Nutritional screening and the impact of malnutrition on poor postoperative outcomes in gynecological oncology patients

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Summary. *Background*: Sufficient nutrition effects the survival and life quality of gynecologic oncology patients. The prevalence of malnutrition among gynecological cancer patients at the time of their diagnosis is estimated to be 20%. The main aim of the study is to provide the care recommendations that can be applied to any gynecologic surgery clinic to reduce the incidence of malnutrition after surgery and to investigate the effects of malnutrition on the healing process of the patient. We aimed also to improve the nutritional status of inpatients and to increase the awareness of malnutrition in hospitals. *Methods:* Our study was a prospective study conducted with 403 patients, 334 of whom were oncologic, at the gynecology clinic of the University of Trakya between February 2017- January 2019. Nutritional characteristics were evaluated with NRS-2002 during the preoperative period. *Results:* The increase in the rate of complications was observed to increase with the risk of malnutrition. It was observed that oncology patients who were hospitalized and operated in gynecology services were at risk for malnutrition. Our study draws attention to the need for nutritional support and follow-up for those at risk of malnutrition. *Discussion:* To identify patients at risk for malnutrition and to intervene in their nutrition program can help to make significant progress in the patient's healing process. In our study, we observed that the increase in complication rate led to an increase in the tendency of malnutrition. The rate of gynecologic oncology patients who were at nutritional risk was not to be underestimated. Nutritional support plans of patients with preoperative malnutrition were required to reduce postoperative morbidity and improve long-term patient outcomes. It is therefore important that in gynecological cancer patients the nutritional risk is determined during their hospitalization and so that, trough treatment, malnutrition can be prevented.

Key words: nutrition, malnutrition, nutritional support, gynecological oncology, patient outcomes

Introduction

Inadequate nutrition is commonly associated with chronical conditions. These chronical conditions create an excessively demanding metabolic environment in which the organism's ability to retain its protein load becomes endangered. If this increase in demand is not supported through a rigorous diet or therapeutical sources, it will lead to gastrointestinal malabsorption, impaired immunological response, impaired plasma protein synthesis in the liver and ultimately consumption of the visceral protein load. The nutritional status of gynecologi-

cal cancer patients should be assessed through a range of anthropometric measurements (weight loss, body mass index (BMI), immunological measurements (such as total lymphocyte count etc.)). The prevalence of malnutrition among gynecological cancer patients at the time of their diagnosis is estimated to be 20%. Sufficient nutrition effects the survival and life quality of gynecologic oncology patients (1, 2).

Malnutrition and patients care are topics that should be addressed at women's health services. Once the patients care has been assessed through a multidisciplinary approach it should be balanced at the

gynecological clinic. Four topics stand out regarding this matter; preparation for gynecological surgery, acknowledgement and prevention of nutritional risks, supplementations that will be needed to improve health condition after surgery and lastly prevention of possible complications by adequate nutritional management. Despite differences in quality of patient caretaking among different clinics, a fair level of standardization should me promoted.

Nutritional screening tests hold an important place in the evaluation of patients with malnutrition and malnutrition risk. Among these tests, NRS-2002 (NUTRITIONAL RISK SCREENING -2002) is a test that is widely used worldwide and is recommended by ESPEN (European Society for Clinical Nutrition and Metabolism) (3).

Many studies have shown that patients at risk for nutritional support benefitted greatly from nutritional supplements and the usage of NRS-2002 in the clinics has helped identify the patients who are more in need of nutritional support from those who are less. This valuable test is based on a large number of scientific studies, emphasizing its value and strength (3, 4).

The relationship between malnutrition and poor postoperative outcomes in surgical patients is well established in areas such as gastrointestinal, cardiovascular, orthopedic, neurosurgery and cardiovascular surgery. However, the literature specific to the gynecologic patient is limited. It is important to evaluate preoperative nutritional status and provide nutritional support or alternative treatment options when necessary.

In reproductive-age-women, hysterectomy is the second most common gynecological surgical procedure. Studies indicate that one in nine women will undergo hysterectomy sometime during their lifetime (5, 6). Because gynecological oncology operations are performed more in tertiary health centers, some studies show that the risk of malnutrition is higher therein (7, 8).

In the period leading to surgery, all health care nurses evaluated the nutritional risks in order to avoid malnutrition after surgery. The effect these risks had on complications and on the hospital stay was evaluated then in the post-surgical period.

The aim of our study is to determine the nutritional risk at the time of hospitalization, the nutritional support rate of patients at risk and the nutritional risk one week after hospitalization of gynecology patients being admitted at tertiary health centers. We aimed also to provide the nursing care recommendations that can be applied to any gynecologic surgery clinic to reduce the incidence of malnutrition after surgery and to investigate the effects of malnutrition on the healing process of the patient.

