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Evaluation of Nutritional Status and Anxiety Levels in Patients Applying to the Radiation Oncology Outpatient Clinic during the COVID-19 Pandemic: Turkish Society for Radiation Oncology Group Study (TROD 12:02)

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Evaluation of Nutritional Status and Anxiety Levels in Patients Applying to the Radiation Oncology Outpatient Clinic during the COVID-19 Pandemic: Turkish Society for Radiation Oncology Group Study (TROD 12:02)

Vuslat Yurut Caloglu[a], Muge Akmansu[b], Deniz Yalman[c], Sule Karabulut Gul[d], Zafer Kocak[a], Zumre Arican Alicikus[e], Alparslan Serarslan[f], Serap Akyurek[g], Teuta Zoto Mustafayev[h], Candan Demiroz[i], Didem Colpan Oksuz[j], Gul Kanyilmaz[k], Pelin Altinok[l], Esra Kaytan Saglam[m], Ayben Yentek Balkanay[n], Halil Akboru[o], Emine Keven[p], Berna Yildirim[q], Cem Onal[q], Sefik Igdem[r], Emre Ozkan[s], Fatih Ozdener[t], and Murat Caloglu[a]

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ABSTRACT

Cancer patients often face malnutrition, which negatively affects their response to cancer treatment. This study aims to analyze the effects of the COVID-19 pandemic on nutritional status and anxiety in cancer patients with different types and stages of cancer. This is a cross-sectional cohort study that includes 1,252 patients with varying cancer types from 17 radiation oncology centers. The nutritional risk scores (NRS-2002) and coronavirus anxiety scale (CAS) scores of all patients were measured. NRS-2002 ≥ 3 and CAS ≥ 5 were accepted as values at risk. Of all patients, 15.3% had NRS-2002 ≥ 3. Breast cancer was the most prevalent cancer type (24.5%) with the lowest risk of nutrition (4.9%, $p < 0.001$). Nutritional risk was significantly higher in patients with gastrointestinal cancer, head and neck cancer, and lung cancer ($p < 0.005$) and in patients with stage IV disease ($p < 0.001$). High anxiety levels (CAS ≥ 5) were significantly related to voluntary avoidance and clinical postponement of hospital visits due to the pandemic ($p < 0.001$), while clinical postponement was particularly frequent among patients with NRS-2002 < 3 ($p = 0.0021$). Fear and anxiety in cancer patients with COVID-19 cause hesitations in visiting hospitals, leading to disrupted primary and nutritional treatments. Thus, nutritional monitoring and treatment monitoring of cancer patients are crucial during and after radiotherapy.

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Introduction

Cancer patients are prone to COVID-19 not only due to treatment-related immunosuppression but also due to patient- or disease-related factors, such as age, comorbidities, or malnutrition. Moreover, the severity and mortality of COVID-19 are higher among cancer patients (1–5).

During this period, the risk of COVID-19 infection has caused fear and anxiety in many patients, as they are unwilling to attend their treatment or follow-up sessions, often leaving their treatment schedules

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incomplete (6). Dealing with an outbreak while continuing treatment and follow-up requires strict rules. Clinics have preferred to act individually regarding treatment or follow-up decisions to reduce the workload and risk of contamination (7–10); thus, physicians were unable to analyze large cohorts of cancer patients to better understand the course of COVID-19.

In addition to primary cancer treatments, such as surgery, radiotherapy, or chemotherapy, other treatments that would increase the compliance and efficacy of the primary treatment may have been overlooked during this period. Cancer cachexia is a syndrome characterized by progressive, involuntary weight loss. Malnutrition is of prognostic significance in cancer patients and for any given tumor type that has a shorter survival duration in patients with malnutrition (11, 12). Therefore, regular nutritional follow-up and providing nutritional support without delay are of great importance to cancer patients (13–15).

Measuring the anxiety levels and nutritional status of cancer patients is crucial to observing the negative effects of an outbreak. The purpose of this multicenter cohort study is to evaluate the nutritional status and anxiety levels of cancer patients referred to radiotherapy clinics for treatment or follow-up during the COVID-19 outbreak in Turkey.

Materials and Methods

Study Design

This is a Turkish observational multicenter cohort study conducted at 17 radiotherapy centers to evaluate the relationship between nutritional risk scores (NRS)-2002, coronavirus anxiety scale (CAS) scores, and two survey questions measuring the negative effects of COVID-19 on hospital visits between various subgroups. NRS-2002 and CAS were measured via conventional surveys of cancer patients visiting the hospital for treatment or follow-up. Both tests had previously been validated in adult Turkish patients (16, 17). Furthermore, to evaluate if a patient's appointment was canceled voluntarily or by the clinic, we asked the two following "Yes/No" questions: "Have you voluntarily canceled or delayed your hospital visit over the last 4 mo, during the COVID-19 pandemic?" and "Has your hospital visit been postponed by the clinic over the last 4 mo, during the COVID-19 pandemic?"

Patients

Between August 1, and October 1, 2020, a total of 1,252 patients with histologically confirmed solid malignant tumors who were informed and who agreed to participate were enrolled consecutively. The inclusion criteria were as follows: patients with a cancer diagnosis of any stage (metastatic/nonmetastatic), undergoing radiotherapy or follow-up, able to read/speak Turkish and understand/answer the questionnaires, and with an age over 18 years. Patients with COVID-19 and those who were unable to understand or answer the questionnaires were excluded from the study. Anxiety level and nutritional risk status were evaluated according to cancer type, gender, age (< 65 vs. ≥ 65), and reason for referral (treatment vs. follow-up).

Qualitative Variables

The clinician responsible for the study in each clinic interviewed the participants about CAS, NRS-2002, and the two "Yes/No" questions. Demographic data (age, sex, tumor type, stage, etc.) were obtained from the patient records. The CAS is a 5-item scale with robust reliability (alpha: 0.93) and validity based on a study conducted in 775 adults. Patients with CAS scores ≥ 5 were considered to be at risk of high anxiety (17).

