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The Effect of Radiotherapy-Related Anxiety and Depression on Quality of Life in Cancer Patients

Kanser Hastalarında Radyoterapiye Bağlı Anksiyete ve Depresyonun Yaşam Kalitesine Etkisi

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Öz

Giriş ve Amaç: Bu çalışmanın amacı, kanser hastalarının radyoterapi öncesi ve sonrası anksiyete ve depresyon düzeylerinin ve yaşam kalitelerinin incelenmesidir.
Gereç ve Yöntemler: Bu çalışma prospektif tanımlayıcı bir çalışmadır. Radyoterapi öncesi ve sonrası veri toplamak için Hasta Bilgi Formu, Hastane Anksiyete Depresyon Ölçeği (HADS) ve Yaşam Kalitesi Ölçeği (EORTC QLQ–C30) kullanıldı. Veriler ki-kare testi, t-testi ve çok değişkenli regresyon analizi ile analiz edildi.
Bulgular: Radyoterapi öncesi ve sonrası yaşam kalitesi ölçeğinin alt ölçek puan ortalamaları arasında istatistiksel olarak anlamlı fark belirlendi. Radyoterapi öncesi anksiyete ve depresyonun emosyonel fonksiyon alt ölçeğini %52, radyoterapi sonrası anksiyeteyi ise %67 oranında etkilediği belirlendi.
Sonuç: Bu çalışmanın bulguları, radyoterapi alan kanser hastalarında yaş, kemoterapi, metastaz varlığı, anksiyete ve depresyonun yaşam kalitesi üzerindeki anlamlı etkisini vurgulamaktadır. Onkoloji hemşirelerinin radyoterapi alan kanser hastalarında anksiyete ve depresyonu değerlendirmeleri ve eğitim vermeleri önerilir.

Anahtar Kelimeler: Anksiyete, Depresyon, Radyoterapi, Yaşam Kalitesi.

Abstract

Objective: This study aimed to investigate anxiety and depression levels and quality of life in cancer patients before and after radiotherapy.
Materials and Methods: This study is a prospective descriptive study. Data were collected via patient information form, Hospital Anxiety Depression Scale (HADS) and European Organization for Research and Treatment (EORTC QLQ-C30) before and after radiotherapy. Data were analyzed by chi-squared test, t-test, and multivariate regression analysis.
Results: There was a statistically significant difference between the mean scores for the subdimensions of the QOL scale before and after radiotherapy. Anxiety and depression before radiotherapy were found to affect the emotional function subdimension by 52% and anxiety after radiotherapy by 67%.
Conclusion: The findings of this study emphasise the significant effect of age, chemotherapy, presence of metastasis, anxiety and depression on quality of life in cancer patients receiving radiotherapy. We recommend that oncology nurses should evaluate anxiety and depression and provide training in cancer patients receiving radiotherapy

Keywords: Radiotherapy, Anxiety, Depression, Quality of Life

1.Introduction

Pre- and post-treatment anxieties and depression are common in patients with cancer who undergo radiation therapy [1,2]. Fear of radiotherapy machines, lack of patient education before radiotherapy, and possible short- and long-term side effects such as skin reactions, dry mouth, fatigue, mucositis, dysphagia, lymphedema, nausea and vomiting, diarrhea, radiation cystitis, and sexual problems after radiotherapy may all cause anxiety and depression in affected patients [3]. Such psychological mood changes may also vary according to the patient's age, marital status, gender, and presence of metastases [3,4]. Quality of life (QoL) is a multi-faceted concept that involves physical, social, emotional, and psychological dimensions. Optimal QoL in oncology patients is dependent on both the psychological and physical well-being of the individual [5]. Factors like being diagnosed with cancer, coupled with severe anxiety and even depression before, during, and after therapy further deteriorate psychological well-being of patients, which in turn leads to prolonged hospital stay, reduction in survival, and poor compliance with therapy [6].

