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KNOWLEDGE, ATTITUDE AND PRACTICE OF THE DENTAL STUDENTS AND INTERNS TOWARDS RADIATION PROTECTION AND SAFETY IN QASSEM PROVINCE

Azhar Ibrahim Alobaysi, dental student, Dr. Elluru Venkatesh, M.S, Dr.Thakur Rajesh Singh, M.D.S

College of dentistry, *Qassem* Private Colleges, Saudi Arabia

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Abstract:

Background: *Dentists and dental students are exposed routinely to radiation in dental clinic. These radiations affect tissues by either direct or indirect effect resulting from forming free radicals, which can kill large number of cells (deterministic effect) or kill individual cells (stochastic effect).*

Objectives: *to evaluate degree of knowledge, attitude and practices of the dental students and interns in Qassem province towards radiation safety and protection and compare it between males and females.*

Methods: *This is across sectional questionnaire-based study, included 203 dental students and interns in Al Qassem province. The questionnaire is formed of two parts; the first part included demographic data including age, gender, college, and academic degree. The second part is formed of nineteen multiple choice questions to evaluate the degree of knowledge, attitude and practice of dental students and interns about radiation safety and protection.*

Results: *between 203 dental students and interns, 52.7% were females and 47.3% were males. Among them 15% were postgraduate and 84.3% were undergraduate students. Over all 203 student responses, 61% had correct answers and 39% had wrong answers. After comparing results of males and females' answers, we detected that females have more knowledge than males regarding radiation safety and protection.*

Conclusion: *Results of this study revealed that dental students and interns' knowledge and practice about radiation safety and protection is average, with lower knowledge among males and have to be improved to be optimal through more education programs.*

Keywords: *radiation protection, radiation safety, knowledge, attitude, dental students.*

Corresponding author:

Azhar Ibrahim Alobaysi,

E-mail: *dr.azharibrahim@icloud.com*

Telephone number*: 00966533658576*

Address: *56241 Unayzah, Al qassim, Saudi Arabia*

QR code

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INTRODUCTION:

Radiation is a type of energy which is transmitted during both matter and space. It has two forms: particulate and electromagnetic. (1)

Radiology is an important part in dentistry specially X-rays. Radiographic examination is a necessary step on the plurality of patients. As an outcome, radiographic images are used as a significant method in dental diagnosis. As dental X- ray has an essential role in diagnosis, it also affects and harms our living tissues. (2)

Dentists, nurses, dental assistants and clinicians who subject patients to undergo X-ray examinations necessitate to be very conscious of any chances of harmful effects or risks. (3)

Dentists and dental students are exposed routinely to radiation in the dental clinic. Radiations affect their tissues by either directly or indirectly because of free radicals production, which can kill large amount of cells (deterministic effect) or kill individual cells (stochastic effect). It is considered to be a carcinogenic substance that may cause leukemia, kill cells or damage DNA. So, the operator should have adequate knowledge about radiation hazards and its protection protocols. (4)

There are numerous variants of equipment and techniques have been created in the field of dental radiography to lower the dose of radiation to which patients are exposed. The guidelines for safe radiological practice include usage of the proper collimator, usage of a lead apron and thyroid collar as well as application of objective selection criteria for x-ray performance, keeping appropriate distance between the member and the source being radiated and avoid exposure to radiations for long duration. Also repeated testing of the quality of radiation equipment should be done. (5)

The dental x-ray use should be limited when its benefit is more than the risk of damage resulting from it. Routine asking for dental radiological examination by young, low experienced interns should be avoided. (6)

We aimed in our study to evaluate knowledge, attitude and practice of undergraduate dental students and interns towards radiation safety and protection in Qassem province and comparison of this knowledge between males and females through a questionnaire.

The questions that we want to answer in this study are:

1-what is the degree of knowledge of dental students and interns about radiation safety and protection?

2- What is the difference in this degree of knowledge between males and females?