Methods

In our study, the data of 403 patients waiting to undergo surgery in Trakya University Medical Faculty Hospital Gynecology Clinic between February 2017 and January 2019 were investigated prospectively. The patients awaiting surgery for gynecological indications were evaluated during their first 48 hours of hospital stay. An informed consent was obtained from all volunteer patients. The patients' sociodemographic characteristics and risks of malnutrition were examined. Nutritional characteristics were evaluated with NRS-2002 during the preoperative period.

Pathological specimen of 334 of all patients showed malignant characteristics. Patients with kidney disease, heart failure, generalized edema, gastrointestinal system diseases were excluded from the study.

NRS 2002 is an accepted scale to determine the risk of malnutrition by ESPEN as well as by the Chinese Society of Parenteral and Enteral Nutrition (CSPEN). This is a screening test that assesses the adequacy of nutritional support, especially in patients hospitalized for any disease and it was developed not only for the elderly but for all hospitalized persons (young and old). It contains nutritional information and reflects the severity of the disease and increased nutritional requirements. It focuses on people who are in acute care and need nutritional support and is a screening test developed by randomized controlled trials (8). The necessity of nutritional support is based on the severity of the disease and the risk of malnutrition. It's a system that scores according to BMI, weight loss, nutrient intake and age (4). The fact that this system is based on many scientific data makes it even more valid. It is overall a screening test that assesses the adequacy of nutritional support, especially in cases of acute illness.

It is not always possible to obtain clear information about weight loss, BMI and recent nutrition over the past 3 months. In case of uncertainty, it is recommended and encouraged to accept the patient as being at risk. For patients who had a score of ≤3, but who were expected to be ≥3 in the near future (individuals undergoing major gyneco-oncologic surgery), a nutritional plan was made available to the attending physician and nurse and the patient was then referred to the dietitian. As recommended for other patients, the NRS-2002 was repeated one week later; at the hospital if the patient was still there and if not by telephone.

Ethical approval was obtained from Trakya University Medical Faculty Scientific Research Ethics Committee for our study (Decision number: 2017/49/21). Permission was also obtained from the board of the Faculty of Medicine Hospital.

SPSS 21.0 Package Program was used in all statistical analyzes. The normal distribution was evaluated by Shapiro-Wilk test. If two groups were compared, Mann-Whitney U test was used. One-way analysis of variance (Anova) was used when comparing three groups. Descriptive statistics for numerical variables were analyzed as mean, standard deviation or median and quarterly distribution ratio. Descriptive statistics for categorical variables were given as percentage and frequency. The significance level was determined as 5% in all statistical analyzes.

Results

A total of 403 planed and performed gynecologic operations of patients between 18 – 87 years-of-age were included in this study. The performed gynecological operation was suited to the matching indications. Patients were evaluated 24-36 hours before the operation. After the pathology results are examined 334 patients were found to malignant and 69 patients were found to have benign conditions. The mean age of patients with malignancy was 55.3; the mean age of the patients with benign pathology was 35.8.

Among the assessed benign etiologies, 22 patients had myoma uteri, 5 patients had pelvic inflammatory diseases, 17 patients had uro-gynecologic diseases, 14 patients had endometriosis and benign ovarian cysts and 11 patients had other benign gynecological pathologies. The patients with borderline and malignant pathology were included in the gynecological cancer group. 129 patients were operated for endometrial pa-

Table 1. NRS 2002 form used for the evaluation of patients

BASIC EVALUATION

Impaired nutritional status	Point		Severity of disease	
Normal nutritional status	0 (None)		Normal nutritional requirements	0 (None)
Weight loss <5% in 3 months or food intake below 50–75% of normal requirement in preceding week	1 (Mild)		Hip fracture, chronic patients, in particular with acute complications: cirrhosis, COPD. Chronic hemodialysis, diabetes, oncology	1 (Mild)
Weight loss >5% in 2 months or BMI 18.5 – 20.5 + impaired general condition or food intake 25–60% of normal requirement in preceding week	2 (Moderate)	+	Major abdominal surgery, stroke, severe pneumonia, hematologic malignancy	2 (Moderate)
Weight loss >5% in 1 month (>15% in 3 months) or BMI <18.5 + impaired general condition or food intake 0-25% of normal requirement in preceding week	3 (Severe)		Head injury, bone marrow transplantation, Intensive care patients (APACHE >10).	3 (Severe)
TOTAL SCORE : A	+1 If age ≥70		**TOTAL SCORE : B**	
TOTAL NRS 2002: A + B				

*Original study1; NRS 2002 (Kondrup et al).

thologies and mesenchymal malignancies of the uterus, 108 for adnexal malignancies, 46 for cervical malignancies, and 51 for other malignancies (gestational trophoblastic diseases, etc.). After the gynecological operations, the results of the pathological results and the preoperative NRS 2002 results were examined.