Patients with NRS-2002 ≥ 3 were considered at risk of malnutrition, indicating the necessity of nutrition assessment. We analyzed the effects of age, tumor type and stage, reason for referral (treatment vs. follow-up), NRS-2002 and CAS scores, and the two "Yes/No" questions, which are stated above, on hospital visits. The distribution of cancer types was also evaluated in terms of CAS and NRS-2002. The distribution of CAS and NRS-2002 scores was compared with the answers to the two "Yes/No" questions.

Statistical Methods

Statistical tests and analyses were conducted using IBM SPSS Statistics for Windows v20.0 software (IBM Corp., Armonk, NY, US). The distribution of quantitative data was evaluated using the Shapiro–Wilk normality test. The Kruskal–Wallis and Mann–Whitney U tests were used for non-parametric independent datasets. The chi-squared test was used for cross-tabulation of qualitative datasets consisting of ≥ 5 samples. Fisher's exact test was used for exact cross-tabulation for < 5 samples. The level of statistical significance was accepted as $p < 0.05$.

Ethical Approval

The study was approved by the Research Ethics Committee of Trakya University and by the Ministry

Table 1. NRS status according to appointment status and purpose of referral.

Appointment status	Answer	NRS < 3, n (%)	NRS ≥ 3, n (%)	Total, n (%)	*P* value*
Voluntary avoidance	Yes	179 (87.8)	25 (12.2)	204 (16.3)	0.179
	No	879 (84.0)	167 (16.0)	1046 (83.7)	
Clinical postponement	Yes	200 (89.7)	23 (10.3)	223 (17.8)	0.021
	No	858 (83.5)	169 (16.5)	1027 (82.1)	
Purpose of referral	Follow-up	383 (94.3)	23 (5.7)	406 (32.4)	< 0.001
	Treatment	677 (80.0)	169 (20.0)	846 (67.6)	

NRS, Nutritional risk score.
*Chi-squared test.

Table 1b. CAS status according to appointment status and purpose of referral.

Appointment status	Answer	CAS < 5, n (%)	CAS ≥ 5, n (%)	Total, n (%)	*P* value*
Voluntary avoidance	Yes	157 (77.0)	47 (23.0)	204 (16.3)	< 0.001
	No	1002 (95.8)	44 (4.2)	1046 (83.7)	
Clinical postponement	Yes	185 (83.0)	32 (17.0)	223 (17.8)	< 0.001
	No	974 (94.8)	20 (5.2)	1027 (82.1)	
Purpose of referral	Follow-up	345 (85.0)	61 (15.0)	406 (32.4)	< 0.001
	Treatment	816 (96.5)	30 (3.5)	846 (67.6)	

CAS, Coronavirus anxiety scale.
*Chi-squared test.

of Health National Commission for COVID-19, with the decision numbered 13/52, dated 08/24/2020. All patients were informed about the study in accordance with Turkish regulatory laws, and those who did not accept the use of clinical data were excluded.

Results

Participants

A total of 1,252 patients were included in the demographic analysis. Cancer staging information was not available for 155 patients (12.4%); thus, the distribution of cancer stages and stage-based NRS distribution analyses were performed on the remaining 1,097 patients. Moreover, the answers to the aforementioned "Yes/No" questions were missing in two patients (0.2%). Thus, the NRS and CAS distribution analyses, together with the distribution of follow-up vs. treatment patients according to those "Yes/No" questions, were performed on the remaining 1,250 patients. Hence, the denominator was different for the different outcomes analyzed.

Descriptive Data

This study included 1,252 patients with different types and stages of cancer. The mean age of the whole sample was 59 years (range: 18–93 years). A total of 664 (53.0%) patients were male, and 588 (47.0%) were female. A total of 846 (67.6%) patients were referred to hospitals for treatment, and 406 (32.4%) were referred for follow-up.

Main Results

Of the study cohort, 16.3% voluntarily avoided their appointments, while 17.8% had their appointments postponed by the clinic due to workload (tables 1a and 1b). Voluntarily avoidance of appointments was significantly higher in men than in woman (18.7% vs 13.6%, respectively; $p = 0.015$). A significant majority of patients (20.0% for treatment vs. 5.7% for follow-up) had NRS-2002 ≥ 3 ($p < 0.001$) (Table 1a). The NRS-2002 ≥ 3 was significantly higher in males than in females (18.8% vs 11.4%, respectively; $p < 0.001$). Most patients who voluntarily avoided their clinic appointments (54.9% for avoided vs. 28.0% for not avoided) were follow-up patients ($p < 0.001$) (Table 2). Likewise, a significant majority of patients whose appointments were postponed by the clinic (74.0% for postponed vs. 23.4% for not postponed) were follow-up patients ($p < 0.001$) (Table 2).

According to the NRS results, we found no correlation between NRS-2002 and voluntary avoidance of appointments ($p = 0.179$). A significant proportion of patients whose appointments were not postponed by the clinic within the last four months (16.5% not postponed vs. 10.3% postponed) had NRS-2002 ≥ 3 ($p = 0.021$) (Table 1a).

According to CAS results, most of the patients who voluntarily avoided their appointments (23.0% for avoided vs. 4.2% for not avoided) or had their appointments postponed by the clinic (17.0% for postponed vs. 5.2% for not postponed) had CAS ≥ 5 ($p < 0.001$ for both). Males had a significantly higher CAS ≥ 5 than females (9.6% vs 4.6%, respectively;

Table 2. Appointment status of patients according to purpose of referral.

