ORİJİNAL ARAŞTIRMA ORIGINAL RESEARCH

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Nurses' Perspectives on Radiation: Drawing Expressions

Hemşirelerin Radyasyona Bakış Açıları: İfade Çizimi

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ABSTRACT Objective: Nurses constitute an important part of health care workers and can be exposed to more radiation in their work areas. The purpose of this study was to determine the nurses' perspectives on radiation. **Material and Methods:** Qualitative and quantitative research methods were used together in the study. The sample group consisted of 109 nurses (83 females, 26 males) working in different departments of Erzurum Regional Training and Research Hospital. Purposeful sampling method was used in the study. The questionnaire was prepared by the researcher and applied between June 2018-August 2018. Semi-structured interviews were conducted with 20 nurses to get more detailed information from the nurses. The drawings were divided into thematic categories and analyzed. The data obtained from the study were analyzed with SPSS 21.0 package program by using number, percentage, means, standard deviation, min-max, chi-square methods. In the analysis of the interviews, descriptive analysis method was used by using direct quotations. **Results:** There was no statistically significant difference between demographic characteristic of the nurses and their drawing ($p>0.05$). Since radiation is an abstract concept, it is observed that nurses have difficulty in radiation drawings. The nurses mostly drew a radiation warning sign, a symbol of death's head, wave, mobile phone, and roentgen or tomography machines. In interviews, it was determined that nurses looked at radiation with fear. **Conclusion:** The majority of nurses see radiation as terrible and lethal. Therefore, education programs can be organized to nurses for looking at radiation from the right perspective.

Keywords: Drawing expressions; nurses perspectives; radiation

ÖZET Amaç: Hemşireler, sağlık çalışanlarının önemli bir bölümünü oluştururlar ve çalışma alanlarında fazla radyasyona maruz kalabilirler. Bu çalışmanın amacı, hemşirelerin radyasyona olan bakış açılarını tespit etmektir. **Gereç ve Yöntemler:** Araştırmada nitel ve nicel araştırma yöntemleri birlikte kullanılmıştır. Örneklem grubunu Erzurum Bölge Eğitim ve Araştırma Hastanesi'nde farklı birimlerde çalışan toplam 109 (83 kadın, 26 erkek) hemşire oluşturmuştur. Çalışmada amaçlı örnekleme yöntemi kullanılmıştır. Çalışmanın anketi araştırmacı tarafından hazırlanmış ve Haziran 2018-Ağostos 2018 tarihleri arasında uygulanmıştır. Çalışmada ayrıntılı bilgi elde etmek amacıyla 20 hemşire ile yarı-yapılandırılmış görüşme yapılmıştır. Çizimler tematik kategorilere ayrılarak analiz edilmiştir. Çalışmadan elde edilen veriler SPSS 21,0 paket programında tanımlayıcı istatistiksel analiz; sayı, yüzde, ortalama, standart sapma, min-max, ki-kare yöntemleri kullanılarak değerlendirilmiştir. Görüşmelerin analizinde ise doğrudan alıntılar kullanılarak betimsel analiz yöntemi kullanılmıştır. **Bulgular:** Hemşirelerin demografik özellikleri ile çizimleri arasında istatistiksel olarak anlamlı bir fark bulunmamıştır ($p>0,05$). Radyasyonun soyut bir kavram olmasından dolayı hemşirelerin radyasyon çizimlerinde zorlandıkları görülmüştür. Hemşirelerin çoğunlukla radyasyon uyarı işareti, kuru kafa sembolü, dalga, cep telefonu ve röntgen veya tomografi makineleri çizdikleri belirlenmiştir. Görüşmelerde hemşirelerin radyasyona korku ile baktığı tespit edilmiştir. **Sonuç:** Hemşirelerin çoğu, radyasyonu tehlikeli ve öldürücü olarak görmektedir. Bu nedenle hemşirelerin radyasyona doğru bakış açısıyla bakabilmeleri için hemşirelere yönelik eğitim programları düzenlenebilir.

