

Radiation and Radiation Protection Awareness among Medical Imaging Program Students



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ABSTRACT: With the technological developments in the field of health, the use of radiation in medicine is increasing day by day. The radiation awareness of healthcare personnel working in radiation is also very important in terms of both their own protection and the protection of patients from radiation. The aim of this study is to reveal the level of knowledge about radiation and radiation protection of students from Çanakkale Onsekiz Mart University Vocational School of Health Services, which provides Medical Imaging and Radiology education in Çanakkale province, who are doing practice/internship/skill training in diagnostic radiology units of hospitals and whether this awareness differs according to various individual and demographic characteristics. For this purpose, a questionnaire including both demographic characteristics and the scale was applied to 189 university students to obtain the data set. For the statement "I have knowledge about X-rays", 3.2% of the 1st grade students strongly disagreed, 8.4% were undecided, 69.5% agreed, 4.2% disagreed and 14.7% strongly agreed, while 1.1% of the 2nd grade students strongly disagreed, 2.1% were undecided, 75.5% agreed and 20.1% strongly agreed ($p=0.04$). In general, no difference was found between the 1st and 2nd grades when the level of knowledge about radiation and radiation protection was evaluated. In order to reinforce the topics related to radiation, it would be useful to repeat the topics frequently in the courses and to prepare current presentations by experts in the field and to present them as seminars within the scope of in-service training for both students and Radiology Technicians professionally.

KEYWORDS: Radiation, Radiation safety, Radiation protection

I. INTRODUCTION

Radiation is energy emitted or transmitted in the form of waves or particles that can penetrate materials and people. Radiation is of two types: ionizing and non-ionizing (Tuieng *et al.* 2021). High-energy ionizing waves can damage genetic and DNA material by altering molecules in biological tissues (Senemtaşı Ünal *et al.* 2018). Computed tomography (CT), which uses X-rays, is currently the most widely used method using ionizing radiation in medical diagnosis. CT scans provide more detailed information than standard X-ray examinations (Shi & Tashiro 2018).

Radiation protection involves protecting people and their environment from the harmful effects of ionizing radiation. There are three rules in radiation protection: distance, exposure time and protection. The dose rate (intensity) of radiation increases as you get closer to the radiation source. Time and radiation exposure are interrelated. There must be a protective material between the worker and the source (Kim 2018).

Although ionizing radiation used for both imaging of diseases and treatment provides benefits, it also brings risks. The radiation awareness of healthcare personnel working in a radiated environment is also very important in terms of both their own protection and the protection of patients from radiation. In order for healthcare personnel to be competent in radiation protection, they must first know radiation and the relationship between radiation and the devices used (Paolicchi *et al.* 2016). Previous studies have also shown that the adequacy of the theoretical knowledge of the staff triggers their self-confidence in practical applications (Saracli & Ulucan 2021, Shafiq & Mehmood 2024).

This study aims to determine the level of knowledge about radiation and radiation protection of the students from Çanakkale Onsekiz Mart University Vocational School of Health Services, which provides Medical Imaging and Radiology education in Çanakkale province, who are doing practice/internship/skill training in diagnostic radiology units of hospitals and whether there is a difference in the assessment of this awareness according to various individual and demographic characteristics.

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II. RESEARCH METHODS

This descriptive study was conducted between Oct 01, 2023 and Feb 20, 2024. A questionnaire form created by the researchers in line with the literature review was used to obtain the study data (Mahabob et al., 2021). The questionnaire form was delivered to the participants as an online survey. Prior to the study, approval was obtained from the Republic of Turkey Çanakkale Onsekiz Mart University Rectorate Graduate Education Institute Ethics Committee / Scientific Research Ethics Committee with the decision number 2023-YÖNP-0305, dated 14.04.2023 and E-84026528-050.01.04-2300088928 document registration number. The questionnaire form consisted of 47 questions aiming to measure the demographic characteristics of the participants (age, gender, department and grade) and their knowledge about the effects of radiation protection. Previous research suggests that Likert scale type questionnaire, ranging from 1 'strongly disagree' to 5 'strongly agree' (Saracli & Ulucan 2021). The population of the study consisted of Çanakkale Onsekiz Mart University Vocational School of Health Services students (n=189) who went to diagnostic radiology units of hospitals in Çanakkale province for internship/practice/skill training. No sample was selected and the entire study population was included in the study. Participants were asked to answer the questions in the form created by the responsible workers. The questionnaire form was not opened on the screen of those who did not accept online consent.

