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# Radiation oncology knowledge levels among nurses working in oncological branches

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► ***Original article***

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## ABSTRACT

***Background***: The objective of the present study is to evaluate the radiation oncology knowledge level among nurses working in oncological branches. ***Materials and Methods:*** A questionnaire inquiring about the radiation oncology knowledge level of nurses was developed and applied. Participants were composed of nurses working in oncology-related branches in a University Hospital. Fifty-eight nurses participated in the survey and answers were analyzed. ***Results:*** The vast majority of nurses (93.2%) stated that their knowledge about radiation oncology was inadequate. Furthermore, nurses with work experience of 12 years and more, who were defined as an experienced group, gave statistically significantly better answers to the three questions which were about the curative indications of radiotherapy (p=0.001), its use in oncological emergencies (p=0.01), and radiotherapy equipment (p=0.01). ***Conclusions:*** Nurses from different oncological branches will come across with many patients receiving radiotherapy during the course of their professional life. It is of great significance for nurses to be aware of the general aspects and side effects of radiation therapy as one of the main modalities in oncology. It must be considered to create both graduate and post-graduate education programs about radiation oncology to increase the exposure among nurses.

## INTRODUCTION

Cancer incidence and cancer-related mortality are steadily increasing worldwide. According to the 2020 data, 1.806.590 new cases and 606.520 cancer-related deaths in the United States have been estimated [1]. Surgery, chemotherapy, and radiotherapy are the main modalities of cancer treatment. As a consequence of developments in radiation oncology and medical oncology, individualized patient care and support have become of great importance in ensuring the quality of oncological treatment [2]. Having sufficient knowledge about cancer and its treatment methods by health professionals will make the process easier for patients [3]. The ability to adapt rapidly changing needs of patients during the treatment and specialized nursing skills are required to provide better healthcare [2]. In radiation oncology clinics, most patients receive radiotherapy as outpatients. In the absence of hospitalization, the need for the education and support that patients will receive becomes even more important [4]. Patients and families often lack sufficient information regarding the side effects of cancer treatment and how to deal with them effectively. Therefore, education, support and care given by oncology nurses are substantial [5].

Nursing education in Turkey has shown significant progress since the 1920s. Especially after the 1950s, nursing education was upgraded to a bachelor's degree and further enhanced with master's and doctorate programs [6]. After the 12-year basic education consisting of elementary, middle, and high school education, nursing undergraduate education in Turkey takes four years [7]. In Turkey, post-graduate programs in nursing are surgery, gynecology & obstetrics, pediatrics, public health, oncology, and forensics. However, radiation oncology does not exist in most curricula, and nurses have very low exposure to the radiation oncology discipline [8]. In terms of post-graduate training courses, symposiums, and congress for nurses working in oncological treatment branches are very few in Turkey. Furthermore, nurses face difficulties in availing of these opportunities due to work-related and financial constraints. Apart from survey studies evaluating the knowledge of palliative radiotherapy among nurses, the current literature is inadequate in evaluating the radiation oncology knowledge level of nurses working in oncology-related branches [9].

The exposure of nurses to radiation oncology knowledge should be increased to optimize cancer treatment. Increasing the awareness of oncological branch nurses about radiotherapy will help to improve the outcomes of cancer patients. We aimed to appraise the radiotherapy knowledge level of nurses working in oncological branches. The consequences of our study will be able to contribute to related studies focusing on radiation oncology knowledge levels among oncology nurses.



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## MATERIALS AND METHODS

Fifty-eight nurses included in the study were working in medical oncology, hematological oncology, and pediatric hematology-oncology departments at the University Hospital. Nurses with less than a year of professional experience and nurses who had worked in the radiation oncology department before were excluded from the study. The participants consisted of 56 (96.6%) females and two males (3.4%) and aged "between" 22-54 (median: 32) were surveyed with face-to-face questionnaires for their knowledge of radiation oncology. The questionnaire was created by radiation oncology doctors and nurses and was conducted at University Hospital in October 2020.

To evaluate the applicability and comprehensibility of the questionnaire, a preliminary draft survey was conducted with six nurses. The final questionnaire consists of nine questions to define the profile of the participants and 13 questions to evaluate the knowledge level of nurses about radiation oncology. Demography-related questions were asked to gather information about gender, age, experience, and expertise. Appointments were made with the nurses working in different units on different days. The survey was applied to a total of 58 nurses and completed in three days.

