Screening for Nutritional Status in Radiation Oncology Outpatients: TROD 12-01 Study

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OBJECTIVE
The objective of the study was to assess nutritional status among radiation oncology outpatients.

METHODS
A total of 394 consecutive oncology outpatients who were screened for nutritional status through nutritional risk screening (NRS) 2002 during their admission to 12 radiation oncology centers across Turkey in October 2018 were included in this cross-sectional screening study. Data on cancer type, time of diagnosis (former and newly diagnosed), and NRS 2002 scores were recorded. Patients with NRS 2002 scores ≥3 were considered to be at risk of malnutrition necessitating the provision of nutritional intervention. NRS 2002 scores were evaluated in the overall study population as well as according to cancer types and time of diagnosis.

RESULTS
NRS 2002 assessment (scores ≥3) revealed 133 (33.8%) patients to be at risk for malnutrition. The highest rates for malnutrition risk were noted for patients with lung cancer (43.8%), head-and-neck cancer (43.5%), and gastrointestinal tumors (42.7%). Poor nutritional status was evident in 36.0% and 25.3% of newly diagnosed and former cancer patients, respectively (p=0.067).

CONCLUSION
This screening study revealed malnutrition risk and need for nutritional intervention in 33.8% of cancer patients, including 36.0% of newly diagnosed patients. A need for nutritional intervention was evident in two out of every five patients with newly diagnosed cancer, emphasizing the importance of screening for nutritional risk in every cancer patient at the time of initial diagnosis given the role of appropriate multimodal nutritional intervention before anti-cancer therapy in the long-term success.

Keywords: Malnutrition risk; nutritional risk screening 2002; nutritional status; nutritional support; radiation oncology; screening.

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Introduction

Malnutrition is a highly prevalent comorbidity in the oncology setting and is associated with prolonged hospital stay, poor treatment response, and decreased quality of life among cancer patients, unless recognized and managed in a timely and efficient manner.[1-5] Cancer-related malnutrition (CRM) is considered a multifaceted problem with a contribution of not only poor nutritional intake but also the cancer-associated metabolic and biochemical alterations as well as the adverse effects of multimodal treatments.[6,7] Hence, in accordance with ESPEN guidelines and expert recommendations, nutritional care is considered as an essential component of multimodal therapy in oncology practice,[5,8-10] while among the available screening tools, nutritional risk screening (NRS) 2002 is considered suitable for screening nutritional risk in cancer patients.[11,12]

However, nutritional screening in cancer patients as well as provision of nutritional support in those at risk of malnutrition remain suboptimal and inadequately addressed in clinical practice.[13,14] CRM is characterized by progressive deterioration of nutritional status that involves pre-cachexia, cachexia, and refractory cachexia phases with increased likelihood of response to nutritional support when administered early in the pre-cachexia period.[5,15,16] This emphasizes the role of oncologists in the nutritional aspects of cancer care in terms of early recognition of malnutrition at the time of initial diagnosis as well as timely provision of nutritional support.[17,18]

Radiotherapy and chemoradiotherapy are considered likely to contribute to the additional deterioration of the nutritional status in cancer patients,[19] while the positive impact of nutritional support in cancer patients undergoing radiotherapy has consistently been reported in terms of fewer treatment-related side effects, fewer treatment discontinuations, as well as improved patient outcomes in some aspects of quality of life and higher survival rates.[10,20,21]

This cross-sectional screening study aimed to evaluate nutritional status through NRS 2002 tool among radiation oncology outpatients and was conducted in collaboration with Turkish Society of Radiation Oncology as an awareness-raising project within the context of World Nutrition Day.

Materials and Methods

Study Population

A total of 394 consecutive oncology outpatients who were screened for nutritional status through NRS 2002 during their admission to 12 radiation oncology centers across Turkey in October 2018 were included in this cross-sectional screening study.

Written informed consent/assent was obtained from children and/or children's parents or legal guardian following a detailed explanation of the objectives and protocol. The study was conducted in accordance with the ethical principles stated in the "Declaration of Helsinki" and approved by the Institutional Ethics Committees.