Appointment Status	Answer	Follow-up	Treatment	*P* value*
Voluntary avoidance	Yes	112 (54.9)	92 (45.1)	< 0.001
	No	293 (28.0)	753 (72.0)	
Clinical postponement	Yes	165 (74.0)	58 (26.0)	< 0.001
	No	240 (23.4)	787 (76.6)	

Table 3. NRS distributions among follow-up and treatment patients according to appointment status.

Appointment status	Follow-up	Follow-up + NRS ≥ 3	Treatment	Treatment + NRS ≥ 3	*P* value**
Voluntary avoidance	112 (54.9)	3 (2.7)	92 (45.1)	22 (23.9)	< 0.001
Clinical postponement	165 (74.0)	4 (2.4)	58 (26.0)	19 (32.8)	< 0.001

NRS, Nutritional risk score.
**Fisher's exact test.

$p = 0.001$). A significant majority of patients who were referred for follow-up (15.0% for follow-up vs. 3.5% for treatment) had CAS ≥ 5 ($p < 0.001$) as well (Table 1b).

In terms of NRS-2002 distributions among treatment and follow-up patients, a significant proportion of the treatment patients (23.9% for treatment vs. 2.7% for follow-up in voluntary avoidance and 32.8% for treatment vs. 2.4% for follow-up in clinical postponement) showed NRS-2002 ≥ 3 ($p < 0.001$) (Table 3).

Distribution of NRS-2002 according to Cancer Type

The distribution of cancer types and stages is indicated in Table 4a. Moreover, Figure 1 shows that the prevalence of NRS-2002 ≥ 3 was significantly higher in patients aged ≥ 65 years ($p < 0.001$). The most common cancer type was breast cancer (24.5%), followed by lung cancer (16.3%), head and neck cancer (12.6%), and gastrointestinal cancer (9.3%) (Table 4a). In terms of NRS-2002, 15.3% of radiation oncology outpatients were at risk of malnutrition (score ≥ 3), indicating that one out of every six oncology patients required nutritional intervention. However, considering the patients on treatment, 20% showed NRS-2002 ≥ 3. This rate was even higher in patients with gastrointestinal cancer, head and neck cancer, or lung cancer, as one out of every 3–4 patients needed nutritional support. The highest malnutrition risk was observed in gastrointestinal cancers (27.6%), followed by head and neck cancer (22.2%), and lung cancer (21.6%) (Table 4b).

Distribution of NRS-2002 and CAS according to Cancer Stages

The distribution of cancer stages according to cancer type is indicated in Table 4a. NRS-2002 scores were significantly higher in stage IV patients (23.7%, and mean rank score of 623.2) compared to all other stages (12.9%, mean rank score of 525.7, $p < 0.001$). Our results showed a directly proportional increase between the number of patients with NRS-2002 ≥ 3 and tumor stages, as there were no patients for stage 0, 25 (10.7) patients for stage I, 28 (14.7) patients for stage II, 55 (13.5) patients for stage III, and 62 (23.7) patients for stage IV ($p < 0.001$) (Table 4c).

The number of patients with CAS score ≥ 5 was significantly higher in high-stage tumors, as there were 2 patients (2.3%) for stage 0, 18 (20.9%) for stage I, 20 (23.3%) for stage II, 27 (31.4%) for stage III, and 19 (22.1%) for stage IV ($p = 0.041$). In addition, patients with head and neck cancer, lung cancer, and urogenital cancer showed a significantly higher prevalence for CAS ≥ 5 scores ($p < 0.001$).

Distribution of NRS-2002 Scores in Treatment and Follow-up Patients

A significantly higher proportion of patients with head and neck or gastrointestinal cancer who were referred for treatment had NRS-2002 ≥ 3 compared to those who were referred for follow-up (34.1% vs. 8.2% for head and neck cancer, 32.3% vs. 5% for gastrointestinal cancer, 18.5% vs. 3.9% for urogenital cancer, and 20.0% vs. 5.7% for all cancer types, respectively). Those who were referred for follow-up mostly had NRS-2002 < 3 compared to those who were referred for treatment (91.8% vs. 65.9%; $p < 0.001$ for head and neck cancer, 95% vs. 67.7%; $p = 0.012$ for gastrointestinal cancer, 96.1% vs. 81.5%; $p = 0.005$ for urogenital cancer, and 94.3% vs. 80.0% for all cancer types, respectively; $p < 0.001$). We determined no significant correlation between the purpose of referral and NRS-2002 status among patients with breast or lung cancer ($p = 0.055$ and $p = 0.171$, respectively) (Table 5).

Table 4. Distribution of cancer types and stages.

Cancer type	All, n (%)†	Stage 0, n (%)	Stage I, n (%)	Stage II, n (%)	Stage III, n (%)	Stage IV, n (%)
Lung	204 (16.3)	0 (0.0)	17 (8.3)	20 (9.8)	66 (32.4)	89 (43.6)
Head and neck	158 (12.6)	1 (<0.1)	24 (15.2)	22 (13.9)	66 (41.8)	17 (10.8)
Gastrointestinal	116 (9.3)	0 (0.0)	5 (4.3)	22 (19.0)	57 (49.1)	31 (26.7)
Breast	307 (24.5)	3 (0.1)	86 (28.0)	37 (12.1)	119 (38.8)	40 (13.0)
Urogenital	158 (12.6)	0 (0.0)	44 (27.9)	31 (19.6)	47 (29.8)	30 (19.0)
Gynecologic	69 (5.5)	0 (0.0)	27 (39.1)	12 (17.4)	22 (31.9)	6 (8.7)
Lymphoma	19 (1.5)	0 (0.0)	5 (26.3)	8 (42.1)	1 (5.3)	0 (0.0)
Other	221 (17.7)	1 (0.1)	26 (11.8)	38 (17.2)	28 (12.7)	49 (22.2)
All types	1252 (100.0)	5 (<0.1)	234 (18.7)	190 (15.2)	406 (32.4)	262 (20.9)

NRS, Nutritional risk score.
†includes relapsed tumors and tumors with unspecified stage.

