Progress in Nutrition 2018; Vol. 20, N. 4: 592-601 DOI: 10.23751/pn.v20i4.6117

Original article

Assessment of nutritional status and quality of life among patients with cancer who underwent major upper gastrointestinal system cancer surgery

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Summary. *Aim:* The risk of developing complications following major gastrointestinal system surgeries has risen in recent years despite of the development of methods and techniques for cancer surgery and increased preoperative care. Complications following surgical intervention reduce the quality of life of the patient, while increasing hospitalization time and mortality rates. In addition, surgery can lead to malnutrition in the postoperative period resulting from catabolism, which is caused by increasing the release of stress hormones and inflammatory mediators. This study was conducted to evaluate the nutritional status and quality of life and to determine the relationship between the two in patients with cancer who underwent major gastrointestinal surgery. *Methods:* Postoperative patients who underwent major upper gastrointestinal system cancer surgery by a general surgeon in the province of Kayseri, Turkey, aged between 20 and 80 years, and who met the criteria of the study, were included in the study. Socio-demographic characteristics, body composition, anthropometric measurements, and biochemical findings of the patients were recorded. NRS-2002 (Nutritional Risk Screening-2002) was used to evaluate the nutritional status of individuals and EORTC QLQ-C30 Version 3.0 (European Organization for the Research and Treatment of Cancer Quality of Life Questionnaire) was used for the assessment of quality of life. *Results:* A total of 119 participants, 69 (58%) male and 50 (42%) female, participated in the research. The most common type of operation was partial/subtotal gastrectomy (41%). According to the NRS-2002 score, malnutrition risk was high in almost all males (98.6%) and females (88.0%), and nutritional support was necessary. It was determined that the albumin values of the individuals who were at risk of malnutrition are lower, and their length of stay in the hospital was longer. When the EORTC QLQ-C30 scores of the individuals were evaluated, the general health status score average was 45.2 ± 18.20, the physical function score average was 67.3 ± 16.72, and the symptom score average was 36.1 ± 16.56 points. Symptom scores were found to be lower in women than men ($p<0.05$). It was determined that there was a negative significant correlation between NRS score and general health status score ($r = -0.154$, $p <0.05$). *Conclusion:* It was determined that nearly all of the participants who participated in the study had NRS scores ≥3 and were at risk of malnutrition. It was observed that the increased risk of malnutrition may negatively affect the quality of life.

Key words: Nutrition assessment, nutritional status, malnutrition, quality of life, cancer.

Introduction

The assessments regarding the cancer estimate that it is going to be a more and more significant cause of morbidity and mortality in every part of the earth during the following decades. Together with the foreseen demographics variations in the population for the period of next twenty years, and supposing that the present cancer prevalence does not undergo a change; the predicted number of 12.7 million for new cancer cases in 2008 will escalate to 21.4 million before 2030 (1, 2).

Although the methods and techniques have been improved in the field of cancer surgery and pre-operative care has been increased in recent years, the risk of developing post-surgical complications following major gastrointestinal system surgeries has been observed to increase. Post-surgical complications decrease the patient's quality of life, and increase the hospitalization period and mortality rates (3, 4). Surgery can cause malnutrition in the post-operative period by increasing the stress hormones and inflammatory mediators, therefore creating a catabolism (5). The malnutrition prevalence of the patients who undergo surgical operations is known to vary between 25-40% (6). As for the cancer cases, malnutrition may occur due to undernutrition, anabolic insufficiency, response to chemotherapy, and inflammation (7, 8). In the conducted studies, it has been determined that malnutrition is closely related to complications, morbidity and mortality rates in the post-operative period (9-11). For this reason, the evaluation of nutritional status and necessary nutritional support are considered to affect the course of the disease in a positive way. A large number of screening tools have been developed recently to be used in hospital conditions in order to evaluate the nutritional risks (12). Nutritional Risk Screening-2002 (NRS-2002), developed by Kondrup et al., is recommended for the assessment of nutrition by The European Society of Parenteral and Enteral Nutrition (ESPEN). NRS 2002 aims to detect the malnutrition risk and individuals who should benefit from nutritional support (13).

European Organization for the Research and Treatment of Cancer Quality of Life Questionnaire (EORTC QLQ-C30) has been developed in order to determine the quality of life for cancer patients (14). Studies conducted with cancer patients in different countries reported that the EORTC QLQ-C30 questionnaire is a valid, reliable, and easily practicable scale for the assessment of the quality of life (14-17). The validity and reliability of the EORTC QLQ-C30 questionnaire have been tested in our country, too; and it was concluded that it is a practicable scale of life quality for cancer patients (18).