Statistical analysis: The data obtained from the study were analyzed using SPSS 19.0 software package (SPSS Inc., Chicago, IL, USA). In the analyses, descriptive findings, number and percentage distributions, mean and standard deviations were given; analytical statistics will be evaluated with Independent Groups t Test, Chi-Square Tests. $p < 0.05$ will be considered statistically significant and the data were evaluated at 95% confidence interval.

III. RESULTS

The mean age of the 1st grade was 19.91 ± 3.62 , while the mean age of the 2nd grade was 20.17 ± 1.57 ($p=0.51$). While 71.6% of the 1st graders were female, 72.3% of the 2nd graders were female. There was no statistical gender difference between the classes ($p=0.51$) (Table 1.).

	1ST GRADE	2ND GRADE	P Value
Age (Mean±SD)	19.91±3.62	20.17±1.57	0.51
Gender			0.51
Male (n,%)	27 (28.4)	26 (27.7)	
Female (n,%)	68 (71.6)	68 (72.3)	

In the 5th question of the survey, the question asked to the students was "I have knowledge about X-rays." While 3.2% of the first year students answered that they strongly disagreed, 8.4% were neutral, 69.5% agreed, 4.2% disagreed, and 14.7% completely agreed, 1.1% of the second year students said they did not agree at all. , 2.1% answered that they were undecided, 75.5% agreed and 20.1% answered that they completely agreed ($p = 0.04$).

In the 18th question of the survey, students were asked: "We are exposed to radiation even without having an examination involving radiation." While 5.3% of first year students answered that they strongly disagreed, 5.3% were neutral, 56.8% agreed, 7.4% disagreed, and 25.3% completely agreed, 19.1% of second year students were undecided. 47.9% answered that they agreed, 2.1% disagreed and 30.9% answered that they completely agreed ($p=0.03$).

In the 30th question of the survey, students were asked: "There is no radiation in Magnetic Resonance (MR)." While 9.5% of first-year students answered that they strongly disagreed, 4.2% were neutral, 20.0% agreed, 17.9% disagreed, and 48.4% completely agreed, 10.6% of second-year students said they did not agree at all. , 1.1% answered that they were undecided, 38.3% agreed, 6.4% disagreed, and 43.6% answered that they completely agreed ($p=0.03$).

There were no statistical differences between groups in other survey questions.

IV. DISCUSSION

In general, no difference was found between the 1st and 2nd graders in terms of their level of knowledge about radiation and radiation protection. However, a statistical difference was observed between the 1st and 2nd grades in terms of their answers to three questions. The reason for this is that the 1st graders have just taken both theoretical and practical courses on radiation.

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This study also has some limitations. First of all, even though the scale in the questionnaire was prepared by utilizing previous studies, the reliability of this scale may vary according to different samples. However, this can be a reference for further research to test the radiation protection knowledge of university students. Future studies should increase the reliability and significance of this study. Secondly, the data here are collected from students at the University at specific date intervals. Even if the sample size is adequate for this study, the results may differ for different samples.

A study conducted in England showed that medical students have insufficient knowledge about radiation hazards and protection from them. Additionally, knowledge did not improve as seniority increased (Khan *et al.* 2019). A study conducted on 518 medical students in Saudi Arabia found that approximately 60% of participants did not know the radiation dose of a common imaging method such as a chest X-ray. Almost half of the students (49.6%) had no idea that a radiological examination, such as an abdominal computed tomography (CT) scan, may be associated with the risk of fatal cancer when performed more than once (Alturki *et al.* 2020). A study conducted in Norway showed that medical students' knowledge about radiation protection and its dangers is very poor (Kada 2017). An Irish study shows that students who studied radiology had a significantly higher number of correct answers than those who did not (59.7% vs 38%, $p < 0.001$) (O'Sullivan *et al.* 2010). Saracli *et al.* *that* their study on examining the effects of radiation awareness on radiation protection with structural equation modeling, they surveyed a total of 3400 students. They showed that Radiation Safety Knowledge had statistically significant effects on students' radiation protection knowledge (Saracli & Ulucan 2021). As a result of our study, in general, no difference was found between the 1st and 2nd grades when their knowledge levels regarding radiation and radiation protection were evaluated. However, a statistical difference was observed between 1st and 2nd graders in terms of their answers to three questions. The reason for this is that 1st graders have just taken both theoretical and practical courses on radiation.

V. CONCLUSIONS

As a result, in order to reinforce the subjects related to radiation, it will be beneficial to repeat the topics frequently in the courses and to present current presentations as seminars within the scope of in-service training for both students and professional Radiology Technicians by preparing them by experts in the subject.

ACKNOWLEDGMENT

This study was funded by the Scientific and Technological Research Council of Turkey (TUBITAK) 2209-A Grant No: 1919B012301028.

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