In all chronic diseases, including cancer, the primary objective of oncology nurses should be to collaborate with other members of the healthcare team and maintain the patient's quality of life at an optimal level [1-4]. By assessing the anxiety and depression levels of patients scheduled to receive radiation therapy, nurses can develop a comprehensive care plan that promotes the emotional well-being of cancer patients [7,8]. Although there has been some research into anxiety, depression, and quality of life in cancer patients receiving radiotherapy [1,9-13], there is no observational or descriptive study that specifically examines the effects of anxiety and depression on quality of life in cancer patients before and after radiotherapy. In addition, there is limited research on cancer patients' experiences of anxiety and depression before and after radiotherapy, as most studies focus on these issues in the context of general cancer and chemotherapy [14,15]. This study therefore aimed to assess the levels of anxiety, depression, and quality of life in cancer patients before and after radiation therapy.

2. Materials and Methods

2.1. Design and Participant

For this prospective descriptive study, patients were asked to complete self-report questionnaires before their first radiotherapy session and immediately after their last one. The study population was composed of patients who received outpatient radiotherapy treatment at a university hospital's radiation oncology clinic in Turkey from April to December 2019. Sample size calculations were conducted using G*Power statistical analysis to determine a minimum sample size of 67 people, with an alpha value of 0.05, power level of 0.80, and Cohen's effect size of $\omega = 0.5$ [16]. Inclusion criteria included being over 18 years old, able to speak Turkish and understand instructions, and scheduled for their first radiotherapy treatment. A total of 96 patients met the criteria and were included in the study.

2.2. Data Collection Tools

2.2.1 Personal information form

The researchers created a personal information form based on previous literature [17-19]. The form consisted of 21 items in two parts, including sociodemographic data (age, gender, education, marital status, and employment status) and disease-related information.

2.2.2 Hospital Anxiety Depression Scale (HADS)

The Hospital Anxiety Depression Scale (HADS) was created by Zigmond and Snaith in 1983 and comprises 14 questions. Seven of the scale items (odd-numbered) measure anxiety, while the other seven items (even-numbered) measure depression. Respondents answer the questions using a four-point Likert scale, with each option assigned a score of 0 to 3 [18]. The scores for anxiety and depression are classified separately into four categories: normal (0-7), mild (8-10), moderate (11-14), and severe (15-21) [20,21]. Aydemir et al. (1997) tested the Turkish validity and reliability of the HADS [22].

2.2.3 The European Organization for Research and Treatment (EORTC) QLQ-C30

Aaronson et al. (1993) created the European Organization for Research and Treatment (EORTC) QLQ-C30 to evaluate the quality of life of cancer patients [23]. The scale contains 30 items divided into three parts: General Health Status (GHS) and two subdimensions-Functional Health (FH) and Symptom Scales (SS). Scores for each item range from 0 to 100. Higher scores on the Functional Health and General Health Status subdimensions and lower scores on the Symptom Scales indicate a higher quality of life [23]. Güzelant et al. (2004) conducted a psychometric evaluation of the scale for the Turkish cancer population. [24].

2.3. Statistical Analysis

The Statistical Analysis System (SAS 9.4) software package was utilized to analyze the data collected in this study. Descriptive statistics were presented in tables with means, counts and percentages. To determine whether the data were normally distributed, the Shapiro-Wilk test was applied. The data that satisfied the normality condition was analyzed using parametric tests. Chi-squared test was used to evaluate the difference between anxiety and depression scores before and after radiotherapy. In addition, t-tests were used to assess differences between quality of life and anxiety-depression subdimensions. The effects of sociodemographic, disease-specific, and anxiety-depression subdimensions on QoL subdimensions were assessed by multivariate regression analysis. The results of the

study were evaluated at a significance level of $p < 0.05$ and with a confidence interval of 95 %.

2.4. Ethical Approval

The study was carried out in accordance with the ethical principles outlined in the World Medical Association Declaration of Helsinki. The research was approved by both the hospital' s management (Approval No: 26708535-010.99-E.37923, Date: March 19, 2019) and the Clinical Research Ethics Committee (Approval no: 104, Date: February 6, 2019). All participants were educated about the scope and purpose of the research and informed about their right to decline participation and were assured that their information would be kept confidential. Prior to the commencement of the study, written and verbal consent was obtained from all participants.

