and significant relationship was found between PG-SGA score and anxiety and depression scores (Table 4). The studies indicating that malnutrition risk is high in cancer patients with anxiety and depression supports this result (22, 48). It is stated that anxiety and depression cause appetite loss, thus leading to malnutrition (49). Some biological mechanisms that explain the relationship between psychological stress and malnutrition are emphasized. For example, it has been reported that cancer-related appetite loss is associated with dysfunction of serotonin which is a biological indication for depression (50). Therefore, in order to prevent malnutrition in cancer patients, psychological support as well as pharmacological support should be considered under the control of the psychiatrist.

# Conclusion

In this study, no significant difference has been found between malnutrition classification, quality of life score, and anxiety and

depression risk rates of patients with GIS and non-GIS cancer. It can be said that, as the severity of malnutrition increases, the quality of life of the individual is adversely affected and the risk of anxiety and depression increases. The nutritional status, quality of life, anxiety and depression level of each patient with cancer diagnosis should be comprehensively evaluated with appropriate scales. The obtained data will be a guide in terms of providing the best nutritional treatment and psychological support to the patient. It is also very important that physicians, dietitians, psychologists and physiotherapists work as a team to improve the quality of life and prolong the survival time of the patients.

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**Informed Consent:** Written informed consent was obtained from all participants who participated in this study.

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## REFERENCES

- [1] Rasnick D. The Chromosomal Imbalance Theory of Cancer: The Autocatalyzed Progression of Aneuploidy is Carcinogenesis. 1th ed. Boca Raton: CRC Press; 2011.
- [2] Kumar NB. Nutritional Management of Cancer Treatment Effects. 1th ed. Verlag Berlin Heidelberg: Springer; 2012.
- [3] Nicolini A, Ferrari P, Masoni MC, Fini M, Pagani S, Giampietro O, et al. Malnutrition, anorexia and cachexia in cancer patients: A mini-review on pathogenesis and treatment. *Biomed Pharmacother* 2013;67(8):807-17.
- [4] Santarpia L, Contaldo F, Pasanisi F. Nutritional screening and early treatment of malnutrition in cancer patients. *J Cachexia, Sarcopenia Muscle* 2011;2(1):27-35.
- [5] Khoshnevis N, Ahmadizar F, Alizadeh M, Akbari ME. Nutritional assessment of cancer patients in Tehran, Iran. *Asian Pac J Cancer Prev* 2012;13(4):1621-6.
- [6] Isenring E, Cross G, Kellett E, Koczwara B, Daniels L. Nutritional status and information needs of medical oncology patients receiving treatment at an Australian public hospital. *Nutr Cancer* 2010;62(2):220-8.
- [7] Wie GA, Cho YA, Kim SY, Kim SM, Bae JM, Joung H. Prevalence and risk factors of malnutrition among cancer patients according to tumor location and stage in the National Cancer Center in Korea. *Nutrition* 2010;26(3):263-8.
- [8] Barthelemy N, Streel S, Donneau A-F, Coucke P, Albert A, Guillaume M. Screening for malnutrition in lung cancer patients undergoing radiotherapy. 2014;22(6):1531-6.
- [9] 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):779-85.
- [10] Caro MMM, Pichard C. Cancer: Influence of nutrition on quality of life. In: Preedy V, Watson R, editors. *Handbook of disease burdens and quality of life measures*. New York: Springer; 2010. p.2947-64.
- [11] Vergara N, Montoya JE, Luna HG, Amparo JR, Cristal-Luna G. Quality of life and nutritional status among cancer patients on chemotherapy. *Oman Med J* 2013;28(4):270-4.
- [12] Bottomley A, Coens C, Flechtner H, Velikova G. Quality of life issues. In: Schmoll H-J, Veer LVt, Vermorken J, Schrijvers D, editors. *ESMO Handbook of cancer diagnosis and treatment evaluation*. Boca Raton: CRC Press; 2009. p.141-6.
- [13] Head BA, Heitz L, Keeney C, Myers J, Appana SN, Studts JL, et al. The relationship between weight loss and health-related quality of life in persons treated for head and neck cancer. 2011;19(10):1511-8.
- [14] Barajas Galindo DE, Vidal-Casariago A, Calleja-Fernández A, Hernández-Moreno A, Pintor de la Maza B, Pedraza-Lorenzo M, et al. Appetite disorders in cancer patients: Impact on nutritional status and quality of life. *Appetite* 2017;114(Supplement C):23-7.
- [15] Climent M, Munarriz M, Blazeby JM, Dorcaratto D, Ramon JM, Carrera MJ, et al. Weight loss and quality of life in patients surviving 2 years after gastric cancer resection. *Eur J Surg Oncol* 2017;43(7):1337-43.
- [16] Polanski J, Jankowska-Polanska B, Uchmanowicz I, Chabowski M, Janczak D, Mazur G, et al. Malnutrition and quality of life in patients with non-small-cell lung cancer. *Adv Exp Med Biol* 2017;1021:15-26.
- [17] Lis CG, Gupta D, Lammersfeld CA, Markman M, Vashi PG. Role of nutritional status in predicting quality of life outcomes in cancer--a systematic review of the epidemiological literature. *Nutr J* 2012;11:27.
- [18] Tan SM, Beck KR, Li H, Lim EC, Krishna LK. Depression and anxiety in cancer patients in a Tertiary General Hospital in Singapore. *Asian J Psychiatr* 2014;8:33-7.
- [19] Nikbakhsh N, Moudi S, Abbasian S, Khafri S. Prevalence of depression and anxiety among cancer patients. *Caspian J Inter Med* 2014;5(3):167-70.
- [20] Darius R, Alain R. Psycho-oncology and communication. *Textbook of Medical Oncology*. 4th ed. CRC Press; 2009.