Assessments

Data on cancer type, time of diagnosis (former patients and newly diagnosed patients), and NRS 2002 scores were recorded in each patient. Patients with NRS 2002 scores ≥3 were considered to be at risk of malnutrition necessitating the provision of nutritional intervention. [22] NRS 2002 scores were evaluated in the overall study population as well as according to cancer types and time of diagnosis.

Statistical Analysis

Statistical analysis was made using IBM SPSS Statistics for Windows, version 22.0 (IBM Corp., Armonk, NY). Descriptive statistics are reported including percentages for categorical variables. Chi-square (χ^2) test was used for the comparison of categorical data. $P<0.05$ was considered statistically significant.

Results

NRS 2002 Scores According to Cancer Types

The most common cancer type was head-and-neck carcinoma (23.4%) as followed by gastrointestinal (20.8%), breast (14.0%), prostate (12.4%), and lung (12.2%) cancers (Table 1). NRS 2002 assessment (scores ≥3) revealed 133 (33.8%) patients to be at risk for malnutrition (Table 1 and Fig. 1).

Highest rates for malnutrition risk were noted for patients with lung cancer (43.8%), head-and-neck cancer (43.5%), gastrointestinal tumors (42.7%), gynecologic cancer (33.3%), and urogenital tumors (33.3%) (Table 1).

NRS 2002 Scores According to Time of Diagnosis

Overall, 78.9% of patients were newly diagnosed cancer patients. No significant difference was noted in nutritional status of cancer patients with respect to date of diagnosis, and poor nutritional status was evident in 36.0% and 25.3% of newly diagnosed and formerly diagnosed patients, respectively (p=0.067) (Table 2 and Fig. 1).

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Table 1 NRS 2002 scores overall and according to cancer types

| | Total | | NRS 2002 scores | | | |
| | | | <3 (normal status) | | ≥3 (malnutrition risk) | |
	n	%	n	%	n	%
Overall	394	100.0	261	66.2	133	33.8
By cancer types						
Head-and-neck tumor	92	23.4	52	56.5	40	43.5
Gastrointestinal tumor	82	20.8	47	57.3	35	42.7
Breast cancer	55	14.0	48	87.3	7	12.7
Prostate cancer	49	12.4	42	85.7	7	14.3
Lung cancer	48	12.2	27	56.2	21	43.8
Brain tumor	15	3.8	13	86.7	2	13.3
Gynecologic cancer	15	3.8	10	66.7	5	33.3
Urogenital tumor	12	3.0	8	66.7	4	33.3
Sarcoma	11	2.8	6	54.5	5	45.5
Skin tumor	8	2.0	6	75.0	2	25.0
Lymphoma	4	1.0	1	25.0	3	75.0
Multiple myeloma	2	0.5	-		2	100.0
Thyroid cancer	1	0.3	1	100.0	-	

NRS: Nutritional risk screening

Considering the specific cancer groups, a tendency was noted for higher rate of poor nutritional status in newly diagnosed versus former cancer patients, particularly for lung cancer (39.6 vs. 4.2%), head-and-neck cancer (38.0 vs. 5.4%), and gastrointestinal tumors (35.4 vs. 7.3%) (Table 2 and Fig. 1).