Anahtar Kelimeler: Çizim ifadeleri; hemşirelerin bakış açıları; radyasyon

Significant developments in technology have reached the health system quickly and started to medical use of radiation effectively.[1] More than 10 million radiological images per day are obtained in the world.[2] Use of radiation for medical examinations and tests is the largest manmade source of radiation exposure.[3] Radiation has been beneficial in diagnosis and treatment in diseases but it has been revealed that it can be harmful to human health.[4] Nowadays, it is not possible to avoid the effects of radiation. Accordingly, health workers are at great risk to be exposed to the effects of radiation.[5] Health workers may have incorrect or inadequate information about radiation, even if they work in the field of radiation.[6-8]

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Nurses are highly trained and skilled health professionals.[9] In health care, nurses undertake very important tasks as a researcher, educator, and manager besides providing treatment and care for the patients. Nurses can help patients during and after radiological imaging.[10] Nurses are constantly exposed to non-ionizing radiation sources in their working lives (mobile phones, wireless internet systems, computers, electronic devices, power supply systems, etc.). In addition, nurses may be exposed to ionizing radiation sources in different units of the hospital (nuclear medicine, radiotherapy, operating room, etc.). Nurses' understanding of the radiation is important in order to protect themselves and their patients.[11] But the lack of information about radiation in nurses has been identified in many studies.[11-15]

People started hearing the word of radiation more often, especially after the 2011 Fukushima accident.[16] News about the damages of mobile phones, nuclear power plants, and tomography devices has started to become more and more in the media in the last period. More negative views against radiation have increased. There is much incorrect information about radiation on websites.[17] In this case, it makes the analysis of positive and negative aspects against radiation difficult. A picture is a simple tool for expressing people's feelings. Drawing techniques provide an easy way to learn.[18] Drawing techniques are useful in revealing incomplete and misconceptions. Nurses' perspectives on the concept of radiation are their prior knowledge. If nurses can have the right perspective on radiation, they can use it better in daily life. The studies in the literature were generally conducted to determine the knowledge levels and attitudes of the nurses related to radiation. No drawing study was detected about radiation among health workers in the literature search. Therefore, it is thought that the results obtained from the drawings and interviews will contribute to the field by determining the perspectives of the nurses about radiation. The aim of the study is to determine nurses' perspectives on radiation.

MATERIAL AND METHODS

PARTICIPANTS

In this study, nurses, who constitute a significant part of the health care workers, were formed as the target group. The sample of the study consists of nurses who work in different departments (Medical and Radiation Oncology Service, Internal Medicine Service, Surgery Service and Operating Room) in Erzurum Regional Training and Research Hospital. Purposeful sampling method was used. Of the participants, 83 (76.1%) were female and 26 (23.9%) were male, the mean age was 30.55±8,11 years (range 18-56), 58.7% were single, 47.7% had a bachelor's degree and the mean duration of occupational duty was 9.8±6.8 years, 60.6% of nurses were working in Internal Medicine Service. Nurses were coded as "N1-N109". Demographics data of the participants are shown in Table 1.

QUESTIONNAIRE

Qualitative and quantitative research methods were used in the study. A cross-sectional study was conducted between June 2018 - August 2018 in Erzurum Regional Training and Research Hospital. The questionnaire included two parts and the first part comprised questions about the demographic information (gender, age, marital status, education, experience, and working department), the second part included only drawing question about radiation. The population of this study consisted of 155 nurses. The nurses were asked to draw the first thing that comes to mind when they heard the word of radiation. Of the nurses, 46 (29.7%) said that they could not participate in the study by stating that they could not draw simple pictures. There were 109 (70.3%) nurses who agreed to participate in the study and filled the questionnaire form. All drawings were then used in the construction of thematic categories.

INTERVIEWS

People's mental images are non-verbal information and they are difficult to disclose.[19] Therefore, using these two methods together was considered to be appropriate to reveal the nurses' radiation perspectives. These are the comments obtained from the drawings produced by the nurses and the comments obtained from the interviews. The semi-structured interview method was used in the research. The interview form

TABLE 1: Demographic characteristic of the nurses.

		Frequency (f)	Percentage (%)
Gender	Male	26	23.9
	Female	83	76.1
Age	18-30 years	66	60.5
	31-40 years	27	24.8
	>40years	16	14.7
Marital Status	Single	64	58.7
	Married	45	41.3
Educational Status	Medical vocational high school	19	17.4
	Associate degree	29	26.6
	Bachelor degree	52	47.7
	Master degree	9	8.3
Duration of Occupational Duty	1-5 years	49	45
	6-10 years	25	22.9
	11-15 years	16	14.7
	16-20 years	3	2.7
	>20 years	16	14.7
Working Department of	Medical and Radiation Oncology Service	18	16.5
	Internal Medicine Service	66	60.5
	Surgery Service	17	15.6
	Operating Room	8	7.3

was prepared by the researcher. Questions were checked by three experts. Validity was provided by taking quotes from nurses.[20] Interviews were conducted with 20 nurses who drew pictures in different categories. During these interviews, nurses were initially asked to clarify their drawings and then to express their ideas about radiation. Nurses were asked if they wished to add anything. It took ~5-10 min to complete the interview and all interviews were tape recorded. Interview records were transcribed and quotations from interviews were used to explain the findings of the interviews for data analysis. The descriptive analysis method was used to evaluate the interviews using direct quotations.

