Hormozgan Medical Journal

doi 10.34172/hmj.2023.1975

Hormozgan Med J. 2022; 27(1):18-22

Research Article

Assessing the Level of Knowledge, Attitude, and Performance of Radiographers About Radiation Protection in Bandar Abbas, Iran

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Abstract

Background: Although radiography tests are beneficial in diagnosing various diseases, they have some risks for patients and radiology staff, which will be minimized if observing radiation protection standards. The purpose of this study was to evaluate the knowledge, attitude, and performance of radiographers regarding radiation protection in the radiology departments of Bandar Abbas.

Methods: This work was performed as a descriptive-analytical study. A questionnaire consisting of 38 items was distributed among all radiographers in Bandar Abbas. Information obtained from the questionnaires was analyzed by appropriate nonparametric tests and Spearman's correlation coefficient. The Kolmogorov-Smirnov test was used to normalize the distribution of scores. Finally, linear regression was employed to determine the effect of each independent variable on the knowledge score.

Results: The participation rate of radiographers was 53.9%. The means and standard deviations of scores assigned to attitude, knowledge, and performance in the field of radiation protection were 65.36±27.11, 36.36±17.72, and 46.66±19.60, respectively. The relationship between age and experience of radiographers with their attitude, knowledge, and practice was significant ($P>0.05$). In addition, there was a significant difference between their attitudes in terms of the place of service ($P<0.05$).

Conclusion: The results of this study revealed that radiographers with different levels of age, education, and work experience have almost the same level of knowledge, attitude, and practice. They had an appropriate attitude and practice in the field of radiation protection.

Keywords: Radiology, Diagnostic X-ray, Radiation protection, Knowledge, Attitudes, Practice

Received April 5, 2021, **Accepted**: January 1, 2022, **Published Online**: November 9, 2023

Background

The radiology department in hospitals plays an important role in diagnosing patients' diseases. Different people work in the radiology department. Due to X-ray use in radiology departments, different risks such as cancer may threaten staff and patients in this ward (1). The biological effects of radiation are divided into definitive and stochastic groups. Definitive effects are detected when the radiation dose is above the threshold, and these effects become more severe with higher doses. However, definitive effects are rarely observed in diagnostic radiology. Stochastic effects may appear as cancer in patients or genetic disorders in their offspring. The probability of these effects increases with increasing absorbed dose (2). Stochastic effects have no threshold, and there is no dose of radiation that can be considered absolutely safe in this regard. Accordingly, observing the rules of radiation protection in radiology departments is of high importance.

A golden tip in radiography is producing an appropriate image quality with the radiation dose as low as possible. Several parameters are under the control of radiographers which can be used to reduce radiation exposure to patients and staff in radiology departments (3). The general principles of radiation protection in radiography must be observed, including justification, optimization, and dose limit. In recent years, new guidelines are published by international reliable organizations such as the International Commission on Radiological Protection and the International Atomic Energy Agency about radiation protection during radiological examinations (2, 4, 5). Radiographers have an important role in applying protective measures because they are responsible for performing radiological tests. In addition, they should be aware of radiation dose reduction guidelines and have a proper attitude and performance in order to minimize

the risks of radiation.

Several studies have been conducted in recent years to evaluate the knowledge, attitude, and performance of radiographers in radiology departments. Some studies focused on the knowledge of radiographers, including the studies of Su et al and Shah et al (6, 7). On the other hand, some studies only examined the performance of radiographers. For instance, Reagan et al attempted to determine the level of the observation of staff's and patients' safety and its connection to early professional training, the highest level of education, background, and workplace among 1500 radiographers in California (8). Slechta and Reagan investigated the knowledge and performance of radiographers to determine the observation of radiation protection methods and its relationship with professional education, continuing education, work experience, and the workplace among 2000 radiographers in California (9). Other studies did not evaluate the overall scores of radiographers' knowledge but only announced the scores of specific questions, including a study conducted by Mojiri and Moghimbeigi in the field of measuring knowledge and attitudes about radiation protection among 71 radiographers in Hamadan (10). Likewise, Chaparian et al assessed the knowledge, attitude, and performance of radiographers regarding radiation protection in Yazd (11). Similarly, Borhani et al evaluated the performance of the radiography staff in hospitals affiliated to Kerman University of Medical Sciences (12). Karami et al also examined the knowledge, attitude, and performance of the radiography staff of Sanandaj about radiation protection (13). In another research by Alipoor et al, the knowledge, attitude, and performance of the radiography staff of Fasa about radiation protection were assessed through a descriptive-analytical cross-sectional study using a 33-item questionnaire (14).

Due to the mentioned necessities and unavailability of information in this regard in Bandar Abbas, the current study investigated the level of knowledge, attitude, and performance of radiographers in the field of radiation protection in this city.