Discussion

This screening study revealed malnutrition risk and need for nutritional intervention in 33.8% of cancer patients, including 36.0% of newly diagnosed patients. Our findings emphasize that nutritional intervention should be implemented in two out of every five patients with newly diagnosed cancer, particularly for those with lung cancer, head-and-neck cancer, and gastrointestinal tumors. Patients with cancer are considered more likely to be malnourished than patients treated in many other specialties with at least 1.5 times more likely diagnosis of malnutrition in oncology inpatients (up to 80%) versus other hospitalized populations (up to 50%).[23-27] Specifically, the past studies in the oncology setting revealed the prevalence of malnutrition to range from 38% to 48% in hospitalized cancer patients, from 17% to 65% in ambulatory cancer patient populations, and from 11% to 30% in patients receiving radiotherapy.[7,26-
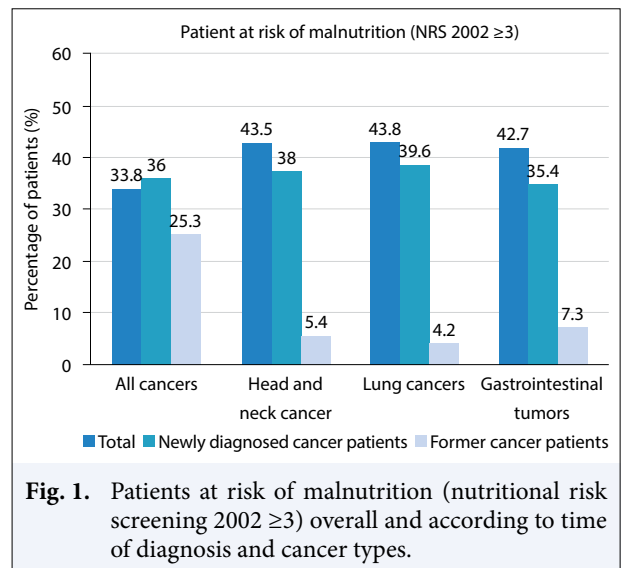
Fig. 1. Patients at risk of malnutrition (nutritional risk screening 2002 ≥3) overall and according to time of diagnosis and cancer types.

34] Similarly, in a multicenter study by the Society of Turkish Enteral and Parenteral Nutrition (KEPAN) to assess the nutrition status of 29,139 hospitalized patients in Turkish hospitals through NRS 2002 based screening, the nutritional risk on hospital admission was reported in 15% of patients overall, while the malnutrition risk increased up to 43.4% in medical oncology (19.5% in radiation oncology) clinics along with implementation of nutritional support only for 51.8% of nutritionally at risk patients.[35]

Table 2   NRS 2002 scores according to time of diagnosis (n=394)

Time of diagnosis	Total		NRS 2002 score			
			<3 (n=261)		≥3 (n=133)	
	n	%	n	%	n	%
Total						
Former patient	83	21.1	62	74.7	21	25.3
Newly diagnosed	311	78.9	199	64.0	112	36.0
p			0.067			
By cancer types						
Head-and-neck tumor						
Former patient	15		10	10.9	5	5.4
Newly diagnosed	77		42	45.7	35	38.0
Gastrointestinal tumor						
Former patient	19		13	15.9	6	7.3
Newly diagnosed	63		34	41.5	29	35.4
Breast cancer						
Former patient	10		10	18.2	0	0.0
Newly diagnosed	45		38	69.1	7	12.7
Prostate cancer						
Former patient	12		10	20.4	2	4.1
Newly diagnosed	37		32	65.3	5	10.2
Lung cancer						
Former patient	7		5	10.4	2	4.2
Newly diagnosed	41		22	45.8	19	39.6
Brain tumor						
Former patient	3		3	20	0	0.0
Newly diagnosed	12		10	66.7	2	13.3
Gynecologic cancer						
Former patient	6		4	26.7	2	13.3
Newly diagnosed	9		6	40	3	20.0
Urogenital tumor						
Former patient	2		1	8.3	1	8.3
Newly diagnosed	10		7	58.3	3	25.0
Sarcoma						
Former patient	5		3	27.3	2	18.2
Newly diagnosed	6		3	27.3	3	27.3
Skin tumor						
Former patient	3		3	37.5	0	0.0
Newly diagnosed	5		3	37.5	2	25.0
Lymphoma						
Former patient	1		-		1	25.0
Newly diagnosed	3		1	25	2	50.0
Multiple myeloma						
Former patient	0		0	0.0	0	0.0
Newly diagnosed	2		0	0.0	2	100
Thyroid cancer						
Former patient	0		0	0.0	0	0.0
Newly diagnosed	1		1	100	0	0.0