3. Results and Discussion

3.1. Results

Out of the 120 patients who were evaluated before radiotherapy, 96 patients completed the questionnaires before and after radiotherapy, resulting in a response rate of 80%. Table 1 presents the sociodemographic and clinical characteristics of the sample group. The study found that 62.5% of patients were worried about receiving radiotherapy (62.5% responded affirmatively to the question "Are you anxious about receiving radiotherapy?"), while 27.1% indicated that their anxiety stemmed from the fear of not being able to manage the side effects of radiotherapy. It was noted that all patients had regular visits with their doctors/nurses during radiotherapy, and 79.2% of them had weekly interviews (Table 1).

Table 1. Sociodemographic and Clinical Characteristics of Patients Undergoing Radiotherapy (n=96)

Variable	n (%)
Age (Mean ± SD) 55.04±10.38 (range: 35 -77)	
Gender	
Female	50 (52.1)
Male	46 (47.9)
Education	
Illiterate	16 (16.7)
Secondary school	59 (61.4)
Higher education	21 (21.9)
Marital Status	
Married	76 (79.2)
Single	20 (20.8)
Employment Status	
Employed	24 (25.0)
Unemployed	72 (75.0)
Income Status	
Income less than expenses	56 (58.3)
Income equal to expenses	32 (33.3)
Income more than expenses	8 (8.4)
Medical Diagnosis	
Lungs	17 (17.7)
Head and Neck	13 (13.5)
Bone and Soft Tissue	8 (8.3)
Breast	36 (37.5)
Stomach	3 (3.2)
Urogenital	19 (19.8)
Metastasis	
Yes	27 (28.1)
No	69 (71.9)
Target of Treatment	
Palliative	18 (18.8)
Adjuvant	49 (51.0)
Curative	29 (30.2)
Radiotherapy area	
Abdomen	5 (5.2)
Head and neck	22 (22.9)
Extremity	1 (1.1)
Pelvis	22 (22.9)
Thorax	46 (47.9)
Chemotherapy	
Yes	54 (56.3)
No	42 (43.7)
Surgery	
Yes	59 (61.5)
No	37 (38.5)
Hormonotherapy	
Yes	15 (15.6)
No	81 (84.4)
Immunotherapy	
Yes	19 (19.8)
No	77 (80.2)
No prior treatment	
Yes	16 (16.7)
No	80 (83.3)
Concomitant disease	
Yes	44 (45.8)
No	52 (54.2)
Nutritional status	
Good	60 (62.5)
Medium	34 (35.4)
Poor	2 (2.1)
Are you anxious about receiving radiotherapy?	36 (62.5)
Yes	36 (37.5)
No	
If yes or partially yes, why are you anxious?	
It does not frighten me	36 (37.5)
Fear of radiotherapy machine	4 (4.2)
Fear that something bad will happen during radiotherapy	12 (12.5)
Fear that radiotherapy will not work	6 (6.3)
No healthcare personnel will accompany me during radiotherapy	1 (1.0)
Fear of inability to cope with side effects that may develop after radiotherapy	26 (27.0)
Lack of information about radiotherapy	11 (11.5)

Did you regularly see your doctor/nurse during radiotherapy?	
Yes	96 (100)
No	0 (0.0)
If yes, how often did you see them?	
Every week	76 (79.0)
Every 15 days	4 (4.0)
Before and after each radiotherapy session	16 (17.0)

The ratio of patients experiencing severe anxiety before radiotherapy was 3.1%, while severe depression was reported in 4.2% of patients. After radiotherapy, although the percentage of patients experiencing normal anxiety increased from 60.4% to 65.6%, the incidence of severe anxiety increased to 10.4%, and severe depression increased to 9.4% (Figure 1). The depression subdimension scores (mild, moderate, severe, normal) did not show a significant difference before and after radiotherapy, whereas the anxiety subdimension scores exhibited a significant difference ($p < 0.05$) (Figure 1).