Methods

This work was performed as a descriptive-analytical study. A 38-item questionnaire was distributed among all radiographers in Bandar Abbas, Iran, in 2020. Informed consent was obtained from all participants. This standard questionnaire contained information about age, gender, academic degree, work years' experience, and workplace. The questionnaire had 38 items, including 33 questions about the knowledge, attitude, and performance of radiographers in the field of radiation protection. Other questions were related to the domain of knowledge and attitude, including information regarding knowledge about the law of ten days during the radiography of women, ALARA law, the role of the filter in reducing the dose, the role of the grid in improving the image quality, film processing conditions, and suitable irradiation conditions. The other included data were the biological effects of ionizing radiation, the role of the cassette in reducing the dose, the necessity of using a Lead gown in portable radiography, dose limit of leakage radiation from the tube, minimum filtration, role of a collimator in reducing the dose, annual dose limit of radiologists and the general public, and allowable dose of fetal dose. Performance questions contained information about the use of a Lead gown during portable radiography, the use of a gonadal shield, the use of a film badge, and periodic blood tests, as well as the correct limitation of the radiation field, the correct adjustment of the distance from the source to the skin surface, and training and inclination to participate in retraining courses.

Knowledge and performance questions were answered using 'Yes', 'No', and 'I do not know', as well as 'Yes', 'No', and 'Sometimes' options, respectively. In addition, correct and incorrect answers received a score of 2 and 1, respectively. A Likert-type scale was used for attitude questions, ranging from 'Strongly agree', 'Agree', 'Undecided', 'Disagree', to 'Strongly disagree'. Depending on the type of question, each option was scored from one to five. Finally, the scores of knowledge, attitude, and performance of individuals were summed up, and the average of each was calculated accordingly. Participants who did not complete the questionnaire or those who were not satisfied with the study procedure were removed from the investigation. The reliability of the questionnaire was assessed by Cronbach's alpha (0.74). Data were analyzed by SPSS software, version 16. The Kolmogorov-Smirnov test was employed to evaluate the normal distribution of scores, and linear regression was applied to determine the effect of each independent variable on the knowledge score. *P* values less than 0.05 were considered statistically significant. Eventually, Mann-Whitney and Kruskal-Wallis tests were used to examine the relationship between variables.

Results

Of 76 radiographers working in the hospitals of Bandar Abbas, 41 persons completed the questionnaire, thus the participation rate was 53.9%. Based on the findings, 37% and 63% of the radiographers were males (n = 15) and females (n = 25), respectively, and 1 person was missed. The age of radiographers ranged between 20 and 50 years (mean 31.56 ± 7.95), and their work experience was between 6 months to 25 years (mean 10.91 ± 7.70 years). In terms of qualifications, 55% (n = 22), 40% (n = 16), and 5% (n = 2) of radiographers had a diploma, bachelor's, and other (masters and the like) degrees, respectively. As regards workplace, 52% (n = 21), 18% (n = 7), 12% (n = 5), 10% (n = 4), and 8% (n = 3) of radiographers were employed in Shahid Mohammadi (central hospital),

Khalij Fars, Shariati, Om Leila, and Koodakan hospitals, respectively. The mean, standard deviation, and medians score of the knowledge, attitude, and performance of all radiographers are presented in Table 1.

Table 2 provides the correlation coefficient of age and work experience of radiographers with knowledge, attitude, and performance.

According to the obtained results, there was no meaningful relationship between age and years of work experience of radiographers and knowledge, attitude, and performance ($P>0.05$).

Table 3 reports data on the relationship between radiographers' gender with knowledge, attitude, and performance. The results were analyzed by the Mann-Whitney test.

No significant difference was found between the two genders in terms of knowledge, attitude, and performance ($P>0.05$).

Table 4 summarizes data on the relationship between educational qualification and knowledge, attitude, and performance. Kruskal-Wallis analysis was performed for this purpose.

According to the P value, no meaningful difference was observed between different levels of educational qualification in knowledge, attitude, and performance ($P>0.05$).

Table 5 presents the relationship between workplace and knowledge, attitude, and performance using the Kruskal-Wallis one-way analysis of variance test.

Based on the findings, there was no significant difference between the workplaces in terms of knowledge and performance ($P>0.05$), while there was a significant difference with regard to attitude ($P<0.05$). According to the obtained results, Om Leila Hospital had the lowest score, while Koodakan, Shariati, Khalij Fars, and Shahid Mohammadi Hospitals had the highest score, respectively.

Table 1. The Mean, Standard Deviation and Median Score of the Knowledge, Attitude, and Performance of all Radiographers

	Knowledge	Attitude	Performance
Mean	36.36 ± 17.72	65.36 ± 27.11	44.06 ± 19.60
Median	36.36	70.00	46.66

Table 2. The Correlation Coefficient of Age and Work Experience of Radiographers With the Parameters of Knowledge, Attitude, and Performance

Variable		Knowledge	Attitude	Performance
Age	Correlation coefficient	-0.036	0.190	0.288
	P value	0.833	0.261	0.175
Work experience	Correlation coefficient	-0.233	-0.014	-0.163
	P value	0.191	0.940	0.365

Discussion

The results of this study demonstrated that the knowledge, attitude, and performance of radiographers working in Bandar Abbas about radiation protection were desirable.