There are numerous factors affecting the life quality of cancer patients. The most important of these are the symptoms of the disease and the side effects of the treatment (19). Additionally, the malnutrition resulting from the degeneration of nutritional status might as well have a significant impact on the quality of life of the patients.

Therefore, we aimed to evaluate the nutritional status and life quality of the cancer patients who have had major gastrointestinal surgeries; and to determine the relationship between the nutritional status and quality of life.

Methods

The time, place, and type of the research

This cross-sectional study consists of the inpatients of General Surgery Clinic of Erciyes University Medical Faculty. 119 post-operative patients living in Kayseri, between the ages of 20-80 who have undergone major upper gastrointestinal cancer surgery by a general surgeon and fulfill the inclusion criteria have been included in the research in between 10.02.2014-09.02.2015. The data were collected by face-to-face interview method from the individuals who volunteered to participate in the study within the first 48 hours of the post-operative period. Written consent was obtained from all participants at the beginning of study which was approved by the Ethics Committee of the Faculty of Medicine, Erciyes University, Kayseri, Turkey (Approval number 21/03/2014-2014/167).

The collection and evaluation of the data

The information regarding the socio-demographic features, body composition and anthropometric measurements, nutritional status, and quality of life

of the post-operative patients have been gathered by the researcher with face-to-face interview method. Biochemical findings were taken from the hospital records.

Assessment of quality of life

Data on life quality was collected by trained dietitian through face-to-face interview using the Turkish version of EORTC QLQ-C30 (18). The EORTC QLQ-C30 is made up of five functional scales (physical, role, emotional, cognitive and social), three symptom scales (fatigue, nausea & vomiting and pain) and a global health status/life quality scale. It further includes six single items (dyspnea, insomnia, appetite loss, constipation, diarrhea and financial difficulties). In all parts of the EORTC QLQ-C30, the scoring range is between 0 and 100. A high standard quality of life is characterized by a high score. Hence, a top-level score in the global health status and the functional scales depicts a high-level quality of life while a top score in the symptom scale reflects symptomatological difficulties (14).

Assessment of anthropometric measurements and nutritional screening

Body Mass Index (BMI) calculations (20) and anthropometric measurements (21) were performed by a researcher dietitian using the criteria suggested by World Health Organization (WHO). Bioelectrical impedance analyzer (TANITA TBF 300, Tanita Corp., Tokyo, Japan) was used to measure body weight. Subjects were instructed to avoid food or liquid intake and vigorous exercise for 4 hours prior to the measurement, and asked not to wear any metallic objects during the measurement. Body height was measured using a tape measure while patients standing without shoes, keeping their shoulders in a relaxed position, arms hanging freely and head in Frankfort horizontal plane. Based on participants' calculated BMI values, patients were classified as normal weight (BMI=18.5-24.9 kg/m^2), overweight (BMI=25.0-29.9 kg/m^2) and obese (BMI=≥30 kg/m^2) using criteria suggested by WHO (20).

In order to conduct nutritional screening, NRS-2002 scores were noted by dietitian. The patients with an NRS-2002 score of 3 or more were accepted as nutritionally at high risk, and scores between 0 and 2 was accepted as lower risk (22).

Statistical analysis

In the study, descriptive statistics (mean, standard deviation) have been used in the evaluation of quantitative data, while number and percentage distribution have been used in the evaluation of qualitative data. Chi-square test has been used in order to assess the categorical data. The normality distribution of the data has been analyzed according to Shapiro-Wilk Test; and a parametric test (Student t test) has been employed for the comparison of the normal distributed data, while a non-parametric test (Mann Whitney U test) has been employed for the non-normal distributed data. The relationship between NRS scores and EORTC QLQ-C30 Quality of Life Questionnaire scores of the individuals has been evaluated with Pearson correlation test and multiple regression analyze. Statistical Package for Social Sciences (SPSS) Windows 21.0 packaged software has been used for statistical analyses, and the results have been evaluated in 95% confidence interval and on $p<0.05$ significance level.

Results

The mean age for the male participants was 58.3±11.73 year while it was 55.4±12.20 year for the female participants. The distribution of the men and women according to age groups has not been found statistically significant. The majority of both the men and women were married (75.4% and 74.0%, respectively) and had a monthly income of over 1300 Turkish Liras (47.6% and 44.0%, respectively). The individuals who had partial/subtotal gastrectomy have been found to be the majority among both the men (37.7%) and the women (46.0%) who participated in the study. It has been observed that neither the female nor the male participants drinks alcohol (not shown in the table); and the ratio of smoking individuals is higher among the men than the women ($p<0.05$). The educational status displayed a significant difference according to gender, and the educational levels of most women (60.0%) were determined to be at primary school level and below. ($p<0.05$) (Table 1).