DRAWING ANALYSIS

The drawings of the nurses were analyzed according to their common characteristics under the specific theme and conceptual categories. These categories were then shown to the two field experts determined by the researcher. Considering the expert opinions, no differences of opinion were found. Obtained data were reported by percentage (%) and frequency (f) analysis.

STATISTICAL ANALYSIS

The data obtained from the surveyed questionnaires were transferred to SPSS 21.0 (statistical package for social sciences) package program and analyzed. Descriptive statistics were used to evaluate the data. Number, percentage, mean, standard deviation, min-max, chi-square methods were used. The level of statistical significance was set at $p<0.05$.

ETHICAL CONSIDERATIONS

This study was approved by the Erzurum Regional Education and Research Hospital Ethics Committee of Clinical Trials (Erzurum BEAH KAEK 2018/04-57). Nurses were informed about the aim of the study. Questionnaires were given to the nurses along with information indicating that participation would be anonymous and should be entirely voluntary. The study was conducted in accordance with the principles of the Helsinki Declaration.

TABLE 2: Conceptual categories and percentages obtained from nurse drawings for the concept of radiation.

Conceptual Categories	Frequency (f)	Percentage (%)
The radiation warning sing	32	29.4
The symbol of death's head	25	22.9
Wave	20	18.4
Mobile phone	14	12.8
Roentgen or tomography machine	13	11.9
Other	5	4.6
Total	109	100

RESULTS

The conceptual categories derived from the drawings of nurses reflecting their perspective on radiation are divided into five groups. Among these categories, the most prominent was the radiation warning sign (32 nurses) (Table 2). Five of the nurses made other drawings (radiation cloud, beam, computer, microwave oven).

The following figures illustrate drawings of five main categories. No significant difference was found between gender, age, marital status, education status, occupational duty year and working department of the participants and their drawing ($p>0.05$).

DRAWING OF RADIATION WARNING SING

Among the conceptual categories, the most common drawing was the radiation warning sign (32 nurses, 29.4%). Representative drawings depicting a radiation warning signs are presented in Figure 1.

The nurse encoded with N58 used the following statements about her drawing during the interview:

"This symbol is widely used at the door of the devices that contain radiation in the hospital, so this symbol comes to my mind first". (N58)

DRAWING OF THE SYMBOL OF DEATH'S HEAD

Twenty-five (22.9%) nurses drew the symbol of death's head. Representative drawings depicting the symbol of death's heads are presented in Figure 2.

The nurse encoded with N93 used the following statements about her drawing during the interview:

"The deadhead comes to my mind first because the radiation is awful and deadly."(N93)

DRAWING OF THE WAVE

Twenty (18.3%) nurses drew the wave. Representative drawings depicting the waves are presented in Figure 3.

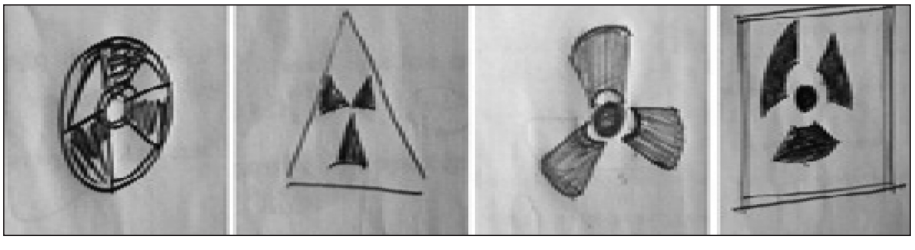

FIGURE 1: Examples of the radiation warning sing motifs drawn by the N6, N58, N63, and N73 coded nurses.

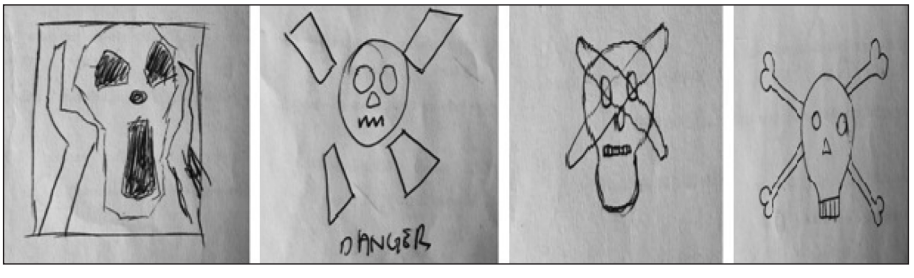

FIGURE 2: Examples of the symbol of death's heads motifs drawn by the N17, N25, N77, and N93 coded nurses.