Table 4b. Distribution of NRS status according to cancer types.

Cancer type	NRS < 3, n (%)	NRS ≥ 3, n (%)	Total, n (%)	*P* value†	*P* value††
Lung	160 (78.4)	44 (21.6)	204 (16.3)	0.007	vs HN: 0.894
Head and neck	123 (77.9)	35 (22.2)	158 (12.6)	0.011	vs GI: 0.301
Gastrointestinal	84 (72.4)	32 (27.6)	116 (9.3)	< 0.001	vs lung: 0.224
Breast	292 (95.1)	15 (4.9)	307 (24.5)	< 0.001	
Urogenital	140 (88.6)	18 (11.4)	158 (12.6)	0.141	
Gynecologic	55 (79.7)	14 (20.3)	69 (5.5)	0.240	
Lymphoma	15 (79.0)	4 (21.0)	19 (1.5)	0.486	
Other	191 (86.4)	30 (13.6)	221 (17.7)	0.423	
All types	1060 (84.7)	192 (15.3)	1252 (100.0)		

NRS, Nutritional risk score.
HN, Head and neck tumor.
GI, Gastrointestinal tumor.
†one cancer type vs. all other cancer types.
††one cancer type vs. one other cancer type.

Table 4c. Distribution of NRS status according to cancer stages.

				P value	
Cancer stage	NRS < 3, n (%)	NRS ≥ 3, n (%)	NRS score mean rank	NRS < 3 vs NRS ≥ 3	NRS Score
0	5 (100.0)	0 (0.0)	400.3	0.001†	< 0.001††
I	209 (89.3)	25 (10.7)	503.2		
II	162 (85.3)	28 (14.7)	489.9		
III	351 (86.5)	55 (13.5)	557.0		
IV	200 (76.3)	62 (23.7)	623.2		
IV vs < IV	200 (76.3) vs 727 (87.1)	62 (23.7) vs 108 (12.9)	623.2 vs 525.7	< 0.001†	< 0.001††

NRS, Nutritional risk score.
†Chi-squared test.
††Kruskal–Wallis test.

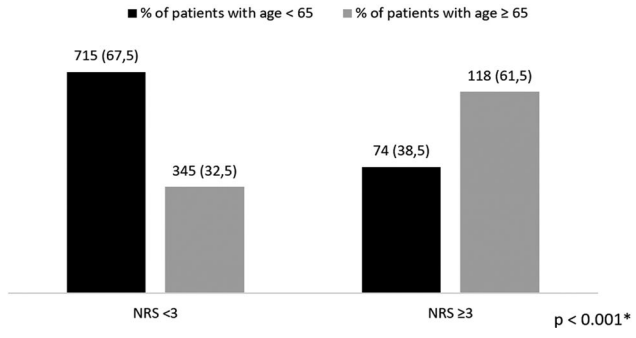


Figure 1. Distribution of patients aged <65 and ≥65 years according to NRS threshold.

Discussion

Of our 1,252 patients, 16.4% voluntarily avoided their appointments, and 17.8% had their appointments postponed by the clinic due to workload. Most of the patients in our sample had NRS-2002 ≥ 3. Both the clinical postponement and voluntary avoidance groups consisted mostly of follow-up patients. There was no correlation between NRS-2002 and voluntary avoidance of appointments. A significant portion of the patients who voluntarily avoided their appointments or had their appointments postponed by the clinic had CAS ≥ 5. Lastly, most treatment patients showed NRS-2002 ≥ 3.

Table 5. Distribution of lung, head and neck, gastrointestinal and breast cancer patients according to purpose of referral and NRS status.

Cancer Type	Purpose of referral	NRS < 3, n (%)	NRS ≥ 3, n (%)	Total	*P* value
Lung	Follow-up	30 (88.2)	4 (11.8)	34 (16.7)	0.171*
	Treatment	130 (76.5)	40 (23.5)	170 (83.3)	
Head and neck	Follow-up	67 (91.8)	6 (8.2)	73 (46.2)	< 0.001*
	Treatment	56 (65.9)	29 (34.1)	85 (53.8)	
Gastrointestinal	Follow-up	19 (95.0)	1 (5.0)	20 (17.2)	0.012*
	Treatment	65 (67.7)	31 (32.3)	96 (82.8)	
Breast	Follow-up	115 (98.3)	2 (1.7)	117 (38.1)	0.055*
	Treatment	177 (93.2)	13 (6.8)	190 (61.9)	
Urogenital	Follow-up	74 (96.1)	3 (3.9)	77 (48.7)	0.005*
	Treatment	66 (81.5)	15 (18.5)	81 (51.3)	
Gynecologic	Follow-up	13 (86.7)	2 (13.3)	15 (21.7)	0.507*
	Treatment	42 (77.8)	12 (22.2)	54 (78.3)	
Lymphoma	Follow-up	0	0	0 (0)	NA
	Treatment	15 (78.9)	4 (21.1)	19 (100)	
Other	Follow-up	65 (92.9)	5 (7.1)	70 (31.7)	0.061*
	Treatment	126 (83.4)	25 (16.6)	151 (68.3)	
All types	Follow-up	383 (94.3)	23 (5.7)	406 (32.4)	< 0.001*
	Treatment	677 (80.0)	169 (20.0)	846 (67.6)	

NRS, Nutritional risk score.
*Fisher's exact test.
Significant P values and descriptive statistics belonging to the purpose of referral group with significantly higher NRS were written as bold for each cancer type.