403 patients, 334 of whom were oncologic, were included in the study. By using the NRS 2002 we prospectively evaluated the risk of malnutrition in patients in this tertiary gynecologic health center.

In our study we evaluated whether the BMI was below 20.5, whether there had been weight loss in the last 3 months, whether there was a decrease in dietary intake in the last week and whether there was an acute or chronic disease. If the answer to any of these questions was yes, then we switched to the scoring system. Scoring consisted of two parts: 'nutritional status' and 'disease severity' and was calculated by 4 separate scoring evaluations, 'no problem', 'mild', 'moderate' and 'severe'. Scoring 0-3 was used for each section. While assessing the nutrition section of the scoring, BMI, the percentage of recent weight loss and recent food intake was evaluated. Patients over seventy years of age also received 1 more point due to age. It was concluded that patients who a total score ≥ 3 were under nutritional risk.

Score 1 included patients with chronic diseases and hospitalized patients due to complications. These were fallen patients, but were able to get out of bed regularly. Protein requirements were increased, but were overcome by oral diet and support. Score 2 included patients who had become bedridden due to infection or a major abdominal surgery. Protein requirements were significantly increased and in some cases artificial feeding was required. In NRS 2002, score 3

consists of patients in need of intensive care with inotropic or ventilatory support. In most cases there is a markedly increased protein degradation and nitrogen loss, even with nutritional support. However, we did not have patients in this group. Only hospitalization was not counted by itself. That is, although a patient had been admitted, the severity of the disease could be scored as 0 (no risk).

In our study, the ratio of those who had no risk in the evaluation with NRS performed before the operation was found to be 31.01%. The ratio who had an intermediate risk from the NRS score were 39.7%, the ratio of those who were found to have three points therefore being at risk of severe malnutrition was 29.28%. Evaluation of postoperative complications with NRS was evaluated. The increase in the rate of complications was observed to increase with the increase in the risk of malnutrition (Table 2). A statistically significant correlation was found.

The duration of hospitalization and the differences in NRS results were examined in patients undergoing gynecologic surgery. Patients with an NRS score of 3 or more were found to have a longer hospitalization period than those with an NRS score of 0 (Table 3). The difference between them was statistically significant (p = 0.01).

In our study patients with gynecological malignancy the rate of NRS score 0 was 28.44%, while the rate of NRS score 1-2 was 39.22%, and those with NRS score ≥3 was 32.33%. It was observed that oncology patients who were hospitalized and operated in gynecology services were at risk for malnutrition. Other studies showed that nutritional risk groups in gynecologic cancers were evaluated with nutritional risk scales such as NRS 2002 and PG-SGA (Patient

Table 2. The relationship between the characteristics of malnutrition risks evaluated with NRS 2002 and complications in the gynecologic patients of our study and the comparison with the original study

NRS 2002 Score	Our study			p	Original study2*		
	All patients	Complications			All patients	Complications	
		None	Present			None	Present
Overall score	403 (100%)	365 (90.57%)	38 (9.42%)	<0.05	336 (100%)	299 (89.0%)	37 (11%)
NRS 0 score	125 (31.01%)	121 (96.80%)	4 (3.20%)	<0.001	78 (23.3%)	76 (% 97.4)	2 (2.6%)
NRS score 1–2	160 (39.70%)	150 (93.75%)	10 (6.25%)	<0.001	157 (46.7%)	145 (% 92.4)	12 (7.6%)
NRS score ≥3	118 (29.28%)	94 (79.66%)	24 (20.33%)	<0.001	101 (30.1%)	78 (77.2%)	23 (22.8%)

*Original study2: Harte et al.

Table 3. Evaluation of the relationship between mean hospital stay and NRS 2002 scores in our study and comparison with the original study

Mean hospital stay	Our study				Original study2*			
	All patients	Complications		p	All patients	Complications		p
		None	Present			None	Present	
Overall score	7.28	7.15	16.49	<0.001	7	6	16	*<0.001*
NRS 0 score	5.46	4.26	10.25	<0.001	4	3	4	*<0.001*
NRS score 1–2	9.54	8.09	13.90	<0.001	6	4	14	*<0.001*
NRS score ≥3	15.41	8.68	16.61	<0.001	10	8	19	*<0.001*

*Original study2: Harte et al.