Table 1. General characteristics of participants

Features	Men (n=69)		Women (n=50)		
	n	%	n	%	p
Age group (year)					0.365
31-50	19	27.5	19	38.0	
51-64	24	34.8	20	40.0	
≥65	26	37.7	11	22.0	
X±SD	58.3	11.73	55.4	12.20	0.194
Min-Max	31-78		32-78		
Educational status					0.003*
Illiterate	2	2.9	9	18.0	
Literate	6	8.7	8	16.0	
Primary school	15	21.7	13	26.0	
Secondary School	28	40.6	6	12.0	
High school	7	10.2	8	16.0	
Higher education	11	15.9	6	12.0	
Marital status					0.866
Married	52	75.4	37	74.0	
Single	17	24.6	13	26.0	
Monthly income (Turkish Lira- TL)					0.520
850-999	17	26.2	17	34.0	
1000-1299	17	26.2	11	22.0	
≥1300	35	47.6	22	44.0	
Type of surgery					0.673
Esophagectomy	5	7.2	4	8.0	
Total gastrectomy	16	23.2	12	24.0	
Whipple	22	31.9	11	22.0	
Partial/Subtotal gastrectomy	26	37.7	23	46.0	
Smoking status					<0.001*
Current	21	30.4	5	10.0	
Never	26	37.7	38	76.0	
Past	22	31.9	7	14.0	
Number of cigarettes (day)					0.042**
1-10	6	28.6	5	100.0	
11-19	5	23.8	-	-	
≥20	10	47.6	-	-	
Min-Max	1-40		5-10		
X±SD	14.5±7.79		9.0±2.23		0.139

Pearson chi-square test, p<0.05, **Fisher-exact test, p<0.05,*Student's t test, p<0.05*

It has been determined that the mean BMI was 23.9±5.19 kg/m^2 for the men, and 28.2±5.61 kg/m^2 for the women; and that the fat mass and fat percentages were higher in the women than men (p<0.05) (Table 2). The BMI of the participants and their classification according to NRS 2002 were given in Table 3. Approximately half of the men (49.3%) were found to be normal weight while 46.0% of the women found to

Table 2. Anthropometric measurements of participants

Anthropometric Measurements	Men (n=69)		Women (n=50)		
	X	SD	X	SD	p
Body weight (kg)	70.4	17.77	66.8	14.56	0.117
Height (cm)	172.7	6.96	155.9	4.89	<0.001**
Body mass index (kg/m²)	23.9	5.19	28.2	5.61	0.001*
Body fat mass (kg)	14.8	8.54	23.2	9.98	<0.001**
Body fat mass (%)	19.1	9.98	33.9	7.97	<0.001**
Fat free mass (kg)	55.2	11.68	43.5	7.27	<0.001**
Fat free mass (%)	52.8	11.13	41.5	6.96	<0.001**

**Student's t test, p<0.05, **Mann Whitney U test, p<0.05*

Table 3. Classification of participants according to BMI and NRS score

Features	Men (n=69)		Women (n=50)		
	n	%	n	%	p
Body mass index (kg/m²)					0.010*
<18.5	8	11.6	3	6.0	
18.5-24.9	34	49.3	12	24.0	
25.0-29.9	16	23.2	23	46.0	
≥30	11	15.9	12	24.0	
NRS score					0.041**
<3	1	1.4	6	12.0	
≥3	68	98.6	44	88.0	
X±SD	3.7	0.57	3.4	0.83	0.057

**Pearson chi-square test, p<0.05, **Fisher exact test (p<0.05)*

be overweight. Although the mean NRS scores were statistically insignificant, it was higher in the men (3.7±0.57) than women (3.4±083) (p=0.057). Furthermore, according to NRS-2002 scores it was determined that, nearly all of the men (98.6%) and women (88.0%) had high malnutrition risk and require nutritional support.

The data regarding the biochemical parameters and hospitalization time of the individuals who were classified according to NRS-2002 scores has been given in Table 4. The individuals who were under the risk of malnutrition were found to have lower albumin values and longer hospitalization time compared to those without the risk of malnutrition.