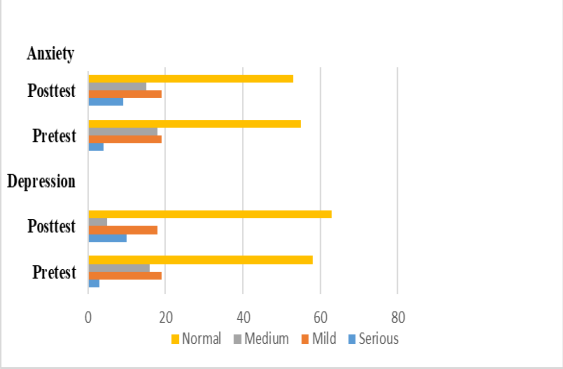

Figure 1. Differences Between Anxiety-Depression Levels of Cancer Patients Before and After Radiotherapy

Mean scores for symptoms of fatigue, nausea, vomiting, insomnia, and loss of appetite were all significantly higher after radiotherapy ($p<0.05$) than before radiotherapy. Subdimension scores of the QoL scale, including the functional subdimension (64.70±23.72), physical (58.61±27.65), and social (57.29±36.58), were lower at post-test (Table 2). Multivariate regression analysis showed that the independent variables of age, metastatic status, chemotherapy, and depression before radiotherapy explained 40% of the physical function subdimension of the QoL scale ($\beta = -0.592$, $\beta = -21.428$, $\beta = 11.900$, $\beta = -2.367$, $p < 0.05$). Marital status, chemotherapy, anxiety, and depression explained 33% of the social function subdimension ($\beta = 15.695$, $\beta = 16.308$, $\beta = -1.862$, $\beta = -2.523$, $p<0.05$). The independent variables of anxiety and depression explained the emotional function subdimension by 52% ($\beta = -3.067$, $\beta = -0.975$, $p < 0.05$). The independent variables of metastasis and depression explained the role function subdimension by 29% ($\beta = -25.392$, $\beta = -2.762$, $p<0.05$) (Table 3).

After radiotherapy, the independent variables of metastasis and depression explained 46% of the physical function subdimension ($\beta = -14.055$, $\beta = -2.491$, $p < 0.05$), 36% of the social function subdimension ($\beta = -16.196$, $\beta = -2.738$, $p < 0.05$), and 41% of the role function subdimension ($\beta = -15.097$, $\beta = -3.231$, $p < 0.05$). Anxiety alone explained 67% of the emotional function subdimension of the QoL scale ($\beta = -4.257$, $p < 0.05$) (Table 4).

3.2. Discussion

Oncology patients undergoing radiation therapy are at a heightened risk for mental health issues, including anxiety and depression, so detecting such issues early can reduce morbidity rates and enhance treatment efficacy [2]. In this study, over half of the patients (62.5%) reported feeling anxious about receiving radiotherapy, with fear of not being able to cope with the side effects (27.1%) being the primary cause of their anxiety. Radiotherapy is a treatment method that involves using advanced technology to expose the patient's body to ionizing radiation in a specialized environment, where the patient is monitored from outside by cameras [25,26]. As a result, patients scheduled to receive radiotherapy for the first time may experience anxiety related to factors such as being confined in a small space, lack of privacy, absence of family members, and insufficient information about the treatment [25,26]. While it is reasonable for patients to be concerned about the management and potential side effects of radiation therapy, steps should be taken to minimize harm to the patient. This study reports on the characteristics of patients who are at risk for such concerns.

No significant difference was found between the depression subdimensions before and after radiotherapy; however, there was a significant difference between the anxiety subdimensions. After radiotherapy, an increase in the number of patients with severe anxiety and depression was observed. In a study conducted by Chow et al. (2019), 66.4% of cancer patients receiving radiotherapy experienced anxiety and 47.7% experienced depression prior to treatment. In contrast, our study found that 39.6% of cancer patients experienced anxiety and 42.7% experienced depression prior to radiotherapy. These rates were lower than those reported by Chow et al. Another study found that the rate of high anxiety before radiotherapy was 48% in breast cancer patients. Possible factors contributing to these differences include cultural differences and regular meetings with healthcare professionals before, during, and after radiotherapy (79.2%), which may have had a positive impact on the rates observed in our study.