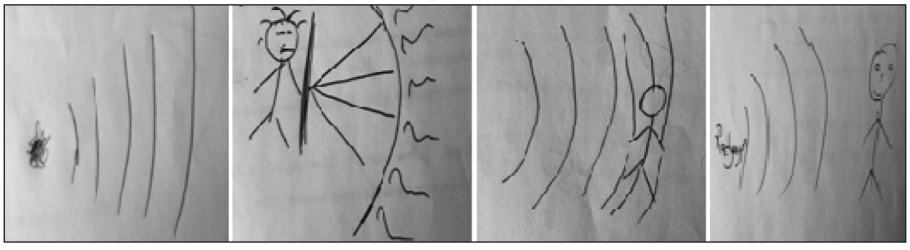

FIGURE 3: Examples of the waves motifs drawn by the N9; N13, N4, and N86 coded nurses.

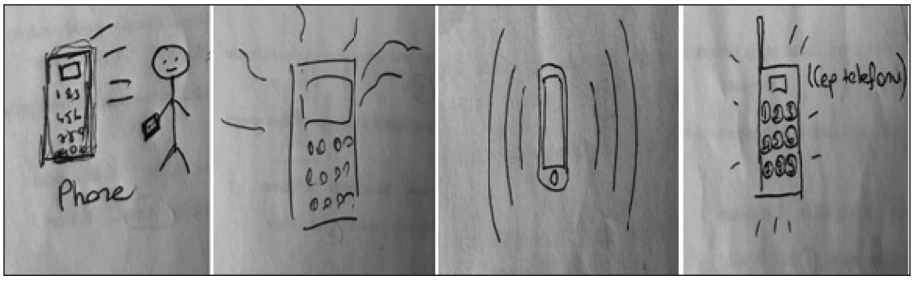

FIGURE 4: Examples of the mobile phone motifs drawn by the N34; N38, N72 and N85 coded nurses.

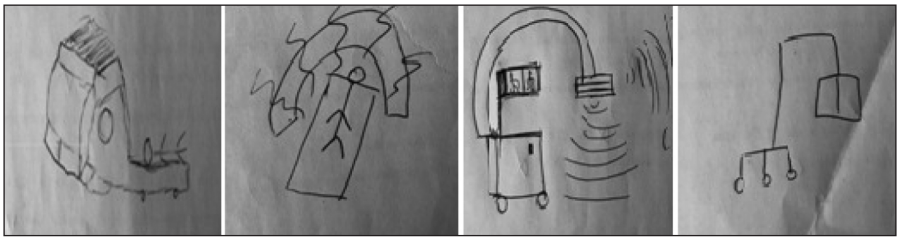

FIGURE 5: Examples of the machine motifs drawn by the N1, N23, N26, and N54 coded nurses.

The nurse encoded with N41 used the following statements about her drawing during the interview:

"I remember that the radiation is a wave from the lesson at school". (N41)

DRAWING OF THE MOBILE PHONE

Fourteen (12.8%) nurses drew the mobile phone. Representative drawings depicting the mobile phones are presented in Figure 4.

The nurse encoded with N72 used the following statements about his drawing during the interview:

"I'm always talking on the phone, sending messages, having time on social media. That's why I drew a mobile phone picture". (N72)

DRAWING OF THE ROENTGEN OR TOMOGRAPHY MACHINES

Thirteen (11.9%) nurses drew the roentgen or tomography machine. Representative drawings depicting the roentgen or tomography machine are presented in Figure 5.

The nurse encoded with N1 used the following statements about her drawing during the interview:

"Since I work in a hospital, I am constantly exposed to radiation from devices that produce radiation. That's why I first thought of this device". (N1)

Fourteen (70%) nurses stated that they were afraid of radiation during the interview.

DISCUSSION

According to White no matter what kind of drawing, the drawing action transforms visual perception, comprehension and thinking into images.[21] In the present study, in order to reveal the point of perspective of the nurses for the concept of radiation, drawings of 109 nurses were analyzed. Edwards states that when adults are asked to draw a human face or shape from themselves, they are suddenly

shy and anxious. In such a situation, most of the individuals who want to make a drawing say *"No, I can't"*.[22] Similar in this study, 109 (70.3%) of 155 nurses agreed to draw on radiation. Nurses who do not accept drawing said *"I don"t have the ability to draw pictures'*. Of course, this may be due to the fact that radiation is an abstract concept. It was said that they could draw simple pictures to encourage nurses. It is common for many adults who have a high level of education, but who do not have the ability to do art, still draw drawings like children and using template figures.[23] The drawings in this study were simple and very similar to children's drawings.