Table 4. Biochemical parameters and length of hospitalization in patients classified according to nutritional risk score

Values	Nutritional Risk				
	Absent (NRS score <3)		Present (NRS score ≥3)		
	X	SD	X	SD	p
Total protein (g/dL)	6.6	0.83	6.2	1.11	0.161
Albumin (g/dL)	3.9	0.79	3.2	0.80	0.034*
White blood cell (WBC)	6.1	1.48	7.2	2.94	0.215
Lymphocyte (x10□/L)	2.1	0.85	2.3	1.93	0.581
Hospitalization time/ days	5.6	5.12	11.5	6.38	0.028**

**Student's t test, p<0.05, **Mann Whitney U test, p<0.05*

EORTC QLQ-C30 scores of the participants were given in Table 5. It was determined that the mean general health status score was 45.2±18.20, the mean functional scale score was 67.3±16.72, and the mean symptom scales score was 36.1±16.56. While no significant relationship was found between NRS scores and functional and symptom scores ($p<0.05$); a significant weak inverse relationship was detected between the NRS scores and the global health status scores ($r=-0.154$, $p<0.05$) (Table 6). In multivariate regression analysis 7% of the variation in global health status scores was explained by the variation in NRS score after adjustment for age and gender ($r=0.279$, $R^2=0.078$, $p<0.025$).

Discussion

The ongoing increase and aging of the world population cause a large increase in cancer burden (23). One of the most common complications of cancer, "cancer cachexia", is caused by nutritional deficiency and affects the quality of life of the patient, leading to an increase in morbidity and mortality rates (24, 25). Cancer cachexia is more common in gastrointestinal system cancers, with cancer type being an important factor affecting malnutrition (26). As the surgery increases the degree of malnutrition by causing catabolism, it is very important to evaluate the malnutrition status of the cancer patients in the post-operative period and determine the necessity of nutritional support (5).

Table 5. Mean EORTC QLQ-C30 scores of participants

EORTC QLQ-C30 Scores	Men (n=69)		Women (n=50)		Total (n=119)		
	X	SD	X	SD	X	SD	p
Global health status	45.2	20.23	45.3	16.15	45.2	18.20	0.989
Functional scales	65.9	17.14	69.2	16.09	67.3	16.72	0.602
Physical functioning	64.9	23.53	71.1	21.24	67.5	22.70	0.423
Role functioning	63.3	26.44	70.0	17.81	66.1	23.36	0.405
Emotional functioning	69.2	20.72	71.3	21.76	70.1	21.10	0.427
Cognitive functioning	70.8	20.89	63.3	51.83	67.6	37.15	0.769
Social functioning	59.4	19.69	65.7	18.26	62.0	19.27	0.029*
Symptom scales	39.1	17.29	32.1	14.69	36.1	16.56	0.047*
Fatigue	45.9	21.21	38.7	16.53	42.8	19.63	0.232
Nausea and vomiting	37.2	26.53	35.0	48.82	36.3	37.7	0.099
Pain	39.9	24.60	35.3	17.70	37.9	22.01	0.625
Dyspnea	35.3	32.30	29.3	27.47	32.7	30.37	0.372
Insomnia	34.3	34.75	31.3	31.80	33.0	33.5	0.735
Appetite loss	58.5	30.99	33.3	25.19	47.9	31.18	<0.001*
Constipation	32.4	32.32	21.3	28.38	27.7	31.08	0.046*
Diarrhea	21.7	27.90	17.3	48.21	19.9	37.66	0.078
Financial difficulties	34.7	34.52	24.6	24.65	31.9	30.80	0.495

**Mann Whitney U test, p<0.05*

Table 6. The correlations between NRS 2002 and EORTC QLQ-C30 scores of participants

	NRS Score	
Global health status scores	-0.154	0.048*
Functional scales scores	0.036	0.349
Symptom scales scores	-0.031	0.367

**Pearson correlation test, p<0.05*

The incidence of GIS carcinoma is increasing gradually after age 40 and peaking between 56-75 years. The most obvious cause of this situation can be considered as the fact that the symptoms are not very explicit in young patients, occur in later stages, and usually diagnosed at an older age (27, 28). In this research, it was determined that the average age of the individuals is over 50 in accordance with the literature. Being male, low educational and socioeconomic level and smoking are also among important risk factors for cancer development (29-33). It was found that the educational status was low, the number of males was greater, and the ratio of individuals who smoke (21.8%) or quit smoking (24.4%) was high among the individuals who participated in this study, too.

Globally, the incidence of colorectal cancers is the first among GIS cancers, followed by stomach cancers as the second (34). In our country; the incidence of stomach cancer is in the second rank following lung cancer in males, and breast cancer in females (35). Consistent with literature (36), we found that partial/subtotal gastrectomy due to gastric cancer was the most common type of operation performed in both women (46.0%) and men (37.7%).

