

KNOWLEDGE AND ATTITUDE OF FEMALE UNDERGRADUATE DENTAL STUDENTS AND INTERNS TOWARDS RADIATION SAFETY AND PROTECTION

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ABSTRACT

Objective: The aim and objective of this study is to evaluate the level of knowledge and attitude about radiation hazards and safety practices among undergraduate female dental students and interns.

Materials and Methods: An electronic questionnaire was distributed among female dental students and interns at the College of Dentistry, King Saud University, using the online service SurveyMonkey.

Statistical Analysis: The collected data were analyzed using the IBM SPSS Statistical program version 26 (IBM Inc.NY, USA). Chi-square was used to test the association of the knowledge and attitude with the academic level.

Results: The surveys were completed by 156 dental students and interns, including 45 in the second year, 33 in the third year, 25 in the fourth year, 30 in the fifth year, and 23 dental interns.

Conclusion: The results obtained from this study indicate that radiological safety and protection measures should be emphasized more throughout the undergraduate level as well as in continuous teaching courses for dental interns.

KEYWORDS: knowledge, attitude, dental radiographs, radiation safety, radiation protection

INTRODUCTION

Radiology has become a major field in diagnostic application in both medicine and dentistry. This field has grown enormously with the rapidly expanding range of imaging modalities. The use of radiology in dentistry has substantial benefits when utilized properly. It is the most widely used preclinical

investigation tool. However, it is a double-edged sword as exposure to ionizing radiation is considered a possible source of health hazards and biological effects. The effects on humans from ionizing radiation are the results of interactions at atomic level. Biological effects of radiation are broadly classified according to occurrence probability into Non-stochastic (deterministic) and

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stochastic effects. Deterministic effects are dose dependent, above which the biological damage appears in the body, and the severity of the response is proportional to the dose. The stochastic effect does not have a threshold dose that could lead to biological injury, so the probability of occurrence of the change, rather than its severity, is dose dependent¹⁻³. All authorities support that radiation exposure of any tissue has the potential to induce malignant transformation and there is no specific radiation dose below which is considered safe^{4,5}. Therefore, compliance with the International Commission on Radiological Protection (ICRP) concept to as low as reasonably achievable As Low as Reasonably Achievable (ALARA) principles is essential in dentistry practice to ensure reducing patient exposure to ionizing radiation as minimally as possible^{6,7}. However, the amount of radiation exposure from dental radiographs depends on many variables starting from the type of the receptor (films or digital receptors), going through exposure factors, collimation and protecting barriers. The undergraduate dental students and interns should have comprehensive knowledge of ionizing radiation's biological hazards and how to protect themselves and their patients⁸.

MATERIALS AND METHODS

An electronic questionnaire was distributed among dental students and interns at the College of Dentistry, King Saud University, using the online service SurveyMonkey. Second to fifth year undergraduate dental students and interns were

included in the study. The collected data were analyzed using the IBM SPSS Statistical program version 26 (IBM Inc. NY, USA). Chi-square was used to test the association of the knowledge and attitude with the academic level. To compare the mean knowledge scores in the five academic groups, one-way analysis of variance (ANOVA) was used. A P-value equal to or less than 0.05 was considered to be statistically significant.

RESULTS

The surveys were completed by 156 dental students and interns, including 45 in the second year, 33 in the third year, 25 in the fourth year, 30 in the fifth year, and 23 dental interns as shown in figure 1. Table 1 compares the knowledge of the participants towards radiation safety and protection. There were significant differences seen among the participants with regards to the knowledge regarding safety of digital radiography ($P=0.038$), holding the film/sensor by patient during exposure ($P=0.003$), and whether radiation is contradicted during pregnancy ($P<0.001$). On evaluating the attitude of the participants towards radiation safety and protection (Table 2), it was found that there was a significant difference seen in the awareness of the deterministic and stochastic effects of radiation ($P=0.009$). The average knowledge scores are presented in table 3. The knowledge score differs between the five academic groups (one-way ANOVA: $F_{4,151}=3.7$, $P=0.007$), where the score of fifth year dental students is significantly higher than the second year.