Table 2. Investigation of Differences Between QoL and Anxiety-Depression Subdimensions Before and After Radiotherapy

Variable	Time			
	Quality of Life Pretest	Quality of Life Posttest		
	Mean (SD)	Mean (SD)	t	p
Symptom Score	29.17 (19.44)	34.37 (21.16)	-3.02	0.003
Fatigue	45.25 (28.76)	52.43 (30.53)	-2.77	0.006
Nausea-Vomiting	11.63 (20.25)	17.01 (24.66)	-2.09	0.039
Pain	33.33 (33.25)	38.37 (32.99)	-1.53	0.128
Shortness of Breath	16.67 (25.13)	20.49 (30.73)	-1.31	0.193
Insomnia	35.76 (35.29)	44.79 (37.72)	-2.77	0.006
Loss of Appetite	20.83 (27.04)	28.47 (33.50)	-2.35	0.021
Constipation	25.69 (32.97)	23.26 (31.76)	0.76	0.450
Diarrhea	11.81 (23.18)	17.01 (27.36)	-1.52	0.132
Financial Difficulty	42.71 (38.30)	44.79 (38.94)	-0.75	0.456
Functional Health	69.81 (20.61)	64.70 (23.72)	3.28	0.001
Physical Function	65.00 (27.73)	58.61 (27.65)	3.61	0.000
Role Function	77.08 (30.99)	71.87 (33.88)	1.87	0.064
Emotional Function	71.27 (22.09)	67.62 (27.65)	1.62	0.107
Cognitive Function	76.04 (24.04)	74.31 (28.60)	0.91	0.364
Social Function	65.45 (32.74)	57.29 (36.58)	2.59	0.011
General Health Function	62.67 (21.15)	60.33 (22.81)	1.06	0.290
Anxiety	6.49 (4.06)	6.32 (5.00)	0.41	0.682
Depression	7.01 (4.49)	7.08 (5.37)	-0.18	0.861

To positively impact patient outcomes, it is important for oncology nurses to create individualized holistic care programs for patients receiving radiotherapy [29,30].

A study conducted on male patients receiving curative radiotherapy for prostate cancer showed that a nurse-led group intervention had relative benefits in reducing depression symptoms and procedural concerns. In this study, moderate reductions were observed in depressive symptoms and procedural concerns for the group that received individual consultations [31], which means that nurses should devise plans to develop such programs to improve patient well-being and quality of life.

Following radiotherapy, there was a significant decrease in the mean scores of functional health and physical function subdimensions, while there was a significant increase in the mean scores of symptom subdimensions, particularly for symptoms like fatigue, nausea-vomiting, and insomnia. This decline in quality of life is associated with the disease and the response to treatment in cancer patients, which may adversely affect survival rates [32,33]. In our study, a significant number of cancer patients reported symptoms of anorexia, nausea-vomiting, fatigue, and insomnia. The study results indicate that the main factors contributing to these symptoms were receiving radiation therapy to the chest (47.9%) or head and neck (22.9%) and having a history of chemotherapy (56.3%). In addition, 37.5% of patients had breast cancer, and a previous study reported that 31% of breast cancer patients undergoing radiotherapy had Grade 2 esophagitis, which adversely affected their nutrition and caused anorexia [34]. The type of cancer, the area treated with radiotherapy, and the associated symptoms are important determinants of the quality of life in cancer patients. Therefore, a comprehensive individualized care plan should be devised for each patient [17, 34-36].

The quality of life in various subdimensions prior to radiotherapy was affected by different factors such as

Table 3. Regression Results for QoL Scale by Subdimensions Before Radiotherapy

	Physical Function		Social Function		Emotional Function		Role Function	
Variable	**Beta**	**p**	**Beta**	**p**	**Beta**	**p**	**Beta**	**p**
Age	-0.592	0.020	0.125	0.688	0.184	0.303	-0.258	0.397
Gender	8.648	0.114	-0.740	0.912	4.095	0.293	6.848	0.301
Marital Status	-0.373	0.949	15.695	0.036	2.469	0.560	2.668	0.711
Employment Status	1.398	0.808	-1.744	0.8084	-0.932	0.821	3.683	0.599
Metastasis	-21.428	0.000	-11.487	0.0904	-5.735	0.139	-25.392	.0002
Chemotherapy	11.900	0.045	16.308	0.028	-0.054	0.989	9.207	0.199
Surgery	-4.364	0.477	6.278	0.412	-4.061	0.355	-4.847	0.516
Immunotherapy	0.633	0.920	1.205	0.878	-0.637	0.887	1.055	0.890
Hormonotherapy	4.709	0.464	-0.088	0.991	4.686	0.309	7.499	0.339
Prior treatment	6.610	0.457	15.737	0.158	3.000	0.636	3.275	0.762
Concomitant Disease	-6.008	0.221	3.480	0.568	0.468	0.893	-5.538	0.352
Anxiety about receiving radiotherapy	-1.459	0.631	1.052	0.781	0.775	0.721	0.882	0.811
Anxiety before RT	0.189	0.790	-1.862	0.038	-3.067	<.0001	0.470	0.587
Depression before RT	-2.367	0.000	-2.523	0.002	-0.975	0.038	-2.762	.0008
Adjusted R2	0.404		0.335		0.520		0.294	