Like all segments of society, cancer patients have been adversely affected by the COVID-19 pandemic. Treatments and follow-up visits have been delayed due to the risk of contamination, and new treatment strategies aimed at lowering the risk have been developed (18). It is well known that nutritional support is an essential part of cancer treatment, and poor nutritional status negatively affects treatment response by disrupting compliance with treatment (11, 12). Proper nutritional screening is crucial in cancer patients, and it has already been included as a standard procedure in oncology units.

The COVID-19 outbreak caused fear, anxiety, and depression in cancer patients. A study from China reported that during the COVID-19 outbreak, patients reported adverse psychiatric symptoms, with the highest percentages accounting for depression and anxiety (19). It is generally assumed that cancer patients may be at an increased risk of severe COVID-19 (17). Previous studies have demonstrated the potential impact of COVID-19-related anxiety on decision-making processes, such as refusal of surgery (20) and postponement of radiotherapy or chemotherapy (6). Moreover, clinics have postponed appointments, reducing the number of outpatients and thus preventing the risk of contamination (21). Therefore, the importance of evaluating virus-related anxiety in cancer patients has increased. CAS is the first published mental health screening tool to identify individuals with functional impairment due to COVID-19 (22). The author used an optimal CAS cut score of nine to separate patients with dysfunctional anxiety from those who were not anxious (90% sensitivity and 85% specificity). In a later investigation, Lee et al. validated these findings (23). However, Lee discovered that the CAS cut score ≥ 9 gave a sensitivity of 53%, which was considerably below the 90% value stated in the initial CAS experiment when he did another replication analysis of CAS utilized in a later study. To achieve a sensitivity rate of 71% and a specificity rate of 74%, the CAS cut score needed to be reduced to 5. According to the Lee, the initial CAS study included only participants who were anxious about the coronavirus, whereas the latter analysis included both people with and without anxiety. As a result, he suggested that current CAS users consider decreasing the cut score to five when evaluating the general population (24). A subsequent investigation in which no cut score was used validated CAS for the Turkish population (17). Therefore, we decided to use CAS with a cut score ≥ 5 for anxiety assessment in our study for the first time in the Turkish population.

Previous research has reported that uncontrolled malignancy is an independent risk factor for severe COVID-19 (25). We observed that the number of patients with CAS ≥ 5 was significantly higher in high-stage tumors ($p = 0.041$). It could be hypothesized that patients with advanced disease were either more afraid of viral contamination or more concerned about uncertainties regarding treatment processes.

We added two "Yes/No" questions to the current study to evaluate the pressure of the current pandemic on visits to radiation oncology clinics. A significant majority of our patients who were referred for follow-up had CAS ≥ 5 ($p < 0.001$). This may be

due to a reluctance to visit hospitals. As expected, most patients who voluntarily avoided their clinic appointments (23.0% for avoided vs. 4.2% for not avoided) had CAS ≥ 5 ($p < 0.001$). One can conclude that patients who voluntarily avoided their clinic appointments felt more anxious about COVID-19, as its prognosis in cancer patients is poor, regardless of being on active anticancer treatment.

Considering the "Yes/No" questions indicative of clinical postponement, a vast majority of our patients who answered "Yes" (17%) had higher CAS scores compared to those who answered "No" (5.2%, $p < 0.001$). Patients may have felt anxious due to concerns about the course of their disease if their treatments were postponed involuntarily.

This study showed that treatment delays—whether voluntary or involuntary—affected nutritional status negatively. However, delays in follow-ups did not affect nutritional status. This could be due to the ongoing nutritional treatment in some of the follow-up patients and the lack of nutritional risk in the rest. The Turkish Society of Radiation Oncology has proposed that treatments should continue (with appropriate modifications) during the outbreak with high-level precautions for both patients and health care professionals. The most important indicator of this fact was that clinics did not postpone the treatment of patients with NRS-2002 ≥ 3 ($p = 0.021$). Furthermore, a significantly higher proportion of the treatment patients whose appointments were not postponed due to COVID-19 had NRS-2002 ≥ 3 ($p < 0.001$) (Table 1a).

A significant number of our patients who were referred to radiation oncology clinics had nutritional disorders, and the prevalence of nutritional risk was higher in some types of cancer. Moreover, within the framework of social events that cause fear and anxiety in patients and health care professionals, such as the COVID-19 pandemic, nutritional evaluation, which is an important component of primary cancer treatment, was emphasized.

Many factors associated with tumor and cancer treatment (e.g., anorexia, dysphagia, obstruction, diarrhea, vomiting, etc.) and the host's response to the tumor (inflammation) contribute to malnutrition. Dewys et al. showed that malnutrition ranged from 31% to 87%, depending on the tumor site and stage, with the highest frequencies observed in patients with aerodigestive tract cancer or more advanced disease (26). Similar to the current study, Muscaritoli et al. showed that, based on the site of the primary tumor, patients with gastroesophageal, pancreatic, head and neck, and lung cancer undergoing oncological treatment had the highest frequency of malnutrition, while those with breast cancer were least likely to be malnourished (27). Hébuterne et al. reported the prevalence of malnutrition to be 27.7% in outpatients (28). In the present study, the malnutrition rate was 20% in all patients who applied for treatment, whereas it was higher in patients with head and neck cancer (34%), gastrointestinal cancer (32%), and lung cancer (23.5%). Furthermore, significantly higher NRS-2002 scores were observed in all stage IV cancer patients compared to the other stages (23.7% vs. 12.9%, $p < 0.001$). Therefore, based on these results, patients diagnosed with gastrointestinal cancer, head and neck cancer, and lung cancer, as well as metastatic disease, carry a particularly high nutritional risk, and it is of utmost importance to perform appropriate nutritional assessment, treatment, and follow-up in these patient groups. The higher nutritional risk in patients with gastrointestinal cancer and head and neck cancer has been steadily mentioned in previous studies. Wan et al. stated in a systematic review that 19–68.75% of patients following gastrointestinal surgery suffer from malnutrition (29). Furthermore, Roshanmehr et al. discovered that the dietary state of gastrointestinal cancer patients has an intentional impact on their long-term prognoses and quality of life (30).