TABLE (1) Knowledge of participants towards radiation safety and protection

Question	Response	2nd year n (%)	3rd year n (%)	4th year n (%)	5th year n (%)	Interns n (%)	Total n (%)	P value
Are x-rays used in dentistry harmful?	yes	14 (31.1)	20(60.6)	9(36.0)	13(43.3)	7(30.4)	63(40.4)	0.238
	no	28 (62.2)	12 (36.4)	15(60)	16(53.3)	16(69.6)	87(55.8)	
	Idont_know	3 (6.7)	1(3)	1(4.0)	1(3.3)	0 (0)	6(3.8)	
Can x-rays be reflected from constructed walls?	yes	17(37.8)	18(54.5)	13(52.0)	14(46.7)	6(26.1)	68(43.6)	0.255
	no	19(42.2)	12(36.4)	9(36.0)	10(33.3)	15(65.2)	65(41.7)	
	Idont_know	9(20)	3(9.1)	3(12)	6 (20)	2(8.7)	23(14.7)	
Does digital radiography require less exposure than conventional?	yes	29 (64.4)	32 (97)	21 (84)	24 (80)	18 (78.3)	124 (79.5)	0.038
	no	10 (22.2)	1 (3)	1 (4)	2(6.7)	2 (8.7)	16 (10.3)	
	Idont_know	6 (13.3)	0 (0)	3 (12)	4 (13.3)	3 (13)	16 (10.3)	
Do high-speed films require reduced exposure	yes	28 (62.2)	21 (63.6)	16 (64)	22 (73.3)	17 (73.9)	104 (66.7)	0.858
	no	7 (15.6)	2 (6.1)	3 (12)	3 (10)	2 (8.7)	17 (10.9)	
	Idont_know	10 (22.2)	10 (30.3)	6 (24)	5 (16.7)	4 (17.4)	35 (22.4)	
Do you prefer to hold the films/sensors during exposure?	yes	3 (6.7)	1 (3)	4 (16)	1 (3.3)	4 (17.4)	13 (8.3)	0.276
	no	40 (88.9)	31 (93.9)	21 (84)	29 (96.7)	19 (82.6)	140 (89.7)	
	Idont_know	2 (4.4)	1 (3)	0 (0)	0 (0)	0 (0)	3 (1.9)	
Do you ask the patient to hold the film/sensor with their hand during exposure?	yes	7 (15.6)	10 (30.3)	7 (28)	6 (20)	14 (60.9)	44 (28.2)	0.003
	no	35 (77.8)	18 (54.5)	18 (72.0)	22 (73.3)	9 (39.1)	102 (65.4)	
	Idont_know	3 (6.7)	5 (15.2)	0 (0)	2 (6.7)	0 (0)	10 (6.4)	
Are dental radiography contraindicated in pregnant patients?	yes	27 (60)	13 (39.4)	7 (28)	0 (0)	6 (26.1)	53 (34)	< 0.001
	no	15 (33.3)	18 (54.5)	17 (68.0)	29 (96.7)	17 (73.9)	96 (61.5)	
	Idont_know	3 (6.7)	2 (6.1)	1 (4)	1 (3.3)	0(0)	7 (4.5)	

TABLE (2) Attitude of participants towards radiation safety and protection

Question	Response	2nd year n (%)	3rd year n (%)	4th year n (%)	5th year n (%)	Interns n (%)	Total n (%)	P value
Are you aware of NCRP/ICRP recommendations?	yes	14 (31.1)	9 (27.3)	12 (48)	9 (30)	13 (56.5)	57(36.5)	0.102
	no	31 (68.9)	24 (72.7)	13 (52.0)	21 (70.0)	10 (43.5)	99 (63.5)	
Are you aware of the usefulness of collimators and filters in dental radiography?	yes	39 (86.7)	26 (78.8)	20 (80)	29 (96.7)	21 (91.3)	135 (86.5)	0.222
	no	6 (13.3)	7 (21.2)	5 (20)	1(3.3)	2(8.7)	21(13.5)	
Are you aware of the deterministic and stochastic effects of radiation?	yes	34 (75.6)	18 (54.5)	15 (60)	10 (33.3)	14 (60.9)	91 (58.3)	0.009
	no	11 (24.4)	15 (45.5)	10 (40)	20 (66.7)	9 (39.1)	65 (41.7)	
Are you aware of the ALARA principle	yes	31 (68.9)	20 (60.6)	20 (80)	25 (83.3)	18 (78.3)	114 (73.1)	0.237
	no	14 (31.1)	13 (39.4)	5 (20)	5 (16.7)	5 (21.7)	42 (26.9)	
Will you adhere to the radiation protocol in the future?	yes	38 (84.4)	30 (90.9)	23 (92)	29 (96.7)	23(100)	143 (91.7)	0.357
	no	3 (6.7)	2 (6.1)	0 (0)	0 (0)	0 (0)	5 (3.2)	
	Idont_know	4 (8.9)	1 (3.0)	2 (8)	1 (3.3)	0 (0)	8 (5.1)	
Do you use lead aprons on a regular basis?	always	24 (53.3)	23 (69.7)	22 (88)	27 (90)	19 (82.6)	115 (73.7)	0.22
	often	0 (0)	1 (3)	1 (4)	1 (3.3)	1 (4.3)	4 (2.6)	
	sometimes	5 (11.1)	2 (6.1)	1 (4)	1 (3.3)	2 (8.7)	11 (7.1)	
	rarely	1 (2.2)	2 (6.1)	0 (0)	1(3.3)	0 (0)	4 (2.6)	
	never	1 (2.2)	0 (0)	0 (0)	0 (0)	1 (4.3)	2 (1.3)	
	I dont know	14 (31.1)	5 (15.2)	1 (4)	0 (0)	0 (0)	20 (12.8)	