MATERIALS AND METHODS:

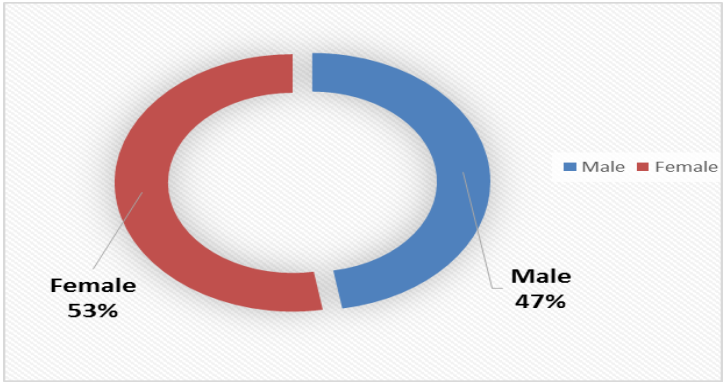
This study was approved by the Institutional Human Ethical committee in Qassem Private Colleges at 28/03/2017 and the certificate code is EAC 104/2017. It was a cross sectional questionnaire-based study, performed in Dentistry colleges of Qassem province (Qassem University, Qassem private colleges and buraydah private colleges), and king Saud Hospital from March 2017 to June 2018, included 203 dental students and interns who were selected randomly from these dentistry colleges and from the hospital. Those who accepted to fill the questionnaire completely, both males and females were included. However those who did not complete their answers or refused to fill it, were excluded. Also students and interns with other specialties and those who are from outside Qassem province were excluded. The questionnaire was formed of two parts; the first part included demographic data as age, gender, college, academic degree. The second part was formed of nineteen multiple choice questions, the first 10 questions to evaluate the degree of knowledge of students and interns about radiation protection and the following 9 questions to evaluate their practice (appendix A). This questionnaire' questions have been prepared after reviewing many articles and the International Commission on Radiological Protection (ICRP) / National Council on Radiation Protection & Measurements (NCRP) recommendations. (4,7,8). It was distributed in all dentistry colleges in Qassem province (Qassem University, Qassem private colleges and buraydah private colleges) and in King Saud Hospital by the investigator. The completed questionnaires were collected from students and interns, then the data was coded, entered to Excel program and analyzed by SPSS program then presented as tables and figures.

RESULTS:

A- Demographic data:

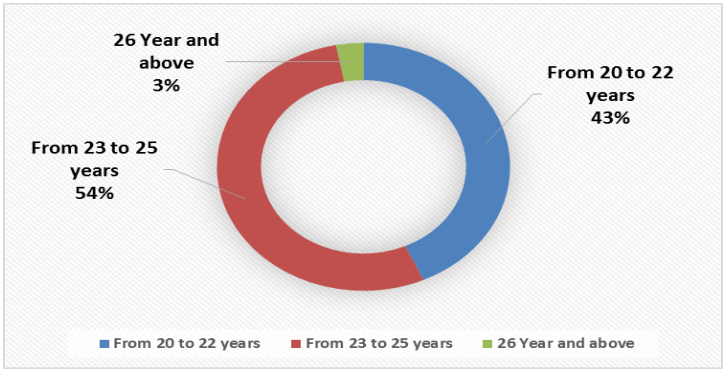
In our study, we aimed to evaluate the knowledge and practice of radiations safety among dental students and interns in Qassem province. From 203 students and interns, 107 (52.7%) were females and 96 (47.3%) were males **(figure1)**.

Figure 1: gender distribution among participating students and interns:



The remaining demographic criteria of participating students and interns regarding their age, academic year and college are shown in figures 2, 3, 4 respectively.
The commonest age of participating students and interns ranged from 22-25 years representing 54% and 43% ranged from 20-22 years. **(Figure 2)**.

Figure 2: distribution of age among participating students and interns:



Most of participating students were in the fourth academic year representing 39.4% while 22.7% were in the fifth year, 22.2 were in the sixth year and only 15.8% were interns. **(Figure 3)**.