NRS: Nutritional risk screening

Indeed, CRM is considered almost universal with a prevalence that ranges from 40% at cancer diagnosis to 70-80% in advanced disease stages, depending on the patient age and cancer type besides the disease stage.[5,7,26-28,35-38] In this regard, the presence of malnutrition risk in at least one-third of newly diag-

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nosed cancer patients in the present study seems to support that pre-cachexia with loss of approximately 5% of body weight is already evident at the time of initial diagnosis among cancer patients, while multimodal treatment (chemotherapy, surgery, adjuvant therapy, and palliative care) is also associated with additional weight loss.[15,18]

The higher prevalence of malnutrition risk in our patients with lung cancer (43.8%), head-and-neck cancer (43.5%), and gastrointestinal tumors (42.7%), particularly at the time of initial diagnosis, supports the consistently reported data from the past studies regarding increased likelihood of being at risk of malnutrition in patients with gastrointestinal, head-and-neck, and lung cancers than those with other types of cancer, being also associated with a poor prognosis in these patients.[2,5,13,39-41]

Likewise, in a multicenter cross-sectional Patient-Generated Subjective Global Assessment (PG-SGA)-based nutritional screening study among 272 patients with newly diagnosed cancer outpatients from Turkey, severe and moderate malnutrition were noted in 29.4% and 24.6% of patients, respectively.[42] In a recent study on 3521 outpatients who were screened for nutritional status through NRS 2002, it was found that poor nutritional status was significantly more common in newly diagnosed versus former patients (23.1% vs. 19.0% p: 0.007), particularly for radiation oncology (30.5% vs. 15.7%) and medical oncology (47.2% vs. 41.6%) clinics as well as in geriatric outpatients (69.6% vs. 46.5%, P: 0.006).[43] In addition, in a study concerning the NRS 2002 based nutritional screening of 840 patients on the day of their admission to radiation oncology department, authors reported 344 patients (40.95%) to be at risk for malnutrition.[19] In another PG-SGA-based study with findings at two time points (in 2012 and 2014) among 1677 cancer patients receiving ambulatory chemotherapy, radiotherapy, and multiday inpatients, authors reported the malnutrition prevalence of 31% in 2012 and 26% in 2014 along with an increased likelihood of being malnourished among patients with upper gastrointestinal (61% and 48%, respectively), head-and-neck (40% and 36%, respectively), and lung (37% and 33%, respectively) cancers.[25]

Notably, CRM is considered to be not merely synonymous with weight loss but a multilayered process of complex etiology that involves anorexia, inflammatory processes, metabolic and endocrine alterations, increased tissue protein turnover, and a chronic wasting process resulting in progressive muscle depletion. [8,15,18,36] The early recognition of CRM is crucial in

this regard, given that patients are more responsive to nutritional support during earlier (pre-cachexia) phase with limited role of clinical nutrition after advanced state of cachexia.[11,15,18,44] Accordingly, our findings emphasize the importance of including the nutritional status assessment based on weight loss or an easy composite index, such as the NRS 2002, in the multidimensional initial approach to cancer for recognition and management of malnutrition at the time of initial cancer diagnosis.[15,17,45]

High rates for malnutrition risk among radiation oncology patients with newly diagnosed lung cancer, head-and-neck cancer, and gastrointestinal tumors in the present study seem notable given that negative effects of radiotherapy to head and neck or esophagus (i.e., mucositis, decreased food intake, and weight loss) in up to 80% of patients as well as association of radiotherapy to the pelvic region with gastrointestinal symptoms in up to 80% of patients.[10] In patients undergoing (adjuvant) radiotherapy, nutritional support is considered to improve intake and weight, and some aspects of quality of life, alongside its association with reduction in the rate of mucositis, increased treatment compliance and improved survival rates.[10,21]

In addition, irradiation is likely cause an acute-phase response where cytokine cascades are triggered following irradiation.[46] Hence, ESPEN guidelines on nutrition in cancer patients recommend that during radiotherapy, with special attention to radiotherapy of the head and neck, thorax, and gastrointestinal tract, an adequate nutritional intake should be ensured through nutrition assessment, adequate nutritional counseling, and, if necessary, nutritional support to avoid nutritional deterioration and to maintain intake and treatment adherence.[10]

