Effects of Nutritional Support on the Quality of Life of Cancer Patients

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ABSTRACT Objective: In this study, we investigated the effects of nutritional support on the quality of life of cancer patients, determined nutritional deficiencies, eliminated it at the earliest, and established a built-in system to prolong patient survival. **Material and Methods:** We included 459 patients admitted to the medical oncology outpatient clinic, diagnosed with cancer and receiving chemotherapy; 59 of 459 patients were diagnosed with malnutrition in the study using the Nutritional Risk Screening (NRS) 2002 nutritional status scale. Appropriate enteral nutrition support was provided to the patients, and control evaluations were made four times at intervals of 28 days. In these controls, information on the height, weight, and the right and left middle arm circumference of the patients was recorded. Along with the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire-30 (EORTC QLQ-30) Quality of Life Scale, the Hospital Anxiety and Depression Scale was also used. **Results:** A statistically significant difference was found in the NRS 2002 scores of the patients regarding the adequacy of intake, protein and calorie requirement, functional status, and the symptom scale. The anxiety and depression scores of the patients decreased in all the controls, and the most noticeable decrease occurred at the end of the third control. **Conclusion:** Evaluating malnutrition and providing adequate nutritional support to cancer patients improves body composition and the quality of life by reducing anxiety and depression.

Keywords: Malnutrition; neoplasm metastasis; nutritional assessment; nutritional support; quality of life

Nutritional deficiency develops in approximately 40% of cancer patients.[1] Cancer malnutrition increases toxicity in treatment, leading to inadequate treatment response, poor quality of life, and poor prognosis. More than 20% of cancer patients die because of nutritional complications rather than primary diseases.[2]

Evaluation of nutritional support in cancer patients should be initiated at the time of diagnosis and included in the treatment plan at all stages of the disease.[3] With nutritional support, cancer-related symptoms can be controlled, postoperative complications and infection rates can be reduced, hospital stays can be shortened, and treatment tolerance and immune response can be increased.[3,4] Due to the above-mentioned reasons, the quality of life of the patients can be improved.[4] In 1948, the World Health Organiza-

tion defined health as the absence of illness or disability and the presence of a state of complete physical, mental, and social well-being.[5] After this definition was framed, the quality of life became important in clinical studies and is now an essential and valid tool in evaluating the effectiveness, cost, and benefits of new treatment strategies.[6-8]

Certain factors, such as the possibility of death, changes in body image, interventional treatments, the fear of pain and suffering, changes in the family, work, and social roles, electrolyte imbalance, tumor localization, chemotherapy, and radiotherapy (RT), might cause depression in patients.[9-11] Recognition and treatment of depressive disorders increase compliance with cancer treatment, improve the quality of life, and reduce suicide rates.[12] In cancer patients, fear of the known or unknown characteristics of the dis-

ease, the thought that the treatment may not work, the expectation of a negative result, the absence of family support while hospitalized, and feelings of uncertainty may cause anxiety.[13,14] Although anxiety among cancer patients has been studied lesser than depression, its incidence has increased.[15] Recently, more than 50% of cancer patients were found to have anxiety, and approximately 30% of them had chronic anxiety.[16] Determining and reducing the level of anxiety in cancer patients can positively affect compliance to treatment and the quality of life.[17]

In advanced disease, somatic symptoms such as fatigue and loss of energy might be confused with symptoms of depression. Depression in cancer patients is diagnosed based on psychological or cognitive symptoms such as worthlessness, hopelessness, excessive guilt, and suicidal thoughts.[18] Depressed patients isolate themselves from society. Thus, patients who experience feeling worthless might be affected more than expected, both physically and mentally. The quality of life of the patients might be negatively affected by a reduction in work performance, social isolation, and a decrease in daily life activities.[19-21] The symptoms of anxiety and depression might be experienced separately or together in disease states.[22,23]

In this study, we screened patients who were followed up in our outpatient clinic for nutritional deficiencies, provided appropriate support to patients with deficiencies, improved their quality of life, and reduced their anxiety and depression levels.

MATERIAL AND METHODS

We screened 459 patients who were admitted to the medical oncology outpatient clinic between September 2019 and November 2020, diagnosed with cancer, and received chemotherapy as indicated by the Nutritional Risk Screening (NRS) 2002 nutritional status score. Malnutrition was detected in 59 of the 459 patients. The study was conducted following the guidelines of the Declaration of Helsinki. The patients who volunteered to participate in the study and signed the informed consent form were evaluated at four control times at 28-day intervals. The stage, primary disease, metastasis location, operation status,

age, and gender of the patients at the time of admission were recorded. We also recorded the information on height, weight, and the right and left middle arm circumference of the patients during admission. The presence and severity of malnutrition in the participants were determined according to the NRS 2002 nutritional status score based on eating habits, height, and weight.