Many factors can be effective in the impression that radiation is on the person. These include the meaning of the word radiation, media news and visual images.[16] In this study, because nurses are hospital employees, this situation is reflected in the fact that the radiation warning sign, symbol of death's head and radiation generating device drawings are high.

In the study, nurses have drawn radiation warning sign most (29.4%, 32 nurses). The radiation warning sign was published by ISO (International Organization for Standardization) in 1975 and is widely used throughout the world. It is one of the well-known symbols by health professionals and hangs on the doors of the x-ray units in hospitals. The symbol of the dead head is another symbol that accompanies the radiation warning sign that has become widespread in 2007.[24] These warning indicators indicate that there may be radioactive substances or radiation in the area where they are hung.[25] The ratio of the nurses who draws the symbol of the dead head was 22.9% (25 nurses) in this study. Of course, nurses may have chosen to draw objects that they can easily draw.

Radiation is invisible to the eye. As the radiation in the school books defines wave, 18.3% (20 nurses) of the nurses have drawn the radiation as a wave. Other prominent illustration was mobile phone drawings. This may be due to the constant use of mobile phones by nurses and news of radiation from mobile phones in the media.

Nurses encounter devices that produce continuous radiation in the hospital environment. Therefore, 11.9% (13 nurses) of the nurses preferred tomography and X-rays in their drawings.

Neumann and Hopf did the most similar work to this study.[16] In their work, they asked the students to draw the picture that came to mind when it was called radiation. The sunlight sources (headlamps or flashlights), nuclear power plants, mobile phones, computer monitors and TV screens were found to be among the prominent drawings in the student drawings. Also Brown, Henderson and Armstrong studied children's perceptions of nuclear power plants as revealed through their drawings.[26] The plenty of children drew building exteriors, chimneys or cooling towers with smoke, and dome-shaped or factory-like buildings. In this study, it was interesting that there was no light, no solar or nuclear power station among the drawings of the nurses.

Ohno and Kaori stated that media was the only source for students to know and think about radiation.[12] Acar and Ince indicated that there is much incorrect knowledge about radiation in the media.[17] There is a lot of information about radiation on the internet that radiation is always very harmful. Many films or documentary programs say that radiation is dangerous and fearful. In interviews, 70% (14 nurses) of the nurses participating in the interview stated that they were afraid of radiation. In addition, the results of a similar study conducted by Ohno and Kaori indicated that approximately 54 (40%) of nurses had a fear of exposure to occupational radiation.[12] The study of Itaki, Tomisawa, Ohgino and Aizu conducted with 161 health students from different departments, revealed that most students think that radiation is scary.[27] In the study of Neumann and Hopf with 9th - grade students, when asked about their initial feelings about radiation, many students only reported negative aspects and emotions.[28]

If radiation can take place in nursing education, students may graduate with basic radiation knowledge. In this way, nurses will have the more information about the effects of radiation on human health. So during the nursing education, the radiation course should be given. The study of Konishi et al., included a 90-min radiation class in an undergraduate public

health nursing course in Tokyo.[29] After taking the course, the students stated that their thoughts about radiation changed and they recived a correct information. The study of Luk, Leung and Cheng highlighted the need for radiation education in the curricula of medical schools.[30] Ohno and Kaori stated that radiation education provides an enormous benefit in improving nurse's perspective.[12] Education programs at the working place should be coordinated efficiently for nurses.

As a matter of course, there are some limitations to this study. The first limitation was the small number of nurses participated in the study, so further studies are required conducted with larger number of nurses. Second, nurses may have preferred to draw concepts of easy radiation images.

CONCLUSION

In this study that was conducted to determine the perspective of nurses on radiation, drawings of the nurses were used. The number of nurses who thought that radiation was dangerous and lethal was high. They reflected this situation in the drawings. When the findings in the drawings and interviews are examined, it becomes clear that most nurses see radiation as scary.

Suggestions for this study are as follows:

- Radiation courses can be organized during nursing education.
- Radiation education programs can be coordinated efficiently to nurses at workplaces.

In this way, nurses can have the right perspective on radiation today and in the future.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

This study is entirely author's own work and no other author contribution.

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