In our study, a significantly higher proportion of patients with head and neck cancer and gastrointestinal cancer who were referred for treatment had NRS-2002 ≥ 3 compared to those who were referred for follow-up (34.1% vs. 8.2%; $p < 0.001$ and 32.3% vs. 5.0%; $p = 0.012$, respectively). This result may be due to the side effects of radiotherapy and/or chemotherapy, or it can be explained by the fact that follow-up patients already receive nutritional treatment as regulated. Interestingly, there was no correlation between NRS-2002 and the purpose of referral in lung cancer patients ($p = 0.171$). In lung cancer, one of the causes of malnutrition is inflammation, and malnutrition status may not improve with nutritional intervention related to inflammation (31). Another reason may be that 43.6% of lung cancer patients had stage IV tumors.

In our study, male gender was found to be a significant determinant in greater NRS-2002, CAS, and voluntarily avoidance of appointments. In several tumors, male gender has an important influence in the incidence, prognosis, and death. In the United States, between 2009 and 2013, the incidence of cancer was around 20% higher in males than in women, while the fatality rate was 40% higher in men (32). As a result, it's possible that during the COVID-19 epidemic, male cancer patients were more prone to

nutritional issues and anxiety than female cancer patients. Future research is needed to completely comprehend the significance of gender in cancer patients' psychology.

Elderly patients are a heterogeneous group with comorbidities related to functional, biological, and social problems, as well as multiple drug use, which makes elderly cancer patients even more susceptible to nutritional deterioration. Nutritional problems are more serious, and treatment is often more difficult in this group. Therefore, further care should be given when evaluating the nutritional status of cancer patients aged ≥ 65 years, compared to younger patients with the same cancer type, the same stage, or the same treatments (33).

A study from Europe estimated the prevalence of malnutrition to be 71% in elderly patients hospitalized with advanced cancer (34). An Italian prospective study of elderly cancer patients showed that 42.5% had a significant weight-loss of ≥ 10% of their usual body weight (35). St. Guily et al. reported that elderly patients were more frequently malnourished than younger patients (44.9% vs. 36.7%; $p = 0.0006$) (36). In this study, the prevalence of NRS-2002 ≥ 3 was significantly higher in patients aged ≥ 65 years compared to those aged < 65 years (61.5% vs. 38.5%, respectively; $p < 0.001$), which is in concordance with the literature, proving the importance of malnutrition management in elderly cancer patients and early integration of nutritional support into cancer treatment.

Limitations

Observing the factors that affect nutritional status in 1,250 hospitalized cancer patients has been a strong aspect of our research. However, our sample consists of a heterogeneous group in which some of the control patients may be disease-free or some may have a stable disease. We did not analyze the subgroups separately. Further research can examine disease-free and stable disease patients separately, together with related voluntary and involuntary clinical postponement rates.

Nutritional risk assessment in cancer patients has frequently been studied to reduce the risk of mortality (25, 37). Research has highlighted that evaluating nutritional risk in cancer patients requires several methods, such as NRS-2002, malnutrition universal screening tool (MUST) and nutritional risk index (NRI) for screening; subjective global assessment (SGA), patient-generated subjective global assessment (PG-SGA), and patient-generated subjective global assessment short form (PG-SGA SF) for nutritional assessment; and Global Leadership Initiative on Malnutrition (GLIM) for nutritional diagnosis (38–41). In this study, we used only the NRS-2002 to evaluate the nutritional status of cancer patients. Among the NRI, MUST (61% and 43% for sensitivity, 76% and 89% for specificity, respectively), and SGA, NRS-2002 showed the highest sensitivity and specificity (62% and 93%) (39). However, Yang et al. found that PG-SGA showed greater sensitivity and specificity compared to NRS-2002 (40). De Groot et al. reported that GLIM was another tool for nutritional diagnosis with fair agreement (76% sensitivity vs. 73% specificity), while PG-SGA SF showed the highest agreement (89% sensitivity vs. 80% specificity) (41). Thus, in this study, we may have also used PG-SGA in combination with NRS-2002 to provide more significant results regarding nutritional status.

Conclusion

Cancer patients whose treatments and follow-ups continue in radiation oncology clinics are at nutritional risk. Moreover, the fear and anxiety caused by the COVID-19 pandemic due to the probable risk of higher mortality in cancer patients led to hesitation in hospital visits. Therefore, it should not be forgotten that there may be disruptions not only in patients' primary treatment but also in their nutritional treatment. Thus, patients should be carefully monitored in terms of nutritional status and treatment both during and after radiotherapy.

Author Contributions

All authors contributed to the conception and design of the study, interpretation of data, drafting the study, and revising it critically for important intellectual content. All authors contributed to retrospective acquisition of the data. All authors validate the final approval of the version to be published and agreed to be accountable for all aspects of the study in ensuring that questions related to the accuracy or integrity of any part of the study are appropriately investigated and resolved.

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Data Availability Statement

Research data are stored in an institutional repository and will be shared upon request to the corresponding author.