- [21] Holland JC, Alici Y. Management of distress in cancer patients. *J Support Oncol* 2010;8(1):4-12.
- [22] Ma L, Poulin P, Feldstain A, Chasen MR. The association between malnutrition and psychological distress in patients with advanced head-and-neck cancer. *Curr Oncol* 2013;20(6):554-60.
- [23] Aaronson NK, Ahmedzai S, Bergman B, Bullinger M, Cull A, Duez NJ, et al. The European Organization for Research and Treatment of Cancer QLQ-C30: a quality-of-life instrument for use in international clinical trials in oncology. *Natl Cancer Inst* 1993;85(5):365-76.
- [24] Guzelant A, Goksel T, Ozkok S, Tasbakan S, Aysan T, Bottomley A. The European Organization for Research and Treatment of Cancer QLQ-C30: an examination into the cultural validity and reliability of the Turkish version of the EORTC QLQ-C30. *Eur J Cancer Care* 2004;13(2):135-44.
- [25] Zigmond AS, Snaith RP. The hospital anxiety and depression scale. *Acta Psychiatr Scand* 1983;67(6):361-70.
- [26] Aydemir Ö, Köroğlu E. *Psikiyatride kullanılan klinik ölçekler*. 3rd ed. Ankara: Hekimler Yayın Birliği Basım Yayın; 2007.
- [27] IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp.; 2013.
- [28] Alpar R. Spor, Sağlık ve eğitim bilimlerinden örneklerle uygulamalı istatistik ve geçerlik-güvenirlilik. Ankara: Detay Yayıncılık; 2010.
- [29] Borges LR, Paiva SI, Silveira DH, Assunção MCF, Gonzalez MC. Can nutritional status influence the quality of life of cancer patients? *Brazilian Journal of Nutrition* 2010;23:745-53.
- [30] Hebuterne X, Lemarie E, Michallet M, de Montreuil CB, Schneider SM, Goldwasser F. Prevalence of malnutrition and current use of nutrition support in patients with cancer. *J Parenter Enteral Nutr* 2014;38(2):196-204.
- [31] Dias do Prado C, Alvares Duarte Bonini Campos J. Malnutrition in patients with gastrointestinal cancer: Effectiveness of different diagnostic methods. *Nutr Hosp* 2015;32(1):182-8.
- [32] Pereira Borges N, D'Alegria Silva B, Cohen C, Portari Filho PE, Medeiros FJ. Comparison of the nutritional diagnosis, obtained through different methods and indicators, in patients with cancer. *Nutr Hosp* 2009;24(1):51-5.
- [33] Halpern-Silveira D, Susin LR, Borges LR, Paiva SI, Assuncao MC, Gonzalez MC. Body weight and fat-free mass changes in a cohort of patients receiving chemotherapy. *Support Care Cancer* 2010;18(5):617-25.
- [34] Hamer M, Chida Y, Molloy GJ. Psychological distress and cancer mortality. *J Psychosom Res* 2009;66(3):255-8.
- [35] Montazeri A. Health-related quality of life in breast cancer patients: a bibliographic review of the literature from 1974 to 2007. *J Exp Clin Cancer Res* 2008;27:32.
- [36] Kathiresan G. Dyspnea in lung cancer patients: a systematic review. *Lung Cancer* 2010;1:141-50.