Blood samples were collected at all four instances of admission of the patients, and albumin, total lymphocyte, and C-reactive protein (CRP) levels were measured. The Tanita body composition device was used to record total energy consumption, muscle ratio, and fat ratio. The nutritional habits of these patients were evaluated, and the amount and portion of food they could consume at meals were determined. Protein intake was targeted at 1.5 g/kg/day, and total daily energy was obtained by multiplying the basal energy measured with Tanita by 1.3. Oral nutrition support and the products suitable for the patients were determined, and a diet list containing calories and protein was provided to the patients who consumed the entire portion. Based on the number of portions they could consume, the calorie and protein requirements were explained to the patients following a list prepared by the dietician (considering different cultural habits and economic levels). During chemotherapy, measurements were repeated in each cycle, the adequacy of the intake was re-evaluated, and necessary controls were made.

The European Organization for Research and Treatment of Cancer Quality of Life Questionnaire-30 (EORTC QLQ-30) Quality of Life Scale was used to evaluate the quality of life of the patients, and the Hospital Anxiety and Depression Scale was used to measure anxiety and depression levels.

STATISTICAL ANALYSES

The Number Cruncher Statistical System (by Kaysville, Utah, USA) program was used to conduct statistical analysis. Descriptive statistical methods (mean, standard deviation, median, frequency, percentage, minimum, and maximum) were used while evaluating the data. The Shapiro-Wilk test and graphical examinations were conducted to determine that the data followed a normal distribution. Repeated

measures analysis of variance was performed for within-group comparisons of normally distributed quantitative variables, and Bonferroni-corrected pairwise evaluations were performed for pairwise comparisons. The Friedman Test was conducted for quantitatively comparing intragroup variables that followed a non-normal distribution, and Dunn's test with Bonferroni correction was performed for pairwise comparisons. All differences among and between groups were considered to be statistically significant at $p<0.05$

ETHICAL STATEMENT

The approval of the Manisa Celal Bayar University Faculty of Medicine Health Sciences Ethics Committee was obtained (date: September 4, 2019, no: E-20.478.486). No humans or animals were used in this study. All procedures performed in this study followed the guidelines of the Declaration of Helsinki.

RESULTS

In this study, 59 patients (28-89 years old) diagnosed with cancer were included; 35.6% (n=21) of the patients were female, and 64.4% (n=38) were male. The characteristics of the patients are shown in Table 1.

　　The weights of the patients showed a statistically significant difference in the 1st, 2nd and 3rd controls compared to the baseline values ($p=0.001$; $p<0.01$). From the results of the double comparison based on the Bonferroni test to determine the difference, we found that while the difference between the baseline and the first control measurements of the cases was not significant ($p>0.05$), the third control measurements were significantly higher than the baseline weight ($p=0.003$) and the first control measurements ($p=0.004$). The weight in the third control was also significantly higher than that in the second control ($p=0.001$). The difference between the other measurements was not significant ($p>0.05$). The measurements of the right middle arm circumference of the female patients were significantly different compared to in the follow-ups ($p<0.01$). The arm circumference value in the third control was significantly higher than that in the second control

($p=0.001$; $p<0.01$). No significant difference was found between the other follow-ups ($p>0.05$) (Figure 1).

　　Weight measurements of male subjects participating in the study were statistically significantly different in the 3rd control measurements compared to the initial, 1st and 2nd control measurements (respectively $p=0.024$, $p=0.0041$, $p=0.001$). When the body mass index (BMI) measurements of the male subjects participating in the study were evaluated according to the follow-ups; there was no significant difference between the initial and first control measurements of the cases ($p>0.05$); The increase in the 3rd control measurements compared to the first control was significant ($p=0.015$; $p<0.05$). No significant difference was found between the BMI values of the other controls ($p>0.05$) (Figure 2).

　　Right and middle arm circumference measurements of male patients were compared with the follow-ups. The second and third control measurements were significantly higher than the first measurement of the arm circumference ($p=0.013$; $p=0.003$). Similarly, the arm circumference values in the second and third controls were significantly higher than that in the first control ($p=0.001$; $p=0.001$; $p<0.01$).