Generated Subjective Global Assessment). Briefly, PG-SGA classifies patients as follows: Class A - well fed, Class B - moderately malnourished, Class C - seriously malnourished. With the risk scales of 1 to 3 according to the degree of risk, the risky group was found to reach up to 40% in gynecologic oncology cases (9-11). (Table 4). The association of leukocyte, hematocrit and platelet changes with NRS was not found to be significant.

In our study, the relationship between hemoglobin, hematocrit, leukocyte and platelet values was evaluated with NRS 2002 results. However, no significant correlation was found between the parameters investigated and the risk of malnutrition determined by NRS.

The use of NRS 2002 helped us identify patients who could benefit from nutritional support. In addition to facilitating the identification of patients with a risk of malnutrition, our study draws attention to the need for nutritional support and follow-up for those at risk of malnutrition.

Discussion

To identify patients at risk for malnutrition and to intervene in their nutrition program can help to make significant progress in the patient's healing process.

Some studies showed that up to 50% of hospitalized patients had a prevalence of malnutrition. In a multicenter study by using NRS 2002, 189 (15%) out of 1255 hospitalized patients in Western Europe were shown to be under risk of malnutrition. This multicenter study showed that patients with an NRS score of 3 or more had more complications, greater mortality, and longer hospitalization than patients with an NRS score <3. In our study, 29.28% of the patients had malnutrition prevalence. Studies have shown that there is a close relationship between malnutrition, increased complication rates, mortality, hospital stay and costs. Studies showing poor nutritional score in 24% of gynecological patients are similar to our study (12-14). In our study, according to the NRS score, 29.8% of the

Table 4. Comparison of other studies evaluating the nutritional risk prevalence in various gynecologic cancers with our study

Parameters	Hertlein et al. study	Rodrigues et al. study	Das et al. study	Hertlein et al. study
Diet scale used	NRS 2002	NRS 2002	PSG-SGA	PSG-SGA
Number of participants	334	272	146	60
Age range	18-87	28-97	–	13-74
Risk of malnutrition	Puan 0 = 28.44% Puan 1–2 = 39.22% Puan ≥3 = 32.33%	Puan 0 = % 27 Puan 1–2 = % 31 Puan ≥3 = % 42	Sınıf A = % 38 Sınıf B = % 47 Sınıf C = % 23	Sınıf A = % 12 Sınıf B = % 48 Sınıf C = % 40
Body mass index assessment	(+)	(+)	(+)	(+)
Evaluation of leukocyte and haematocrit	(+)	(-)	(-)	(-)

Abbreviations: PG-SGA: Patient-Generated Subjective Global Assessment
 PG-SGA classifies patients in: Class A - well fed, Class B - moderately malnourished, Class C - seriously malnourished.
NRS-2002: Nutritional Risk Screening-2002

scanned surgical cohort was at risk of severe malnutrition (NRS> 3). Our results compared with the results of studies on nutritional risk assessment in gynecologic patients showed that prevention of malnutrition is an important issue in women undergoing gynecological surgery. Necessary attention should be given to nutritional assessment and the time required for patient care should be reserved.

The overall complication rate in patients who underwent surgery was 9.42%. In other studies it was found to be 17.6% and 11% (15). In our study, the risk of complication development in patients with an NRS score of 3 or higher was found to be 20.33%. This result was close to other studies which were determined as 22.8% and 30.6% (15, 16).

Unfortunately, there is no gold standard accepted worldwide for assessing the risk of malnutrition. Generally, it is determined that evaluation by a healthcare worker, anthropometric measurements and the NRS 2002 scale are valid reference methods (17). Although there is no gold standard for effectively defining nutritional status, well-fed patients have better results during the post operational period than patients with undernourished conditions and also recovered faster. Patients who are undernourished have a higher rate of complications, increased mortality, prolonged hospital stay and a higher total cost. Studies have shown that the NRS 2002 scale can be used to evaluate malnutrition in gynecologic patients. Studies have shown that nutritional problems occur often, and patients with 3 or higher NRS scores in the surgical cohort have a significant higher risk of malnutrition (30.1%). These data indicate that health care providers and nurses should take extra care of the patient's nutritional treatment before and after surgery (17, 18).

It is important that the members of the surgical team are aware of the risks in the nutritional area. Prevention of malnutrition after surgery requires responsibility for each member of the perioperative team. The individual roles of surgeons, nurses and the entire healthcare team should be defined. The nursing team plays an important role in ensuring the availability of medications arranged in treatment, organizing pre- and post-operative care, and ensuring that nutritional support to be followed during the patient's recovery process is monitored. Regulation of nutritional risk

management and timing reduces surgical complications. In our study, we observed that the increase in complication rate led to an increase in the tendency of malnutrition. The results were similar to those of Hertlein et al. (11).

