

## LEVEL OF INFORMATION ABOUT RADIATION AMONG MEDICAL STAFF WORKING IN OPERATING ROOMS WITH FLUOROSCOPY

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### ABSTRACT

**Aims:** The aim of this study is to determine the level of information regarding radiation safety and the side effects related to the use of fluoroscopy among a group of teaching assistants, research assistants, medical students, nurses, technicians and caretakers working at Trakya University Health Center for Medical Research and Practice.

**Methods:** A descriptive, cross-sectional survey study was conducted from December 2014 to April 2015 at Trakya University Health Center for Medical Research and Practice. The questionnaire consisted of 24 questions and was applied to 53 people. Responses regarding radiation safety and the side effects of fluoroscopy were analyzed in Statistical Package for the Social Sciences (SPSS) 20.0 using descriptive statistics including frequencies and percentages.

**Results:** 98.08% of the participants responded “yes” to the question “Do you think fluoroscopy is hazardous to health?”. On the other hand, the results showed that only 32.69% of the participants wore lead apron and 32.77% used thyroid shields in every operation. 88.46% of the participants reported that they would like to attend a training regarding fluoroscopy and radiation safety.

**Conclusion:** The results indicated that the operating room staff of Trakya University Health Center for Medical Research and Practice does not possess adequate knowledge regarding radiation safety.

**Keywords:** Fluoroscopy, radiation, safety

### INTRODUCTION

Radiation is the emission of energy through a medium in the form of particles or electromagnetic waves. Basically, there are two types of radiation: ionizing and non-ionizing. Ionizing radiation is found in particle form, including alpha particles, beta particles, neutrons, and in waveform, including X-rays and gamma waves. Radio waves, microwaves and infrared waves can be given as examples of non-ionizing radiation (1).

Medical imaging techniques used as diagnostic devices, such as X-ray imaging, computed tomography (CT) and fluoroscopy lead to radiation exposure of the patients and medical staff (2). X-rays are the most frequently used form among these imaging techniques. X-rays, as they are a type of ionizing radiation, excite the atoms of the medium they pass through and lead to the generation of free radicals. These ionizations can cause serious biological damage in the organism. These damages manifest as deterministic and stochastic effects. Deterministic effect, which is directly associated with cell

death, occurs only as a result of the exposure of cells to a level of radiation above a threshold level and this effect may result in infertility, skin burns or death. Stochastic effect is linked to the absorption rate of radiation within the tissue. It may emerge even at low levels. Genetic damages and cancer are the results of the stochastic effect. Aside from the known effects of radiation, consequences of a long-term, low-dose use during surgical practice remain unclear (3). Therefore, it is important that the operating room staff has adequate information about the techniques that utilize ionizing radiation and their side effects of them.

Our study is designed to determine the operating room staff’s level of information regarding the radiation emitted by fluoroscopy devices, which are regularly used in operating rooms and also, to draw attention to radiation safety.

### MATERIAL AND METHODS

A descriptive, cross-sectional survey study was con-

ducted from December 2014 to April 2015. Respondents of the survey were teaching assistants, research assistants, nurses, technicians and caretakers working at the departments of Orthopedics, Urology, Neurosurgery, Cardiology, Pediatric Surgery, General Surgery at Trakya University Health Center for Medical Research and Practice and have been exposed to fluoroscopy. 53 staff members accepted to complete the questionnaire, 52 questionnaires were considered valid.

The questionnaire, designed by the researchers, contained multiple-choice questions regarding the participants' gender, age, title, years spent in occupation, whether they have been exposed to fluoroscopy in their workplace in the last year and if the answer is yes, how frequent they have been under radiation exposure, whether fluoroscopy is hazardous to health, the presence of danger/warning signs in the workplace, whether they have attended any training regarding fluoroscopy and radiation, effective dose unit for the organism, distance they have to keep during fluoroscopy procedure, organs affected by radiation, if the device has been maintained and calibrated, presence of a radiation safety office at the hospital, presence of protective equipment at the operating room and how often it was maintained, the use of lead apron and thyroid shield, availability of safety glasses, availability of operating rooms with radiation safety, whether environmental analysis was conducted and if they wish to attend a training about these matters.

The collected data was analyzed using SPSS 20.0. The results were analyzed using descriptive statistics including frequencies and percentages.

## RESULTS

Of the participants, 4 were caretakers, 6 technicians, 12 nurses, 15 research assistants, and 15 teaching assistants. Participants between the ages 20-30 constituted the largest group with a percentage of 42.31%. 36.54% had 0-5 years of practice. Table 1 shows the demographic characteristics of the participants.

98.08% of the participants were exposed to fluoroscopy in the last year. All of them were present in an environment in which fluoroscopy was used and 9.62% of these were exposed to fluoroscopy once a month, 5.77% once a week, 36.54% 2-3 times a week, 36.54% everyday, 11.54% more than once a day. Besides, 98.08% of the participants thought that fluoroscopy has harmful effect on the body.