References

1. Bakouny Z, Hawley JE, Choueiri TK, Peters S, Rini BI, Warner JL, Painter CA. COVID-19 and cancer: current challenges and perspectives. Cancer Cell. 2020;38(5):629–46. doi:10.1016/j.ccell.2020.09.018
2. Buglione M, Spiazzi L, Guerini AE, Barbera F, Pasinetti N, Pegurri L, Triggiani L, Tomasini D, Greco D, Costantino G, Radiation Oncology Department Staff, et al. Two months of radiation oncology in the heart of Italian "red zone" during COVID-19 pandemic: paving a safe path over thin ice. Radiat Oncol. 2020;15(1):191. doi:10.1186/s13014-020-01631-2
3. Saini KS, Tagliamento M, Lambertini M, McNally R, Romano M, Leone M, Curigliano G, de Azambuja E. Mortality in patients with cancer and coronavirus disease 2019: a systematic review and pooled analysis of 52 studies. Eur J Cancer. 2020;139:43–50. doi:10.1016/j.ejca.2020.08.011
4. Lièvre A, Turpin A, Ray-Coquard I, Le Malicot K, Thariat J, Ahle G, Neuzillet C, Paoletti X, Bouché O, Aldabbagh K, GCO-002 CACOVID-19 orators/investigators, et al. Risk factors for Coronavirus Disease 2019 (COVID-19) severity and mortality among solid cancer patients and impact of the disease on anticancer treatment: a French nationwide cohort study (GCO-002 CACOVID-19). Eur J Cancer. 2020;141:62–81. doi:10.1016/j.ejca.2020.09.035
5. Taghizadeh-Hesary F, Porouhan P, Soroosh D, PeyroShabany B, Shahidsales S, et al. COVID-19 in cancer and non-cancer patients. Int J Cancer Manag. 2021;14(4):e110907.
6. Karacin C, Bilgetekin I, B Basal F, Oksuzoglu OB. How does COVID-19 fear and anxiety affect chemotherapy adherence in patients with cancer. Future Oncol. 2020;16(29):2283–93. doi:10.2217/fon-2020-0592
7. Schrag D, Hershman DL, Basch E. Oncology practice during the COVID-19 pandemic. JAMA. 2020;323(20):2005–6. doi:10.1001/jama.2020.6236
8. Rakhsha A, Azghandi S, Taghizadeh-Hesary F. COVID-19 pandemic and patients with cancer: the protocol of a clinical oncology center in Tehran, Iran. Rep Pract Oncol Radiother. 2020;25(5):765–7. doi:10.1016/j.rpor.2020.07.001
9. Fadavi P, Houshyari M, Yousefi Kashi AS, Jarrahi AM, Roshanmehr F, Broomand MA, Sandoughdaran S, Taghizadeh-Hesary F. Review on the oncology practice in the midst of COVID-19 crisis: the challenges and solutions. Asian Pac J Cancer Prev. 2021;22(1):19–24. doi:10.31557/APJCP.2021.22.1.19
10. Rakhsha A, Azghandi S, Taghizadeh-Hesary F. Decision on chemotherapy amidst COVID-19 pandemic: a review and a practical approach from Iran. Infect Chemother. 2020;52(4):496–502. doi:10.3947/ic.2020.52.4.496
11. Muscaritoli M, Molfino A, Lucia S, Rossi Fanelli F. Cachexia: a preventable comorbidity of cancer. A T.A.R.G.E.T. approach. Crit Rev Oncol Hematol. 2015;94(2):251–9. doi:10.1016/j.critrevonc.2014.10.014
12. Bauer J, Jurgens H, Fruhwald MC. Important aspects of nutrition in children with cancer. Adv Nutr. 2011;2(2):67–77. doi:10.3945/an.110.000141
13. Arends J, Bachmann P, Baracos V, Barthelemy N, Bertz H, Bozzetti F, Fearon K, Hütterer E, Isenring E, Kaasa S, et al. ESPEN guidelines on nutrition in cancer patients. Clin Nutr. 2017;36(1):11–48. doi:10.1016/j.clnu.2016.07.015
14. Arends J, Baracos V, Bertz H, Bozzetti F, Calder PC, Deutz NEP, Erickson N, Laviano A, Lisanti MP, Lobo DN, et al. ESPEN expert group recommendations for action against cancer-related malnutrition. Clin Nutr. 2017;36(5):1187–96. doi:10.1016/j.clnu.2017.06.017
15. Muscaritoli M, Arends J, Aapro M. From guidelines to clinical practice: a roadmap for oncologists for nutrition therapy for cancer patients. Ther Adv Med Oncol. 2019;11:1758835919880084. doi:10.1177/1758835919880084
16. Bolayir B, Arik G, Yeşil Y, Kuyumcu ME, Varan HD, Kara Ö, Güngör AE, Yavuz BB, Cankurtaran M, Halil MG, et al. Validation of nutritional risk screening-2002 in a hospitalized adult population. Nutr Clin Pract. 2019;34(2):297–303. doi:10.1002/ncp.10082
17. Evren C, Evren B, Dalbudak E, Topcu M, Kutlu N. Measuring anxiety related to COVID-19: a Turkish validation study of the coronavirus anxiety scale. Death Stud. 2022;46(5):1052–8. doi:10.1080/07481187.2020.1774969
18. Madan A, Siglin J, Khan A. Comprehensive review of implications of COVID-19 on clinical outcomes of cancer patients and management of solid tumors during the pandemic. Cancer Med. 2020;9(24):9205–18. doi:10.1002/cam4.3534
19. Wang Y, Duan Z, Ma Z, Mao Y, Li X, Wilson A, Qin H, Ou J, Peng K, Zhou F, et al. Epidemiology of mental health problems among patients with cancer during