When the patients were malnourished (NRS score 3), the mean time was 10 days. In patients who developed complications, it became 16 days. The mean hospital stay was 19 days when the patients were malnourished and complications occurred (11). In our study, we saw that the average duration of hospital stay increased from 5.46 days to 15.41 as the risk of malnutrition increased. We observed that this period increased to 16.61 days in patients with complications and inadequate nutritional status. In another study, the mean duration of hospital stay was 7 days. Our study and the literature show that malnourished patients have a longer hospital stay than those with good nutritional status.

Studies have shown that in Australia and the United States, 20 to 50% of gynecological cancer patients are at least exposed to mild malnutrition (1, 19). In a study conducted in Germany only 22% of patients had normal nutritional status in gynecology. Studies in India and Brazil reported that 62% to 86% of gynecologic cancer patients presented with inadequate nutrition status. It is reported that malnutrition accounts for 20% of all cancer-related deaths (9, 10, 18). In our study, the rate of gynecologic oncology patients who were at nutritional risk was not to be underestimated. The percentage of patients with NRS score ≥3 was 32.33%. The high incidence of malnutrition in gynecological cancer patients is of concern. In gynecologic oncology patients, it was also seen that these results were consistent with studies reporting these estimates based on other malnutrition screening or assessment tools (Table 4).

Malnutrition in cancer patients is usually due to the inability to intake or absorbs enough nutrients. Surgery requires a period fasting of the patient and may lead to postoperative protein catabolism depending on the length of hunger. Loss of appetite further reduces dietary intake after surgery. In cases where the functional slowdown of the intestines is common, the deficiency of nutrients becomes a problem. Difficulties in gastric emptying increased bacterial growth and

gas may also affect food intake. Metabolic demand is another parameter that is known to increase as cancers grows and results in overuse of conserved proteins (17, 20). The combination of reduced nutritional intake, reduced nutritional absorption and increased metabolic demand may result in a negative nutritional balance and a reduced nutritional status.

Contemporary studies in Australia and the United States have shown that 20 to 53% of gynecologic cancer patients develop with at least mild malnutrition at the time of diagnosis. Malnutrition prevalence was reported to be higher in developing countries (62-88%) (9, 10). The British Association of Parenteral and Enteral Nutrition (BAPEN) listed a number of social and physical factors that increase the risk of malnutrition, including social isolation, poverty and cultural norms. Studies have investigated the nutritional parameters associated with postoperative complications in various types and stages of gynecologic cancers. In studies, hospitalization periods were used as an indirect indicator of hospital complication rates. Santoso et al. found that malnutrition was significantly associated with longer hospital stay, regardless of age, extent of disease, or primary tumor site (21).

For nurses, it is important to standardize preoperative nutritional support instructions and patient training materials. Preoperative feeding and care instructions should be provided to women who will undergo major gynecological surgery. Providing patient training materials and providing nutritional support shortens the length of hospital stay, makes patients' requests for pain treatment reasonable, and improves healing by providing more patient and family satisfaction. Patient anxiety and fear prevent the learning of nutritional information and useful recommendations (22). For this reason, when nutritional information is started early, during the treatment and care process, it allows effective relief for the patients' and families' concerns. It is mandatory to strengthen the patient's best learning forum, even though it is early. The patient education process should be strengthened by using various methods such as oral, written instruction pages, simulated representations.

Several studies have shown that low prealbumin or albumin levels are associated with a higher prevalence of postoperative complications in gynecological cancers (9, 16). As one of the limitations of our study, these parameters could not be evaluated from all patients that were admitted to the gynecology service. Additional parameters for malnutrition, such as albumin or bioimpedance measurements, may enhance the assessment of undernourished gynecological patients. Our study has shown that in gynecological patients and especially those with a risk of malignancy, awareness about the problem of malnutrition should be increased. Thus, the benefit provided to the patient during the care taking process increases and so does the healing quality. Healthcare providers should be able to recognize and in a short period of time provide nutritional support to patients assessed to be at nutritional risk, through easily applied and validated measurements.

Conclusions

In view of the results of our study, nutritional support plans of patients with preoperative malnutrition were required to reduce postoperative morbidity and improve long-term patient outcomes. However, the number of studies evaluating the value of preoperative nutritional support in surgical gynecologic cancer patients is limited in the literature. Therefore it is important that in gynecological and especially in gynecological cancer patients the nutritional risk is determined during their hospitalization and follow-up periods so that, through treatment, malnutrition can be prevented.

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