Early nutritional intervention (before refractory cachexia) has been reported to reverse the potential adverse effects of CRM such as high rates of hospital readmissions, longer hospital stays, poor treatment response and poor tolerability, reduced quality of life, and increased mortality in cancer patients.[11,15,45,47-49] Accordingly, the ESPEN recommendations on nutritional care in patients with cancer emphasize the implementation of nutritional screening in all cancer patients early in the course of their care with consideration of anorexia, body composition, inflammatory biomarkers, resting energy expenditure, and physical function in the assessment along with the use of multimodal nutritional interventions targeting increase in nutritional intake and physical activity while reducing inflammation and hypermetabolic stress.[5]

However, the CRM has not been adequately addressed and its management remains suboptimal in general oncology practice with the provision of appropriate nutritional support only 30-60% of cancer patients who were identified to be at risk of malnutrition.[5,7,13-15,18,50] In a questionnaire-based survey among oncologists in Turkey, only 46.0% of oncologists reported that they plan nutritional therapy simultaneously with the initial diagnosis of cancer and only for patients with noticeable weight loss or poor oral intake.[51] The authors concluded that the diagnosis and practice patterns need to be improved in terms of the use of evidence-based malnutrition screening tools and consulting with clinical nutrition specialists on the provision and monitoring of nutritional support.[51]

In fact, weight loss and muscle loss are commonly considered as an inevitable consequence of progressive tumor growth in the oncology practice and patient care focus on better control of tumor growth rather than nutritional intervention.[7,18] Given the suboptimal knowledge of most of oncology practitioners on basic nutrition and potential nutritional interventions,[11] it has also been emphasized that there is a need for increased awareness of advances in the nutritional aspects of cancer care among oncologists to effectively couple oncologic and nutritional care.[5,52] In this regard, it should be noted that KEPAN Radiation Oncology Study Group has recently started to implement monthly theoretical and applied courses on nutritional screening assessment and techniques specifically for radiation oncologists in different cities of Turkey, while KEPAN also organizes the nationwide courses on nutritional screening methods for the past two decades across the Turkey within the scope of basic nutrition courses along with the ESPEN's Life Long Learning courses as integrated into the module of Nutritional Assessment and Techniques.[35]

Limitations of the Study
The major strength of this screening study seems to be the inclusion of database on radiation oncology cancer outpatients at 12 centers in Turkey with t use of a standardize nutritional status screening tool which enables our findings to be likely to be generalizable based on presence of a representative sample of overall population. However, certain limitations to this study should be considered. First, due to the cross-sectional design, it is impossible to establish any cause-and-effect relationships. Second, nutritional screening was based on single-point assessment with no data on follow-up status with respect to multimodal cancer treatment or provision

of nutritional support. Third lack of detailed data on patient and treatment characteristics is another limitation which otherwise would extend the knowledge achieved in the present study. Nonetheless, this was a screening study conducted as an awareness-raising project within the context of World Nutrition Day, providing a snapshot of the nutritional status of radiation oncology patients across Turkey.

Conclusion

This screening study revealed malnutrition risk and need for nutritional intervention in 33.8% of cancer patients, including 36.0% of newly diagnosed patients. Our findings emphasize that nutritional intervention should be implemented in two out of every five patients with newly diagnosed cancer, particularly for those with lung cancer, head-and-neck cancer, and gastrointestinal tumors. Accordingly, screening for nutritional risk in every cancer patient during the early treatment period seems crucial, given the likelihood of being already at risk of malnutrition at the time of initial diagnosis and the role of appropriate multimodal nutritional intervention before anti-cancer therapy in the long-term success. In this regard, efforts to increase awareness among radiation oncologists regarding importance of including nutritional status assessment in the multidimensional initial approach to cancer patients are crucial to be able to recognize the malnutrition risk at an earlier and more responsive phase and to improve patient outcomes through appropriate nutritional support.

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