Table 4. Regression Results of QoL Scale by Subdimensions After Radiotherapy

	Physical Function		Social Function		Emotional Function		Role Function	
Variable	**Beta**	**p**	**Beta**	**p**	**Beta**	**p**	**Beta**	**p**
Age	-0.407	0.087	-0.202	0.552	0.194	0.295	0.077	0.798
Gender	0.820	0.878	-5.622	0.467	-7.607	0.071	-7.206	0.293
Marital status	-0.868	0.875	11.769	0.144	-8.016	0.068	5.414	0.446
Employment status	-2.521	0.643	1.354	0.863	2.157	0.612	-4.355	0.531
Metastasis	-14.055	0.007	-16.19	0.031	-1.980	0.623	-15.097	0.024
Chemotherapy	6.270	0.261	2.734	0.733	-1.431	.0742	10.579	0.139
Surgery	0.867	0.880	-1.198	0.885	-5.300	0.242	-3.058	0.678
Immunotherapy	3.467	0.563	5.378	0.533	2.811	0.548	6.511	0.395
Hormonotherapy	-2.180	0.730	-0.638	0.944	-1.289	0.794	0.973	0.904
Prior treatment	0.791	0.925	-2.621	0.829	-5.044	0.445	14.105	0.193
Concomitant Disease	-3.436	0.470	6.212	0.365	-7.003	0.062	-9.457	0.122
Anxiety after RT	-0.505	0.491	-1.502	0.157	-4.257	<.0001	-0.201	0.830
Depression after RT	-2.491	0.0003	-2.738	0.004	-0.371	0.472	-3.231	0.0002
Adjusted R2	0.462		0.361		0.671		0.415	

patients' age, marital status, chemotherapy, anxiety, and depression levels. The study observed that anxiety levels of patients were linked to the social and emotional function subdimensions, while depression levels affected all QoL subdimensions. According to a previous study on head and neck cancer patients, the pre-radiotherapy anxiety rate was 23.3%, and the depression rate was 28.3%, and the mean score of the emotional sub-dimension of quality of life was higher than the mean score obtained after radiotherapy [1].

The difference between our results and the findings of this previous study could be attributed to the inclusion of all patients diagnosed with cancer in the sample group, cultural differences, and the high rate of patients diagnosed with breast cancer in our study. The overall differences in quality of life physical function, social function and emotional function subdimensions after radiotherapy were explained by

the presence of metastases, anxiety and depression. Previous studies have reported that increasing levels of anxiety and depression can reduce the quality of life in cancer patients, particularly in the elderly [4,34]. While similar studies have examined this issue in general cancer populations, our study focused specifically on cancer patients undergoing radiotherapy. We found that middle-aged patients, patients with metastatic cancer, and those who felt lonely during radiotherapy were more likely to experience anxiety, depression, and a deterioration in quality of life. It is essential to support and monitor these patients during the radiotherapy process, and oncology nurses should provide individualized care to improve patient outcomes. One limitation of our study is the lack of interim monitoring of cancer patients during radiotherapy. However, the strength of our study is that we used the same sample to evaluate patients before and after radiotherapy.

4. Conclusion

The findings of this study highlight the significant impact of age, chemotherapy, presence of metastasis, anxiety, and depression on the quality of life of cancer patients undergoing radiotherapy. As a result, it is crucial for oncology nurses to closely monitor and evaluate the psychological well-being of these patients and provide tailored care that addresses their unique needs. By adopting a patient-centered approach, healthcare professionals can help improve the overall quality of life of cancer patients and enhance their treatment outcomes.

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