

Knowledge of Medical Staff About the Principles of Radiation Protection in Bandar Abbas City

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Abstract

Background: Radiation has a negative biologic effect, which depends on the duration of exposure and dose. This study aimed to assess knowledge of the principles of radiation protection among medical staff in educational hospitals in Bandar Abbas University of Medical Sciences. **Materials and Methods:** This descriptive cross-sectional study was carried out on 105 health workers who were exposed to radiation during 2018. The sample size was determined by Cochran's statistical formula. The sampling method was the census method. Our target group was all employees who used radiation as part of their work. Data gathering tool was a researcher-made demographic questionnaire and a checklist containing 21 radiation protection principles. To each correct answer, the score of 1 and each wrong answer was given a zero score. Data then analyzed using SPSS version 20 software, P-value<0.05 was considered as significant difference. **Result:** Based on the findings, the mean scores of the participants was 10.26, and the lowest and highest score were 6 and 16, respectively. Also, there was a significant relationship between education level, workplace, work experience, and continuing education with the level of knowledge of the principles of radiation protection (P-value<0.05). **Conclusion:** The average level of knowledge of the medical staff was related to the level of education and retraining courses. It is suggested that regular training courses on radiation protection should be held for all employees using radiation. **Keywords:** Radiation Protection, Knowledge, Medical Staff

Introduction

The use of ionizing radiation in medicine is one of the most important diagnostic methods. Although the use of ionizing radiation has potential benefits in diagnosing diseases, the risks of using it should not be ignored. Ionizing radiation has destructive effects on gonads, the central nervous system and the digestive system, which can be seen in the person itself or transmitted in subsequent generations as genetic changes (1). Some diseases such as cataracts, leukemia, and skin lesions (e.g., erythema and hair loss) have been reported in workers who have exposed to high levels of radiation. Also, in some studies, cancer has been reported due to long exposure to radiation (2, 3). The

principles of dose management should be observed not only for patients but also for healthcare workers, the risks of radiology staff are mentioned as part of the justification in the International Commission on Radiological Protection (ICRP) and the new European directive on Basic Safety Standards (4). Several medical techniques, including angiography, radiology/cardiology procedures, fluoroscopy, computed tomography (CT) and radiography portable imaging utilize ionizing radiation. The main objective radiographic imaging to achieve optimal quality image using the minimum possible dose (5). Although ionizing radiation is clinically useful for medical imaging, it is estimated that 20% of the medical radiation tests are not helpful (6) that this and others exposed to unnecessary radiation can increase the risk of cancer, which depends on the dura-

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tion of exposure to radiation and the dose level. Studies have shown that more than 10 million radiographic examinations are taking place every day in the world (7). Amongst different types of radiographic methods, portable radiography in areas such as intensive care and operating rooms is most at risk, since these sections do not have the standard requirements for radiographic rooms and patients are usually the least likely to cooperate due to emergency conditions (8). Regarding the risks and requirements are listed as well as the lack of information about the knowledge associated with radiation, this study aimed to assess knowledge of the principles of radiation protection of medical staff in the educational hospital in Bandar Abbas city.

Materials and Methods

This descriptive cross-sectional study was performed on health workers who exposed to radiation in Shahid Mohammadi Hospital, Bandar Abbas, Iran during 2018. In this study, our target group was all employees who used radiation as part of their work (radiology technician, technologist, nurses, etc.) in different sections. The staff of the radiology departments, the operating room, the intensive care unit, and angiography ward was invited to participate in the study, and 105 of them participated. The sample size was determined by Cochran's statistical formula. The sampling method was the census method. Inclusion criteria include working with radiation during the shift, satisfaction to participate in the study. Also, exclusion criteria were individuals without radiation-related relationship and dissatisfaction to participate in the study. Data gathering tool was a researcher-made questionnaire that was designed by a researcher and in collaboration with two radiologists. Also, the validity of questioners was determined by two medical physicists. Reliability of the questionnaire was also evaluated using Cronbach's alpha coefficient, which showed acceptable internal reliability ($\alpha=0.842$). The first part of the questionnaire includes demographic information of nurses (including age, gender, background, job rank, work shift, workplace, and the passing of the retraining course), and the second part contains 21 questions about protection and regulations regarding radiation protection and knowledge of protective equipment. To each correct answer, the score of 1 and each wrong answer was given a zero score. The questionnaires were provided to staff and collected immediately after completion. Data analyzed using SPSS software (Chicago, IL, USA, ver. 19) and P -value <0.05 was considered as significant difference.