COVID-19 pandemic. Transl Psychiatry. 2020;10(1):263. doi:10.1038/s41398-020-00950-y
20. Vanni G, Materazzo M, Pellicciaro M, Ingallinella S, Rho M, Santori F, Cotesta M, Caspi J, Makarova A, Pistolese CA, et al. Breast cancer and COVID-19: the effect of fear on patients' decision-making process. In Vivo. 2020;34(3 Suppl):1651–9. doi:10.21873/invivo.11957
21. Dinmohamed AG, Visser O, Verhoeven RHA, Louwman MWJ, van Nederveen FH, Willems SM, Merkx MAW, Lemmens VEPP, Nagtegaal ID, Siesling S, et al. Fewer cancer diagnoses during the COVID-19 epidemic in the Netherlands. Lancet Oncol. 2020;21(6):750–1. doi:10.1016/S1470-2045(20)30265-5
22. Lee SA. Coronavirus anxiety scale: a brief mental health screener for COVID-19 related anxiety. Death Stud. 2020;44(7):393–401. doi:10.1080/07481187.2020.1748481
23. Lee SA, Jobe MC, Mathis AA. Mental health characteristics associated with dysfunctional coronavirus anxiety. Psychol Med. 2021;51(8):1403–4. doi:10.1017/S003329172000121X
24. Lee SA. Replication analysis of the coronavirus anxiety scale. Dusunen Adam. 2020;33(2):203–5. doi:10.14744/DAJPNS.2020.00079
25. Pablo AM, Izaga MA, Alday LA. Assessment of nutritional status on hospital admission: nutritional scores. Eur J Clin Nutr. 2003;57(7):824–31. doi:10.1038/sj.ejcn.1601616
26. Dewys WD, Begg C, Lavin PT, Band PR, Bennett JM, Bertino JR, Cohen MH, Douglass HO, Engstrom PF, Ezdinli EZ, et al. Prognostic effect of weight loss prior to chemotherapy in cancer patients. Eastern Cooperative Oncology Group. Am J Med. 1980;69(4):491–7. doi:10.1016/s0149-2918(05)80001-3
27. Muscaritoli M, Lucia S, Farcomeni A, Lorusso V, Saracino V, Barone C, Plastino F, Gori S, Magarotto R, Carteni G, PreMiO Study Group, et al. Prevalence of malnutrition in patients at first medical oncology visit: the PreMiO study. Oncotarget. 2017;8(45):79884–96. doi:10.18632/oncotarget.20168
28. Hébuterne X, Lemarié E, Michallet M, de Montreuil CB, Schneider SM, Goldwasser F. Prevalence of malnutrition and current use of nutrition support in patients with cancer. JPEN J Parenter Enteral Nutr. 2014;38(2):196–204. doi:10.1177/0148607113502674
29. Wan G-Y, Zheng L-Y, Li H-Q, Yuan H, Xue H, Zhang X-Y. Effects of enteral nutritional rich in n-3 polyunsaturated fatty acids on the nutritional status of gastrointestinal cancer patients: a systematic review and meta-analysis. Eur J Clin Nutr. 2020;74(2):220–30. doi:10.1038/s41430-019-0527-5
30. Roshanmehr F, Kagawa M, Taghizadeh-Hesary F, Milani-Bonab A, Haghighian-Roudsari A. Nutritional status of cancer patients: a unicenteric report from Iran. JNFS. 2022;7(1):11–21. doi:10.18502/jnfs.v7i1.8530
31. Simmons CP, Koinis F, Fallon MT, Fearon KC, Bowden J, Solheim TS, Gronberg BH, McMillan DC, Gioulbasanis I, Laird BJ, et al. Prognosis in advanced lung cancer–a prospective study examining key clinicopathological factors. Lung Cancer. 2015;88(3):304–9. doi:10.1016/j.lungcan.2015.03.020
32. Siegel RL, Miller KD, Jemal A. Cancer statistics, 2017. CA Cancer J Clin. 2017;67(1):7–30. doi:10.3322/caac.21387
33. Volkert D, Beck AM, Cederholm T, Cruz-Jentoft A, Goisser S, Hooper L, Kiesswetter E, Maggio M, Raynaud-Simon A, Sieber CC, et al. ESPEN guideline on clinical nutrition and hydration in geriatrics. Clin Nutr. 2019;38(1):10–47. doi:10.1016/j.clnu.2018.05.024
34. Paillaud E, Caillet P, Campillo B, Bories PN. Increased risk of alteration of nutritional status in hospitalized elderly patients with advanced cancer. J Nutr Health Aging. 2006;10(2):91–5.
35. Mariani L, Lo Vullo S, Bozzetti F, Group SW. Weight loss in cancer patients: a plea for a better awareness of the issue. Support Care Cancer. 2012;20(2):301–9. doi:10.1007/s00520-010-1075-7
36. St Guily JL, Bouvard É, Raynard B, Goldwasser F, Maget B, Prevost A, Seguy D, Romano O, Narciso B, Couet C, et al. NutriCancer: a French observational multicentre cross-sectional study of malnutrition in elderly patients with cancer. J Geriatr Oncol. 2018;9(1):74–80. doi:10.1016/j.jgo.2017.08.003
37. Ryu SW, Kim IH. Comparison of different nutritional assessments in detecting malnutrition among gastric cancer patients. World J Gastroenterol. 2010;16(26):3310–7. doi:10.3748/wjg.v16.i26.3310
38. Fruchtenicht AV, Poziomyck AK, Kabke GB, Loss SH, Antoniazzi JL, et al. Nutritional risk assessment in critically ill cancer patients: systematic review. Rev Bras Ter Intensiva. 2015;27(3):274–83.
39. Kyle UG, Kossovsky MP, Karsegard VL, Pichard C. Comparison of tools for nutritional assessment and screening at hospital admission: a population study. Clin Nutr. 2006;25(3):409–17. doi:10.1016/j.clnu.2005.11.001
40. Yang J, Yuan K, Huang Y, Yu M, Huang X, et al. Comparison of NRS 2002 and PG-SGA for the assessment of nutritional status in cancer patients. Biomed Res-Tokyo. 2016;27:1178–82.
41. De Groot LM, Lee G, Ackerie A, van der Meij BS. Malnutrition screening and assessment in the cancer care ambulatory setting: mortality predictability and validity of the patient-generated subjective global assessment short form (PG-SGA SF) and the GLIM criteria. Nutrients. 2020;12(8):2287. doi:10.3390/nu12082287