Figure 3: distribution of academic year among participating students and interns:

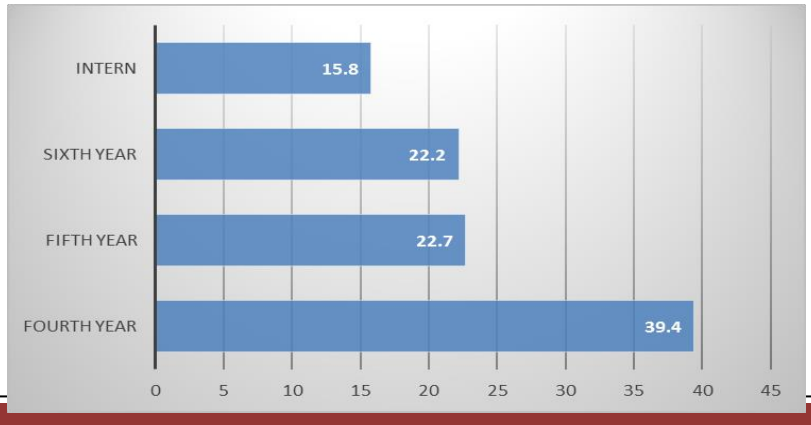
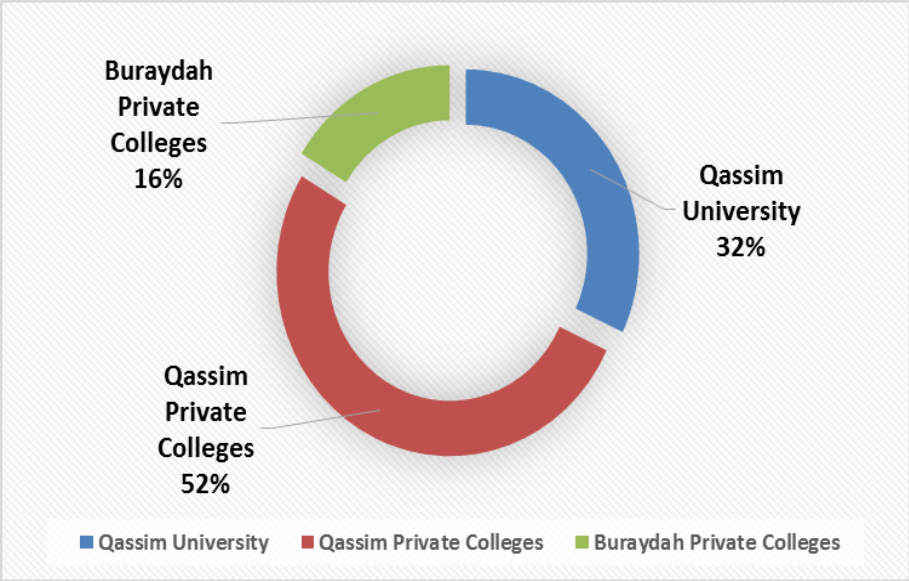


Figure 4: classification of participating students and interns based on their college:



B- Knowledge of radiation safety and practice:

Analysis of the correct and wrong answers of participating students and interns showed that 124 students (61%) have correct answers while 79 students (39%) have wrong answers. **(Table 1)** This means that knowledge of dental students and interns of Qassim province about radiation protection is average.