Weight loss, especially muscle loss, is inevitable in cancer patients as metabolic and endocrine changes activate catabolic pathways (37). In a study conducted with individuals with lung and GIS carcinoma (n =1473), it was determined that undesired weight and muscle loss negatively affected the course of the disease, regardless of BMI (38). In a study conducted with cancer patients in Canada and Europe (n=8160), the longest survival time was observed in the group with BMI> 25 kg/m^2 and without weight loss (39). In different studies, it was stated that the mortality rates increased in cancer patients with BMI <18.5 kg/m^2 (40, 41). According to our findings, higher number of normal weight (men = 49.3%, women = 24.0%) and overweight (men = 23.2%, women = 46.0% 6.0%) individuals compared to lean individuals (men=11.6%, women=6.0%) could indicate that BMI>18.5 kg/m^2 might have positive impact on the life span of patients.

The prevalence of malnutrition in hospitalized cancer patients ranges from 30 to 87%, and approximately half of cancer patients lose their lives due to malnutrition (42-44). Currently, in the evaluation of nutritional status in hospitalized patients, NRS-2002 screening tool, which ESPEN also recommends, is being used (45). Karaman et al. (46) evaluated the nutritional status of 100 cancer patients hospitalized in the general surgery clinic and reported that 66.0% of individuals with gastric cancer had NRS scores above 3. Another study found that 45% of patients undergoing stomach cancer-related gastrectomy had a NRS score above 3 and that their life span was shorter (47). A similar study with 5034 cancer patients in China stated that one out of every 5 patients had a NRS score greater than 3 and that the risk of malnutrition was highest in individuals with gastric cancer according to the NRS 2002 score (48). In this study, in accordance with the literature, it was determined that nearly all of the patients who underwent major upper gastrointestinal system surgery had NRS scores above 3 and that these individuals were at risk in terms of malnutrition.

Routine clinical laboratory testing, especially serum albumin levels, is associated with hospitalization time and mortality (49). In a research, it was determined that the presence of hypoalbuminemia and the NRS score being greater than 3 after gastrectomy increased the risk of developing postoperative complications and extended the length of stay in the hospital (50). A similar study also found that, in patients with gastric cancer, an NRS score greater than 3 in the preoperative period, extended the length of hospital stay in the postoperative period (51). Consistent with the literature, this study also found that serum albumin levels of individuals with NRS ≥ 3 were lower than those with NRS <3, and that their hospitalization durations were longer.

Life quality is described with physical health, psychological status, level of independence, social participation, interpersonal relations, self-realization, and intellectual development (14). EORTC QLQ-C30 is a useful questionnaire which is developed to determine the quality of life in cancer patients (14). The EORT QLQ-C30 questionnaire was used to assess quality of life in many studies involving individuals with gastrointestinal system cancer (52-54). Malnutrition, which is frequently encountered with in cancer cases, adversely affects the quality of life and lifespan (52, 55). In studies conducted with individuals with gastrointestinal system cancer, it was concluded that

increased weight loss and malnutrition development have adverse effects on the quality of life (56, 57). Studies have shown that the quality of life of women with cancer is lower than that of men (58, 59). It is stated that women experience cancer with more intensity and more anxiety, which may be the cause of this situation (60). In this study, no difference was observed in general health status score and physical function scores according to gender, unlike the literature, but when the symptom scores are compared, a significant difference was found between the genders. Accordingly, it was concluded that men experience the symptom scores such as loss of appetite and constipation more intensely, and that their quality of life is worse in this respect.

Impaired nutritional status may negatively affect quality of life by causing anxiety and depression and reducing self-care capacity and performance (61). When the relationship between nutritional status and quality of life of the individuals was evaluated, a negative relationship between the NRS score and the global health status, one of the EORTC QLQ-C30 scale scores, was found. It is considered that increasing nutritional risk in patients may adversely affect quality of life.

Conclusion

The name of the cancer, the fear incited by the name, the future anxiety, the stress caused by the things that might happen in the process of the disease, and the treatment–related adverse effects can significantly affect the quality of life of the patients. It is important for dieticians to monitor malnutrition in cancer patients, to observe the degree of the effect of malnutrition on quality of life, and to evaluate the nutritional status of cancer patients before, during and after the treatment at appropriate intervals, in order to improve and maintain the quality of life of the patients.

Limitations

Failing to obtain the pre-operative body composition of the subjects participating in the study and to perform the nutritional risk assessment in the pre-operative period can be counted among the limitations of the study. There is a need for studies to examine the effect on quality of life by monitoring the nutritional status before and after the operation.

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