Result

A total of 105 medical staff working in a different section of Shahid Mohammadi Hospital, of Bandar Abbas city, participated in the study, of which 71 (67.6%)

were female, and 34 (32.4%) were male. Also, 47.6% of individuals were aged 22-30 years. From 105 subjects, 86 cases (81.9%) were married, and 19 subjects (18.1%) were single. In terms of workplace, 23 subjects (21.9%) were in the surgical department, 19 subjects (18.1%) in the internal and angiographic units, 16 subjects (15.2%) in the intensive care units, 37 subjects (35%) in the operating room and 10 subjects (9.5%) in the radiology department (Table-1). In terms of education level, the highest percentage (67.6%) of subjects had of the bachelor's degree. Most of the subjects had more than five years of work experience. Also, 37.1% of the subjects participated in retraining classes on radiation protection individually. Based on the research findings, the mean scores of participants was 10.26 ± 2.46 (ranged 0-21). Also, the lowest and highest score was 6 and 16. In Table-2 mean scores of subjects in the term of gender are mentioned. Mann-Whitney test showed no significant relationship between gender and knowledge level (P -value=0.562). According to the findings of the study, the Kruskal-Wallis test showed a significant relationship between education level and knowledge (P -value=0.007, Table-3). Also, the staff who worked in the radiology department had the highest score (average of 11) of knowledge about the principles of personal protection against radiation and the staff working in the operating room had the least (average 9.8) of knowledge score (Table-4). Statistical tests showed a significant difference between the workplace and the level of knowledge of the principles of personal protection against radiation. Also, based on our findings, there was a significant relationship between the work experience and the level of knowledge (P -value=0.03, Table-5). Also, the results of the study showed that subjects who completed retraining courses had higher scores than those who did not complete these courses. The Mann-Whitney test showed a significant difference between the passing of the radiation training course and the level of knowledge about the principles of personal protection against radiation (Table-6).

Discussion

Knowledge of the principles of radiation protection in radiological examinations in other parts in addition to radiology, it is a critical issue because the probability of radiation complications during portable radiographs is higher than standard radiography. In this study, we examined the knowledge of medical staff in different sections of the hospital regarding the principles of radiation protection. In this study, the knowledge of all personnel of different sections of the hospital about radiation was studied, while in previous studies only the radiology department staff was investigated. Generally based on the findings of the current study, the knowledge of the medical staff was evaluated from

Table 1. Some demographic characteristics of subjects

Variables		N (%)
Age (years)	22-30	50 (47.6)
	30-35	30 (28.6)
	35-40	18 (17.1)
	40-44	7 (6.7)
Educational level	Associate	33 (31.4)
	Bachelor	71 (67.6)
	Postgraduate	1 (1)
Work experience	1-5 years	28 (26.7)
	5-10 years	30 (28.6)
	10-15 years	30 (28.6)
	15-20 years	7 (10.5)
	20-30 years	6 (5.7)

Table 2. Scores of knowledge of medical staff about the principles of radiation protection in terms of gender

Gender	Mean	SD	P-value
Female	10.33	2.22	0.562
Male	10.11	2.92	
Total score	10.267	2.462	

Table 3. Scores of knowledge of medical staff about the principles of radiation protection in terms of education level

Education level	Mean	SD	P-value
Associate degree	11.21	2.32	0.007
Undergraduate	9.77	2.37	
Postgraduate	14	--	

Table 4. Scores of knowledge of medical staff about the principles of radiation protection in terms of workplace

Workplace	Mean	SD	P-value
Surgery department	10.30	1.89	0.05
Internal section and angiography	10.15	2.36	
Intensive care unit	9.5	2.44	
Operating room	8.9	2.18	
Radiology unit	11	2.7	

Table 5. Scores of knowledge of medical staff about the principles of radiation protection in terms of Work experience.

Work experience	Mean	SD	P-value
1-5 years	8.75	1.35	0.03
5-10 years	11.43	2.45	
10-15 years	10.16	2.62	
15-20 years	10.63	2.90	
20-30 years	11.33	1.21	

Table 6. Scores of knowledge of medical staff about the principles of radiation protection in terms of radiation training course

Radiation training course	Mean	SD	P-value
Yes	11.12	2.66	0.008
No	9.75	2.19	

the principles of protection against low average radiation, which is consistent with the study by Safi et al. (9). In this study, the demographic characteristics of the participants showed that there was no significant relationship between gender and knowledge level; our results are consistent with the study of Kargar et al. (10). According to our findings, there was a significant relationship between education level and knowledge; this result is consistent with the study by Tohidniya et al. Who reviewed the principles of radiation protection in intensive care units (11). The obtained results demonstrated that there was a significant difference between the workplace and the level of knowledge. On the other hand, Reagan and Slechts showed there was a significant relationship between the work experience and the workplace of the workers with the level of protection measures (12, 13). Also, based on our result, there was a significant relationship between the work experience and the level of knowledge. These findings are in contrast with the results of the Kargar et al. study. Indeed, they had done their research only in the radiology department of the educational hospitals, and this result could be attributed to the training of students and staff members that increase their knowledge about the principles of radiation protection, but in our study, which has been done in other section. Also, there was no such factor, that is consistent with the results of Mojiri et al. study (11, 14). Also, our findings showed that there was a relationship between the passing of the radiation training course and the level of knowledge about the principles of personal protection against radiation, which is in line with the results of other studies (11, 15). Also, our findings showed that 37.1% of the subjects participated in retraining classes on radiation protection individually, and this is less than other studies (15, 5). In general, given that the mean scores of knowledge of participants were moderate, and since the level of education, work experience and passing of the retraining course are among the factors influencing the knowledge of individuals about the principles of radiation protection, consideration of these factors it will significantly reduce the adverse effects of exposure to radiation. According to the results of this study, it is suggested that regular training courses on radiation protection should be held for all employees using radiation.

Conflict of interest

The authors declare no conflict of interest.

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