Descriptive analyzes were used to identify the profile of the participants. The Chi-square test was utilized for comparisons between groups. P values <0.05 were taken into account statistically significant. Statistical analyses were implemented utilizing the IBM SPSS Statistics version 24.0 software. (Armonk, NY: IBM Corp. 2016).

## RESULTS

The nurses were working in the hematological oncology, medical oncology, and pediatric hematology-oncology departments (21, 23, and 14 nurses respectively). More than half of the nurses included in this study (63%) were graduates, 21% of the nurses had master's degrees, whereas 16% of the nurses completed only secondary education. The mean of the experience (years of working) of the nurses was 12 years. Twenty-one nurses were working for 12 years and more, and these nurses were identified as the more experienced group. The mean experience was 7.2 years, and only 21% of the total had oncology certificates. Merely four of the 58 nurses indicated their knowledge of radiation oncology was adequate. Only five nurses answered "yes" to the question asked about whether they have participated in a radiation oncology symposium and/or seminar previously (table 1). The rate of those who stated that the patients' emitted radiation after external radiotherapy was 51.7%, and those who thought that radiation oncology is a side branch of radiology was 53.4%. While 91.4% of the participants thought that radiotherapy can be used in pediatric patients, the percentage of participants who answered that radiotherapy could also be used in benign diseases was 51.7% (table 2).

**Table1.** Participant Profiles.

| Characteristics | n | % |
|---|---|---|
| **Gender** | | |
| Male | 2 | 3.5 |
| Female | 56 | 96.5 |
| **Age (years)** | | |
| 18-39 | 41 | 70.6 |
| 40-59 | 17 | 29.4 |
| **Occupational Experience** | | |
| 1-12 | 37 | 63.8 |
| >12 | 21 | 36.2 |
| **Working Department** | | |
| Medical Oncology | 23 | 39.7 |
| Pediatric Hematology-Oncology | 14 | 24.1 |
| Hematological Oncology | 21 | 36.2 |
| **Is your knowledge of radiotherapy adequate?** | | |
| Yes | 4 | 6.8 |
| No | 54 | 93.2 |
| **Symposium, congress or conference participation** | | |
| Yes | 5 | 8.6 |
| No | 53 | 91.4 |

Because of rounding, percentages may not be exactly total 100.

**Table 2.** Responses of the participants on general knowledge of radiotherapy and comparison of these responses according to 12 years of nursing experience.

| Survey | Total N (%) | <12 years N (%) | ≥12 years N (%) | P Value |
|---|---|---|---|---|
| **Is Radiation Oncology a branch of radiology?** | | | | |
| Yes | 31 (53.4) | 21 (56.7) | 10 (47.6) | 0.76 |
| No | 25 (43.1) | 15 (40.5) | 10 (47.6) | |
| No comment | 2 (3.4) | 1 (2.8) | 1 (4.8) | |
| **Do patients emit radiation after external radiotherapy?** | | | | |
| Yes | 30 (51.7) | 21 (56.7) | 9 (42.8) | 0.28 |
| No | 27 (46.6) | 16 (43.3) | 11 (52.4) | |
| No comment | 1 (1.7) | 0 | 1 (4.8) | |
| **Do radiotherapy workers have to carry dosimeters on them in daily practice?** | | | | |
| Yes | 52 (89.7) | 31 (83.7) | 21 (100) | 0.05 |
| No | 6 (10.3) | 6 (16.3) | 0 | |
| **Is External Beam Radiation Therapy a painful procedure?** | | | | |
| Yes | 13 (22.4) | 8 (21.6) | 5 (23.8) | 0.84 |
| No | 45 (77.6) | 29 (78.4) | 16 (76.2) | |
| **Can radiation therapy be used for pediatric patients?** | | | | |
| Yes | 53 (91.4) | 32 (86.4) | 21 (100) | 0.21 |
| No | 4 (6.9) | 4 (10.8) | 0 | |
| No comment | 1 (1.7) | 1 (2.8) | 0 | |
| **Can radiation therapy be used in the treatment of benign disorders?** | | | | |
| Yes | 30 (51.7) | 20 (54.0) | 10 (47.6) | 0.84 |
| No | 26 (44.8) | 16 (43.2) | 10 (47.6) | |
| No comment | 2 (3.4) | 1 (2.8) | 1 (4.8) | |
| **Which one is not a radiation oncology practice?** | | | | |
| Tomotherapy | 3 (5.1) | 3 (8.1) | 0 | 0.01 |
| Cyberknife | 7 (12) | 5 (13.5) | 2 (9.5) | |
| Positron Emission Tomography | 23 (39.6) | 9 (24.3) | 14 (66.6) | |
| Boron Neutron Capture Therapy | 6 (10.3) | 3 (8.1) | 3 (14.3) | |
| Brachytherapy | 14 (24.1) | 13 (35.2) | 1 (4.8) | |
| No Comment | 5 (8.6) | 4 (10.8) | 1 (4.8) | |