　　It was determined that albumin decreases in the 1st, 2nd and 3rd controls compared to baseline differed significantly between the groups ($p=0.038$). The albumin levels in the third control measurements were significantly lower than that in the first control ($p=0.045$; $p<0.05$). During the follow-up period, lymphocyte measurements were not significantly different ($p>0.05$). CRP changes in the 1st, 2nd and 3rd controls were found to differ significantly between the groups ($p=0.001$; $p<0.01$). The CRP level in the second control was significantly higher than that in the first control ($p=0.004$; $p<0.01$) (Table 2).

　　The NRS 2002 scores differed significantly compared to the follow-ups ($p<0.01$); considering which control the significance originated from, the difference between the baseline and the first follow-up scores was not significant ($p>0.05$), while the scores of the second and third controls were significantly different compared to the baseline score

TABLE 1: Descriptive characteristics of the patients.		
Patient characteristics		**X±SD (Minimum-Maximum)**
Age		57.93±12.60 (28-89)
Height		163.29±9.34 (142-181)
Weight		54.79±11.64 (32-88.8)
BMI		20.21±3.79 (14.6-34.8)
Right mid-arm circumference		22.41±3.28 (14.5-31)
Left mid-arm circumference		22.27±3.22 (14.5-29)
Gender n (%)	Female	21 (35.6)
	Male	38 (64.4)
Stage (n=59) n (%)	Stage 1	5 (8.4)
	Stage 2	15 (25.6)
	Stage 3	12 (20.3)
	Stage 4	27 (45.7)
Primary disease (n=59) n (%)	Lung	3 (5.1)
	Head and neck	8 (13.5)
	Gallbladder	4 (6.7)
	Cholangiocellular	3 (5.1)
	Colon	6 (10.2)
	Breast	6 (10.2)
	Gastric	16 (27.3)
	Ovarian	2 (3.4)
	Pancreatic	4 (6.7)
	Neoplasm of unknown primary	3 (5.1)
	Rectum	4 (6.7)
Metastatic n (%)		44 (74.5)
Non-metastatic n (%)		15 (25.5)
Multiorgan metastasis n (%)		3 (6.8)
Metastasis sites (n=44) n (%)	Lung	7 (15.9)
	Bone	2 (4.5)
	Brain	1 (2.3)
	Liver	6 (13.6)
	LN	21 (47.7)
	Peritoneum	4 (9.1)
	Thyroid	3 (6.8)
Operation n (%)	No	17 (28.8)
	Yes	42 (71.2)
Exitus status n (%)	No	49 (83.1)
	Yes	10 (16.9)

SD: Standard deviation; BMI: Body mass index; LN: Lymph node.

(p=0.007; p=0.001, respectively). The scores of the second and third controls were significantly different compared to that of the first control (p=0.011; p=0.002, respectively). The NRS score of the second control was not significantly different from that of the last control (p>0.05). In total, 22% (n=13) of the patients showed higher NRS scores compared to that at baseline (Table 3).

The scores obtained in all dimensions of the EORTC QLQ-C30 Quality of Life Scale, based on the follow-up of the study, were significantly different (p=0.001; p<0.01). The double comparison results evaluated to determine the difference showed that the third control score was significantly higher than the baseline, first control, and second control scores (p=0.001; p=0.001; p=0.010; p<0.05) (Figure 3).

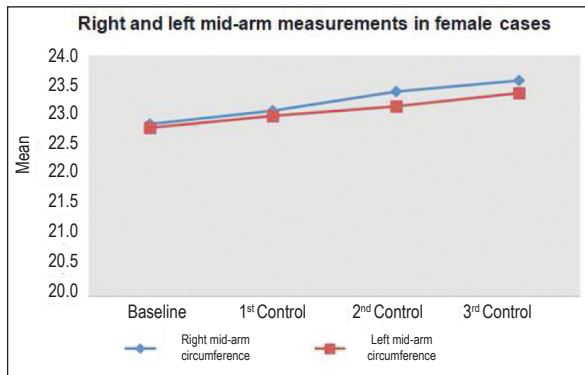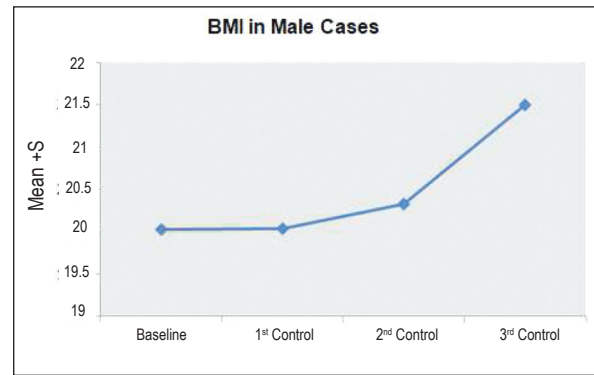**FIGURE 1:** Measurements of right and left middle arm circumference in female cases.