- [37] Kenzik KM, Ganz PA, Martin MY, Petersen L, Hays RD, Arora N, et al. How much do cancer-related symptoms contribute to health-related quality of life in lung and colorectal cancer patients? A report from the Cancer Care Outcomes Research and Surveillance (CanCORS) Consortium. *Cancer* 2015;121(16):2831-9.
- [38] Fenn KM, Evans SB, McCorkle R, DiGiovanna MP, Pusztai L, Sanft T, et al. Impact of financial burden of cancer on survivors' quality of life. *J Oncol Prac* 2014;10(5):332-8.
- [39] Adler NE, Page AEK. *Cancer care for the whole patient: Meeting psychosocial health needs*. Washington, DC: The National Academies Press; 2008.
- [40] Hong JS, Tian J. Prevalence of anxiety and depression and their risk factors in Chinese cancer patients. *Support Care Cancer* 2014;22(2):453-9.
- [41] Isenring E, Bauer J, Capra S. The scored Patient-generated Subjective Global Assessment (PG-SGA) and its association with quality of life in ambulatory patients receiving radiotherapy. *Eur J Clin Nutr* 2003;57(2):305-9.
- [42] Shahmoradi N, Kandiah M, Peng LS. Impact of nutritional status on the quality of life of advanced cancer patients in hospice home care. *Asian Pac J Cancer Prev* 2009;10(6):1003-09.
- [43] Nourissat A, Vasson MP, Merrouche Y, Bouteloup C, Goutte M, Mille D, et al. Relationship between nutritional status and quality of life in patients with cancer. *European J Cancer* 2008;44(9):1238-42.
- [44] Lee JLC, Leong LP, Lim SL. Nutrition intervention approaches to reduce malnutrition in oncology patients: a systematic review. 2016;24(1):469-80.
- [45] Brown LF, Kroenke K, Theobald DE, Wu J, Tu W. The association of depression and anxiety with health-related quality of life in cancer patients with depression and/or pain. *Psychooncology* 2010;19(7):734-41.
- [46] Husson O, Mols F, van de Poll-Franse LV. The relation between information provision and health-related quality of life, anxiety and depression among cancer survivors: a systematic review. *Ann Oncol* 2010;22(4):761-72.
- [47] Seo KS, Lee JM, Kim WY. Comparison of reconstructive techniques after total gastrectomy as determined by patient quality of life and nutritional status. *Journal of the Korean Gastric Cancer Association* 2007;7(4):219-27.
- [48] Daudt HM, Cosby C, Dennis DL, Payeur N, Nurullah R. Nutritional and psychosocial status of colorectal cancer patients referred to an outpatient oncology clinic. *Support Care Cancer* 2012;20(7):1417-23.
- [49] Nho JH, Kim SR, Kwon YS. Depression and appetite: predictors of malnutrition in gynecologic cancer. *Support Care Cancer* 2014;22(11):3081-8.
- [50] Walz DA. Cancer-related anorexia-cachexia syndrome. *Clin J Oncol Nurs* 2010;14(3).