Because of rounding, percentages may not be exactly total 100.



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All nurses participating in the study knew that radiotherapy can be used in the palliative treatment of bone metastases, and 19% of the nurses falsely thought that radiotherapy has a place in the treatment of febrile neutropenia. Whereas 79.3% of the participants gave the right answer to the question evaluating the head and neck cancer radiotherapy acute side effects, only 15.5 % of the participants knew the question evaluating the chronic side effects of radiotherapy on brain tumors (table 3).

**Table 3.** Responses of the participants for side effects and indications of radiation therapy and comparison of these responses according to 12 years of nursing experience.

| Survey | Total N (%) | <12 years N (%) | ≥12 years N (%) | P Value |
|---|---|---|---|---|
| **Which is an acute side effect of radiotherapy in head and neck cancers?** | | | | |
| Rectal irritation | 1 (1.7) | 1 (2.8) | 0 | 0.59 |
| Dysphagia | 46 (79.3) | 27 (72.8) | 19 (90.4) | |
| Diarrhea | 5 (8.6) | 4 (10.8) | 1 (4.8) | |
| Bladder irritation | 5 (8.6) | 4 (10.8) | 1 (4.8) | |
| No comment | 1 (1.7) | 1 (2.8) | 0 | |
| **Which is a long-term side effect of radiotherapy in brain malignancies?** | | | | |
| Nausea and Vomiting | 9 (15.5) | 7 (18.9) | 2 (9.5) | 0.78 |
| Headache | 29 (50) | 18 (48.7) | 11 (22.3) | |
| Cognitive disorders | 9 (15.5) | 5 (13.5) | 4 (19.1) | |
| Oral mucositis | 11 (19) | 7 (18.9) | 4 (19.1) | |
| **In which oncologic situation radiotherapy is not being used?** | | | | |
| Bone metastasis | 0 | 0 | 0 | 0.35 |
| Vena Cava Superior Syndrome | 10 (17.2) | 8 (21.6) | 2 (9.6) | |
| Brain metastasis | 1 (1.7) | 1 (2.8) | 0 | |
| Febrile neutropenia | 47 (81) | 28 (75.6) | 19 (90.4) | |
| **Is there an oncological condition that requires urgent radio-therapy?** | | | | |
| Yes | 35 (60.3) | 18 (48.6) | 17 (80.9) | 0.01 |
| No | 23 (39.7) | 19 (51.4) | 4 (19.1) | |
| **What is radiotherapy given after surgery called?** | | | | |
| Adjuvant | 44 (75.9) | 26 (70.2) | 18 (85.7) | 0.18 |
| Neoadjuvant | 14 (24.1) | 11 (29.8) | 3 (14.3) | |
| **In which cancer radiotherapy has no curative role?** | | | | |
| Colon cancer | 22 (37.9) | 7 (18.9) | 15 (71.5) | 0.001 |
| Cervix cancer | 7 (12) | 7 (18.9) | 0 | |
| Prostate cancer | 10 (17.2) | 8 (21.6) | 2 (9.5) | |
| Nasopharynx cancer | 15 (25.8) | 13 (35.1) | 2 (9.5) | |
| No comment | 4 (6.9) | 2 (5.4) | 2 (9.5) | |

Because of rounding, percentages may not be exactly total 100.