Table 3. Comparison of Mean and Standard Deviation of the Score of Knowledge, Attitude, and Performance of Radiographers According to Gender

Variable			Knowledge	Attitude	Performance
Gender	Male (n = 15)	Mean	41.818 ± 22.21	66.00 ± 27.46	45.33 ± 15.57
	Female (n = 25)	Mean	33.45 ± 14.30	65.20 ± 28.00	42.40 ± 21.76
	P value		0.155	1.00	0.651

Table 4. Comparison of Mean and Standard Deviation of Points Related to Knowledge, Attitude, and Performance of Radiographers According to Educational Qualification

Variable			Knowledge	Attitude	Performance
Educational qualification	Diploma (n = 22)	Mean	30.99 ± 16.51	61.81 ± 28.89	44.54 ± 20.91
	Licentiate (n = 16)	Mean	44.31 ± 18.44	69.37 ± 27.19	43.33 ± 18.37
	Other cases (n = 2)	Mean	36.36 ± 0	75.00 ± 7.07	33.33 ± 18.85
	P value		0.073	0.056	0.074

Table 5. Comparison of the Mean and Standard Deviation of Points Related to Knowledge, Attitude, and Performance of Radiographers According to the Place of Service

Variable			Knowledge	Attitude	Performance
Hospital	Shahid Mohammadi	Mean ± SD	34.63 ± 19.41	62.38 ± 29.13	41.90 ± 23.10
	Khalij Fars	Mean ± SD	46.75 ± 15.23	78.57 ± 10.69	53.33 ± 7.69
	Shariati	Mean ± SD	40.00 ± 8.13	80.00 ± 7.07	48.00 ± 13.66
	Koodakan	Mean ± SD	42.42 ± 10.49	83.33 ± 5.77	48.88 ± 10.18
	Om Leila	Mean ± SD	20.45 ± 18.74	27.50 ± 27.53	25.00 ± 13.74
	P value		0.178	0.028	0.198

Note. SD: Standard deviation.

The participation rate of radiographers was desirable compared to the participation rate of 23.9% and 32% in other studies by Slechta and Reagan (9) and Reagan et al (8), respectively.

Based on the score of attitude, radiographers had a positive opinion about reducing the dose of radiation, which was much better than the score of 16.59% in the study of Karami et al (13) and compared to scores of 62.4% and 78.33% in studies conducted by Alipoor et al (14) and Chaparian et al (11), respectively. The score of knowledge in the field of different aspects of radiation protection was better than that of other studies, including scores of 20.65% 42.36%, and 46.5% obtained by Karami et al (13), Alipoor et al (14), and Chaparian et al (11), respectively. The score of the performance of radiographers was highly better than the score of 11.43% in the study of Karami et al (13) and in comparison with 48.54% and 45.9% scores reported by Alipoor et al (14) and Chaparian et al (11).

In line with our study, Chaparian et al (11) found no meaningful relationship between gender and the level of knowledge, attitude, and performance. Further, no significant relationship was observed between the workplace and the level of knowledge, attitude, and performance. Additionally, there was no meaningful relationship between educational qualifications and the level of attitude and performance. However, there was more knowledge in higher education, and there was a negative relationship between work experience and knowledge in the above-mentioned study, indicating that radiographers with lower educational qualifications and more experience had less knowledge, which contradicts the result of our study. Similar to our study findings, the results of Karami et al (13) demonstrated no meaningful relationship between age and level of knowledge, attitude, and performance. Moreover, Chaparian et al (11) found no meaningful relationship between educational qualifications and the level of attitude and performance, but there was more knowledge in higher education. There was no meaningful relationship between the experience and level of knowledge and attitude, but radiographers with more experience had better performance.

According to the obtained results, no significant relationship was observed between age, experience, gender, and education qualification and knowledge, attitude, and performance. In fact, the results showed that radiographers at different levels of age, education, work experience, and gender have almost the same level of knowledge, attitude, and performance and have good attitude and performance (65.36% and 46.6%) but have less knowledge (36.36%). According to data in Table 5, there was no meaningful difference between different levels of the place of service in the knowledge and performance. However, there was a meaningful difference in attitude. Based on the obtained averages of hospitals, Om Leila had the lowest score (27.5%), while Koodakan (83.33%), Shariati (80%), Khalij Fars (78.57%), and Shahid Mohammadi (62.38%) Hospitals received the highest score, respectively.

Conclusion

The results of this study revealed that the levels of knowledge, attitude, and performance of radiographers in Bandar Abbas about radiation protection were not different in terms of age, education, work experience years, and gender. The radiographers had an acceptable attitude and performance but had less knowledge. To solve this problem, radiographers should attend regular training and retraining courses held by competent authorities. There should be also continuous monitoring, and periodic examinations shall be taken from radiographers. Moreover necessary informative instructions can be placed in the form of posters in radiology departments so that they can be easily found by staff and patients.

Acknowledgments

The researchers thank the contribution of the participants who spent their time to complete the survey.

Author Contributions

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Conflict of Interests

None declared.

Ethical Approval

The study protocol was approved by the Ethics Committee of Hormozgan University of Medical Sciences (No. 9320).

Funding

This work was supported by a grant (No. 9320) from Hormozgan University of Medical Sciences.

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