**Table 1: Demographic characteristics of participated operating room staff (n=47)**

	Number	Percentage (%)
<b>Gender</b>		
Male	31	
Female	16	
<b>Age</b>		
20-30	22	42.31
31-35	6	11.54
36-40	7	13.46
40-50	11	21.15
51-60	6	11.54
<b>Occupation</b>		
Caretaker	4	7.69
Technician	6	11.54
Nurse	12	23.08
Research assistant	15	28.85
Teaching assistant	15	28.85
<b>Years in practice</b>		
0-5	19	36.54
6-10	8	15.38
11-15	8	15.38
16-20	7	13.46
20-30	8	15.38
30+	2	3.85

42.31% of the participants stated that there were radiation danger/warning signs in the workplace, despite there being none, whereas 57.69% reported that there were no signs.

67.31% of the participants had never attended any training about radiation or fluoroscopy. 18% attended a training session once, 12% more than once.

33.33% answered the question regarding the effective dose unit in the organism correctly, 30.77% the right distance to keep during fluoroscopy, 18.42% the most vulnerable organ system to radiation, and 13.46% the question if maintenance and calibration of the device were provided.

26.92% of the participants answered "yes" to the question "Is there a radiation safety office at your hospital?," whereby 19.23% answered "no" and 53.85% reported that they did not know.

As to the question is there protective equipment in

the operating theatre?"; 78.43% of participants answered "yes", whereas 3.92% reported that there was, but that they were unusable and 3.92% answered "no". 5.77% of participants had correct information regarding how regularly the protective equipment was inspected.

The data regarding the use of lead apron and thyroid shield is shown in Table 2.

19.23% of participants answered "yes" to the question "Do you have radiation safety glasses?"; 73.08% answered "no" and 7.69% reported they did not know.

57.69% had correct information regarding the presence of operation rooms with radiation safety, 42.31% knew whether environmental analysis was performed.

88.46% of the participants reported that they would like to be informed about this matter, whereas 3.85% re-

ported they were not interested and 7.69% reported that they already have sufficient knowledge.

## DISCUSSION

Nowadays, radiological investigations have an important role concerning the diagnosis and treatment of diseases. Despite the fact that the medical use of radiological imaging techniques contribute greatly to the diagnosis and treatment processes, the radiation emitted during these investigations have a negative effect on both the patients and the personnel performing the imaging (2).

Scientific studies demonstrated that the exposure dose during procedures involving fluoroscopy is low. Even though a low dose is used, there is no clear evidence concerning the long-term effect of the cumulative dosage.

The radiation emitted during fluoroscopy affects the personnel directly or by leakage. They are also under the exposure of the radiation emitted from the patients' body and surrounding materials. Consistent with these facts, 98.08% of our participants thought that fluoroscopy had a harmful effect on the body.

In order to decrease the rate of radiation exposure, the primary measure to take should be informing the operating room personnel about radiation safety (4). In our study, 70% of the participants had no previous training about radiation, which demonstrates a great lack of one of the basic elements in radiation safety. Our results are consistent with those of Vural et al. (2), which indicated that 90% of the participants were exposed to fluoroscopy in the last year, whereas 94% had no previous fluoroscopy training. 88.46% of the participants indicated that they would like to attend trainings about radiation safety, which demonstrates an increased awareness about the matter.

There are three fundamental elements in radiation safety: time, distance, shielding. The time spent around the source should be kept to a minimum. The distance between the radiation source and the personnel is of crucial importance; an increase of 1.5 meters in the distance decreases the exposure dose by 88% (3). In our study, 30.77% of the participants were aware that a distance of 2 meters should be kept during fluoroscopy procedure. 55.77% of the participants reported that the distance should be more than 2 meters. These results reveal that the personnel is aware of the connection between

**Table 2: The use of lead apron and thyroid shield**

	Use of lead apron		Use of thyroid shield	
	Number	Percentage (%)	Number	Percentage (%)
I use it in every operation	17	32.69	16	30.77
I use it if there will be a extensive use of fluoroscopy involved	14	26.92	13	25.00
I use it if I will be working near the fluoroscopy device	3	5.77	3	5.77
I use it occasionally	12	23.08	9	17.31
I do not use it	6	11.54	11	21.15

radiation exposure and the distance, but have no clear understanding about the matter. Surrounding the radiation source with lead blocks or enclosing linear accelerators with reinforced concrete is also effective in radiation protection.

Along with the basic protective measures, use of protective equipment plays an important role in radiation protection. 78.43% of the participants were aware of the availability of protective equipment in the operating room, whereas 11.54% did not wear lead aprons and 21.15% did not use thyroid shields. Notwithstanding that the percentage of those who wore lead aprons during every operation was 32.69% and those who used thyroid shields in every operation was 30.77%, the use of protective equipment is not sufficient enough, although it is one of the simplest measures to take for radiation safety.

To conclude, the level of awareness about the matter should be increased in order to prevent the negative consequences of radiation exposure. To achieve this, in-service trainings should be given on a more regular basis. Aside from trainings, radiation danger/warning signs and regular environmental analysis should be provided. In short, operating rooms with radiation safety are needed. In addition, a more effective use of the available protective equipment should be ensured and safety precautions should be taken. We are of the opinion that, in order to meet these necessities, the radiation safety office of the hospital should work effectively and the safety measures should be inspected regularly.

**Ethics Committee Approval:** This study was approved by Scientific Researches Committee of Trakya University School of Medicine.

**Informed Consent:** Written informed consent was obtained from the participants of this study.

**Conflict of Interest:** The authors declared no conflict of interest.

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