The percentage of participants who correctly stated the question considering oncological emergencies was 60.3% and significantly better in the more experienced group (p = 0.01). Regarding the question about curative indications of radiotherapy, 37.9% of the nurses specified that colon cancer is not one of the malignancies in that radiotherapy is curatively used. Similar to the previous question, the answers of the nurses of the experienced group were significantly better (p = 0.001). The inquiry about radiation oncology practices was also responded significantly better by the experienced group (p = 0.01).

## DISCUSSION

In the management of oncology patients, it is essential to be aware of every aspect of treatment and radiotherapy is a quite specific branch in this subject. In the current literature, there are few studies evaluating knowledge level and awareness among healthcare professionals, but generally, there is an inadequate evaluation for nurses [9, 15]. Nurses carry out a critical role in the management of side effects of radiotherapy, patient education, and communication with the radiation therapy team. Despite these important roles, only a small proportion (6.8%) of nurses thought their knowledge adequate in the current study. Similarly, in a study conducted by Fairchild *et al.*, referring healthcare professionals' self-rated knowledge was found good with only 1.6% [15].

Nurses working in all clinical branches, including oncology, should be aware of the potential toxicities of the methods used in cancer treatment, particularly radiotherapy. Timely interventions, recognition of symptoms, and managing side effects require teamwork and nurses are often the first to encounter with those [10]. Thus, they need to be able to notice the acute side effects including fatigue, skin reactions, and mucosal reactions [11]. The question regarding this subject was answered accurately by the majority, while the question about chronic side effects was answered correctly only by a small number. This can be elucidated by the limited role of nurses in long-term follow-up.

For all healthcare professionals especially nurses and doctors, experience is very important in detecting alterations in the condition of patients [12]. The experienced group gave significantly better answers to the three questions, about the curative indications of radiotherapy, its use in oncological emergencies, and radiotherapy devices. This could be a result of higher exposure to radiation oncology associated with more years of experience.

Palliative radiotherapy is effective in the alleviation of symptoms in advanced-stage diseases and can be utilized in pain, bleeding, compression, and obstruction symptoms [13, 14]. Although febrile neutropenia is not one of the palliative radiotherapy indications, 19% of the nurses stated that it can be utilized in this situation. Hayden et al. reported similar results about the same topic (20.5% incorrect answers). Likewise, Hayden et al. reported that vaguely less than half of the nurses surveyed accurately responded to the question if patients emit radiation after external radiation therapy [9].

Increasing training courses for nurses is another important element in managing cancer treatment which consequently improves the adverse effects and reduces hospitalization rates [16]. In undergraduate nursing education, cancer patients' care is generally



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insufficient [17]. In addition, time devoted to training for specific areas such as radiotherapy is limited in the curriculum [18]. This situation was similar in our study, with a majority of the participants stating that their radiotherapy knowledge was inadequate for their needs.

Education programs in oncology nursing are insufficient worldwide. In less developed countries, the workforce and resources for nursing education are in lack [19]. However, in high-income countries, for example, in North America, there is an internship program that enables nurses to gain experience in oncology clinics during the licensing process [20]. It is thought that implementing similar programs in developing countries will increase the quality of care for oncology patients.

On the other hand, some limitations should be taken into account. Nurses from only a single institution were questioned and these results represent the curricula in Turkey. It could have been helpful to include more centers for similar studies. Furthermore, to include nurses from other oncological branches such as gynecology and uro-oncology could enhance the strength of study in various contexts.

In conclusion, the knowledge levels of oncology nurses about radiation oncology were limited. General aspects, treatment courses, and side effects of radiotherapy should be known by healthcare professionals, especially nurses. For this purpose, radiation oncology lectures should be increased in the curriculum, and more exposure should be provided through training projects such as conferences, symposiums, and e-learning. Moreover, creating a radiation oncology nursing specialization program will nurture the best-educated nurses in this subject.

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***Author's contributions*:** TK, RA and EA devised the study. YS and FK identified eligible patients and collected data. YS, RA, and EA analyzed the data. TK, RA, EA and AFK were the major contributors to writing of the manuscript. All authors read, edited, and approved the final manuscript.

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