TABLE (3) Differences between the mean knowledge scores using one-way analysis of variance (ANOVA):

academic year	N	Mean	Std. Deviation	P value
2nd_year	45	56.5079	21.52695	0.007
3rd_year	33	68.3983	19.15218	
4th_year	25	65.7143	19.34295	
5th_year	30	72.8571	21.66536	
Intern	23	57.7640	22.57877	
Total	156	63.8278	21.61485	

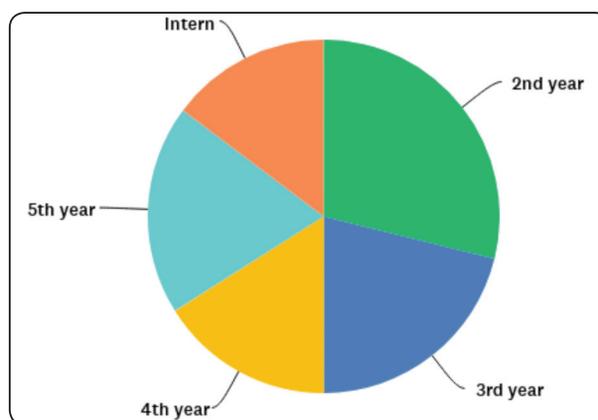


Fig. (1) Pie chart showing the distribution of participants

DISCUSSION

Literature review showed that studies were deficient in evaluating the knowledge and attitude of dental undergraduate students and interns in Saudi Arabia. A study done by Arnout, et al.⁹ showed that among undergraduate dental students, 87.5% considered x-rays to be harmful, while in this study, 87% believed that it is not. This is unexpected since students have been taught since day one of their first radiology course that x-rays are potentially dangerous.

Furthermore, according to Arnout, et al., there was a question of whether X-ray can be reflected from the walls of the room, 69.7% of undergraduate students answered yes. A study done by Aldosimani¹⁰ showed that among undergraduate dental students, 53.6% considered x-rays to be harmful, and 48.3% thought that x-rays could be reflected from the walls.

Since 1977, the International Commission on Radiological Protection (ICRP) started to implement the risk vs. benefit concept. All radiation exposure in medicine must be based on the ALARA principle (as low as reasonably achievable)⁴. In a study by Aravind, et al.¹¹, dentists were asked about ALARA principle, and 84.3% answered that they know it. However, only 73.1% in this study mentioned that they are aware of it. When students and interns were asked about the importance of collimators and filtration in the dental X-ray machine, 86.5% answered yes. In Arnout, et al. study, only 30.3% of the undergraduate gave “yes” as an answer. Also, in their study, it has been shown that 68.0% of the participants claimed that they would adhere to radiation protection protocol in their future clinical practice. While in this study, 91.7% of the dental students and interns will adhere to radiation protection protocol in their future clinical practice.

Radiation exposure to pregnant women causes several biological effects on the fetus such as intrauterine death, developmental abnormalities, and mutagenic carcinogenic effects¹². In pregnancy,

it is better to avoid radiation exposure during the first trimester of pregnancy. If the radiological examination is unavoidable, it should be carried out during the second and third trimester with proper protection by utilizing lead apron, thyroid collar, etc. In the study by Swapna, et al.¹³, 42% of the undergraduate dental students answered that it is contraindicated to make dental radiograph to pregnant, while in this study, 65.4% answered that it was not contraindicated. Similarly, Aldosimani¹⁰ found out that 54.9% of the undergraduate dental students answered that it is not contraindicated to make dental radiographs for pregnant.

CONCLUSION

The results obtained from this study indicate that radiological safety and protection measures should be emphasized more throughout the undergraduate level as well as in continuous teaching courses for dental interns.

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