FIGURE 2: BMI distribution in male cases.
BMI: Body mass index.

TABLE 2: Evaluation of the biochemical parameters.

Laboratory values	Baseline	1st control	2nd control	3rd control	p value
Albumin X±SD	3.65±0.42	3.61±0.45	3.60±0.5	3.60±0.6	[a]0.038
Lymphocyte X±SD	1760.4±903.5	1774.8±952.5	1684.9±862.0	1820.1±1013.7	[a]0.123
CRP Median (minimum-maximum)	1 (0-20.1)	0.9 (0-14)	1.1 (0-19)	1 (0-27)	[b]0.001

[a]Repeated Measure Test; [b]Friedman Test; SD: Standard deviation; CRP: C-reactive protein.

TABLE 3: The comparison of the NRS scores of the patients at the control times.

Control times	NRS 2002-1st n (%)	NRS 2002-2nd n (%)	NRS 2002-3rd n (%)
Baseline	0 (0.0)	50 (84.7)	9 (15.3)
1st control	0 (0.0)	51 (86.4)	8 (13.6)
2nd control	3 (5.1)	53 (89.8)	3 (5.1)
3rd control	4 (6.8)	54 (91.5)	1 (1.7)
p value	>0.05	0.007	0.001

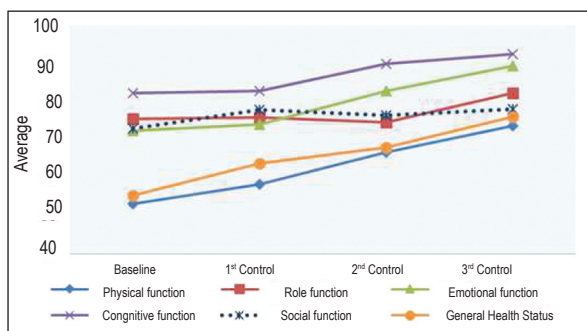NRS: Nutritional Risk Screening.

FIGURE 3: The European Organization for Research and Treatment of Cancer Quality of Life Questionnaire-C30 (EORTC QLQ-C30) Distribution of Quality of Life Functional Scale scores.

When the anxiety and depression scores of the patients were evaluated during the follow-up period; the third control score for anxiety was significantly lower than the baseline, first, and second control anxiety scores (p=0.001; p=0.001; p=0.013).

DISCUSSION

Malnutrition is a major cause of morbidity and mortality. Patients diagnosed with malnutrition have decreased tolerance to computed tomography, RT, and surgical treatment due to the loss of skeletal muscles, decrease in visceral proteins and decrease in immune functions.[24,25] Malnourished patients are at a high risk of toxicity related to chemotherapy, and the mortality rate is 2-5 times higher than that of well-nourished patients.[26-28]

In our study, 459 patients receiving chemotherapy were screened using the NRS 2002 nutritional

status scale. Malnutrition was detected in 59 patients screened. The effects of nutritional support on the quality of life of cancer patients were evaluated using the Quality of Life Scale and the anxiety and depression scale in patients diagnosed with malnutrition. Anthropometric measurements of male and female patients were evaluated; the weight, BMI, and right and left middle arm circumference increased significantly in the follow-ups compared to the baseline. The BMI of the patients was the highest in the third control, and the mean BMI was 21.54±3.37 in females and 21.5±5.4 in males. The BMI of females was significantly higher in the second and third controls compared to the first control. In males, the BMI was significantly higher in the third control. In a similar study on patients receiving outpatient RT, the BMI was measured before education on nutrition, one month after education, and three months after education. The BMI of the patients who did not receive education decreased significantly.[29] In another study, the BMI was compared before and after treatment in the patient groups who received and did not receive nutritional support. The BMI in the group that did not receive nutritional support decreased rapidly.[30] Thus, the risk of malnutrition increases with a decrease in BMI. In our study, the BMI of the patients who received nutritional support increased in all control measurements. The BMI is easy to evaluate, indicates weight changes, and predicts survival independent of prognostic factors.

In the initial evaluation of NRS 2002 of 59 patients included in the study, the distribution of the score of the patients with planned nutritional support was 84.7% as score 3, and 15.3% as score 4, respectively, and the distribution of the scores at the last control was 6.8% as score 2, 91.5% as score 3, and 1.7% as score 4. The number of patients who initially needed nutritional support and had an NRS 2002 evaluation score of 3 and above decreased. While the baseline scores did not differ significantly compared to the first follow-up, the scores in the second control and the third control were significantly different compared to the baseline score. From the NRS scores, 22% (n=13) of the cases showed improvements in nutrition at the last follow-up compared to the baseline. The score did not change compared to

that at baseline in 78% (n=46) of the cases. The risk of malnutrition increased with an increase in the NRS 2002 score. In a study, the results of the anthropometric measurements showed that 68.5% of the patients had an NRS 2002 score of ≥3 and 17.6% of the patients had a BMI of ≤18.5 kg/m². Also, 72.7% of the patients experienced weight loss, and 47.9% of them lost more than 10% of their body weight.[31] Another study found that in cancer patients admitted to the dietary polyclinic, the NRS 2002 score decreased significantly at the second follow-up compared to the first follow-up, similar to our study.[31] In a similar study, 43.9% of the participants showed moderate impairments in their nutritional status.[32] In our study, only 12% of the patients were found to be malnourished, probably due to the screening of the patients admitted to the outpatient clinic rather than the screening of the inpatients. The general condition of the patients followed up in the outpatient clinic was better than that of the inpatients. In our study, the gradual decrease in NRS 2002 scores in patients with malnutrition compared to the baseline in the controls might indicate successful compliance of the patients with the nutritional therapy administered.

When the patients' quality of life measurements were compared with baseline and 1st, 2nd and 3rd controls, significant differences were found in the subdimensions of physical function, role function, emotional function, cognitive function, social function and general health score. The score of the subdimension of the Quality of Life Scale was significantly higher in the third control measurement. Concerning the third control values, the mean physical function score was 73.67±23.14, the mean role function score was 82.06±21.98, the mean emotional function score was 89.27±16.09, the mean cognitive function score was 92.37±14.95, the mean social function score was 77.97±20.4, and the mean general health score was 75.99±20.12. The scores of the subgroups of quality of life of patients with continuing or resolving malnutrition, according to the evaluation made between the baseline and third controls, were statistically significant when the quality of life and nutrition of the patients at risk were compared, although the mean score of the Quality of Life Scale was the highest at the third control and the scores of the patients were

higher than at baseline. No significant result was obtained. Cancer reduces life expectancy, satisfaction with life, functional life, and quality of life of patients due to the associated physical, psychological, and socio-economic problems.[33-35] In a similar study that evaluated the quality of life of cancer patients, the general health status was positively and significantly associated with the functional status.[25] Kenne Sarenmalm et al. conducted a study on cancer patients and found that the emotional functions of the patients were lower than the physical functions, and the general well-being function was also lower.[36] As the social support levels of patients increase, their general health status and physical, emotional, and cognitive functions also increase.[25]

The quality of life symptom scale of the patients was evaluated, and the symptom scores, such as fatigue, nausea-vomiting, pain, dyspnea, insomnia, loss of appetite, constipation, and diarrhea, were found to be the lowest in the third controls. With nutritional support, these symptoms were managed to controllable levels in the patients. Symptoms such as weakness, pain, constipation, nausea, and vomiting are quite common in patients with cancer. Patients experience more intense fatigue, loss of appetite, and insomnia depending on the disease and treatment-related nausea and vomiting, changes in blood values, and the disease.[35] About 50% of cancer patients experience constipation, and 78% of these patients have terminal cancer.[25] In a study, Ertem reported that pain and fatigue were the most common symptoms in the patients.[25,37] Weakness, insomnia, pain, nausea, vomiting, loss of appetite, sadness, difficulty in sexual activities, and dry mouth were other common symptoms in cancer patients.[35]

When the anxiety and depression levels of the patients were examined, it was reported that the anxiety and depression scores of all controls decreased compared to the baseline. This decrease was statistically significant in the third control compared to the other controls.

CONCLUSION

In this study, we found that malnutrition negatively affects many conditions, such as the quality of life, anxiety level, treatment process, cancer stage, hospitalization process, and tolerance to chemotherapy. Providing nutritional support by evaluating the risk of malnutrition and taking precautions for the symptoms can increase the quality of life of the patients. In the routine controls of cancer patients, the NRS 2002 score should be evaluated, the nutrition plan and the importance of nutrition for cancer patients should be explained to the patients and their relatives, and the factors that might affect the quality of life, such as eating habits, depression, anxiety, and pain, should be evaluated frequently.

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