Table 1: percentages of correct and wrong answers among participating students and interns:

Question	Correct Answer N (%)	Wrong Answer N (%)
1-Are dental x-rays harmful?	196 (96.6)	7 (3.4)
2-Are you aware of international commission on radiological protection (ICRP) \ National council on radiation protection &measurements (NCRP) recommendations?	176 (86.7)	27 (13.3)
3-Do you know the criteria for prescribing a radiograph?	194 (95.6)	9 (4.4)
4-Do you know the annual radiation dose limit for dentist?	179 (88.2)	24 (11.8)
5-It takes 5 seconds after an exposure for a scatter radiation to be dissipated, is it right?	29 (14.3)	174 (85.7)
6- Are barriers like lead walls mandatory to ensure adequate protection for the operator?	21 (10.3)	182 (89.7)
7-Do all human tissues have the same radio sensitivity?	134 (66)	69 (34)
8-Which is the most sensitive organ in dental radiography?	122 (60.1)	81 (39.9)
9- Which one according to you will give less radiation exposure?	143 (70.4)	60 (29.6)
10- In your opinion, which of the following radiographic techniques delivers more radiation to the patient	119 (58.6)	84 (41.4)
11- Which technique do you use for peri-apical radiography?	120 (59.1)	83 (40.9)

12- Which type of collimator do you prefer to reduce radiation exposure?	86 (42.4)	117 (57.6)
13-Do you prefer to use film holder while taking radiographs?	142 (70)	61 (30)
14-Foot three-dimensional radiography, which one do you prefer?	123 (60.6)	80 (39.4)
15-Do you change the exposure time according to the tooth radiographed and the built of the patient?	170 (83.7)	33 (16.3)
16-Which film speed do you prefer for periapical radiography?	99 (48.8)	104 (51.2)
17-Do you explain radiation risk\benefit to patients and get a consent from them before taking radiographs?	112 (55.2)	91 (44.8)
18-In absence of barrier, what is the safe distance from the x-ray source during exposure?	75 (36.9)	128 (63.1)
19-Which period is best for radiographic examination of pregnant women?	109 (53.7)	94 (46.3)
Total N (%)	124 (61%)	79 (39%)

Analysis of the correct and wrong answers of the 19 questions of the questionnaire in relation to gender shown in **(table 2**) and **(figures 5, 6,7,8,9, 10, 11, 12, 13)** showed that there was a statistically strong association between students' answer and their Gender in (9) questions out of (19) questions; in which females had higher percentage of correct answers in (6) questions, as follow:

Females are better than males in answering the following questions:

1) All human tissues have the radio sensitivity (chi-square = 9.471, p-value =0.002 (<0.01). **(figure 5)**
2) Which is the most sensitive organ in dental radiography? (Chi-square = 31.966, p-value =0.000 (<0.01). **(figure 6)**
3) For three-dimensional radiography which one do you prefer? (Chi-square = 4.252, p-value =0.039 (<0.05). **(figure 7)**
4) Do you change the exposure time according to the tooth radiograph and the built of the patient? (Chi-square = 7.937, p-value =0.005 (<0.01). **(figure 8)**
5) In absence of barrier, what is the safe distance from the x-ray source during exposure? (Chi-square = 4.731, p-value =0.030 (<0.05). **(figure 9)**
6) Which according to you will give less radiation exposure? (Chi-square = 20.304, Sig. = .000 < .01). **(figure 10)**

Males are better than females in answering the following question:

1) Are barriers like lead walls mandatory to ensure adequate protection for the operator? (Chi-square = 7.848, p-value =0.005 (<0.01). **(figure 11)**
2) Which techniques do you use for periapical radiography? (Chi-square = 3.195, Sig. = .05< .10).**(figure 12)**
3) Which period is best for radiographic examination of pregnant women? (Chi-square = 2.364, Sig. = .081 < .10). **(figure13)**

Table 2: Correlation between the responses and Gender of participating students and interns:

	Chi-Square	p-value
1-Are dental x-rays are harmful?	.282	.595
2- Are you aware of international commission on radiological protection (ICRP) \ National council on radiation protection &measurements (NCRP) recommendations?	1.314	.252
3- Do you know the criteria for prescribing a radiograph?	.736	.391
4-Do you know the annual radiation dose limit for dentist?	.023	.879
5-It takes 5 seconds after an exposure for scatter radiation to be dissipated, is it right?	.843	.358
6- Are barriers like lead walls mandatory to ensure adequate protection for the operator?	7.848	.005***
7- Do all human tissues have the radio sensitivity?	9.471	.002***
8- Which is the most sensitive organ in dental radiography?	31.966	.000***
9- Which according to you will give less radiation exposure?	20.304	.000***
10- In your opinion, which of the following radiographic techniques delivers more radiation to the patient?	.874	.214
11- Which techniques do you use for periapical radiography?	3.195	.050*
12- Which type of collimator do you prefer to reduce radiation exposure?	1.765	.118
13-Do you prefer to use film holder while taking radiographs?	.762	.383
14-For three-dimensional radiography, which one do you prefer?	4.252	.039**
15-Do you change the exposure time according to the tooth radiographed and the built of the patient?	7.937	.005***
16-Which film speed do you prefer for periapical radiography?	.628	.428
17-Do you explain radiation risk\benefit to patients and get a consent from them before taking radiographs?	.309	.578
18-In absence of barrier, what is the safe distance from the x-ray source during exposure?	4.731	.030**
19- Which period is best for radiographic examination of pregnant women?	2.364	.081*

***Correlation is considered highly significant if p-value is < 0.01.
**Correlation is considered significant if p-value is < 0.05.
*Correlation is Significant at the 0.10 level.

Figure 5: correlation between gender and answer of the question (Do all human tissues have the radio sensitivity?)

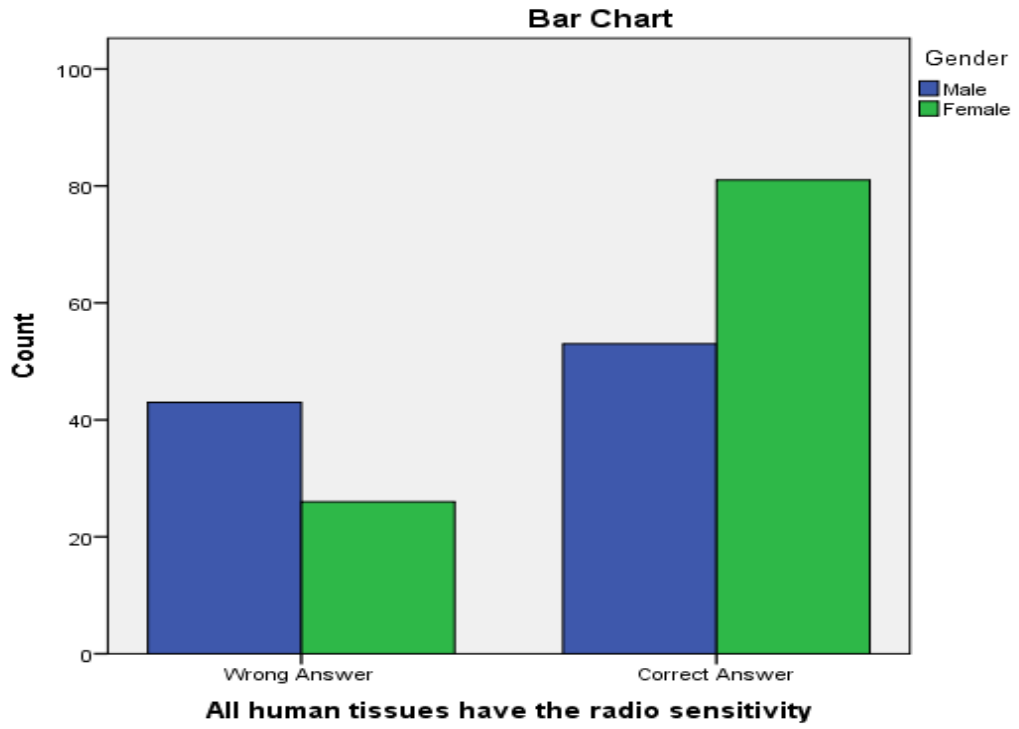


Figure 6: correlation between gender and the answer of the question (Which is the most sensitive organ in dental radiography?)

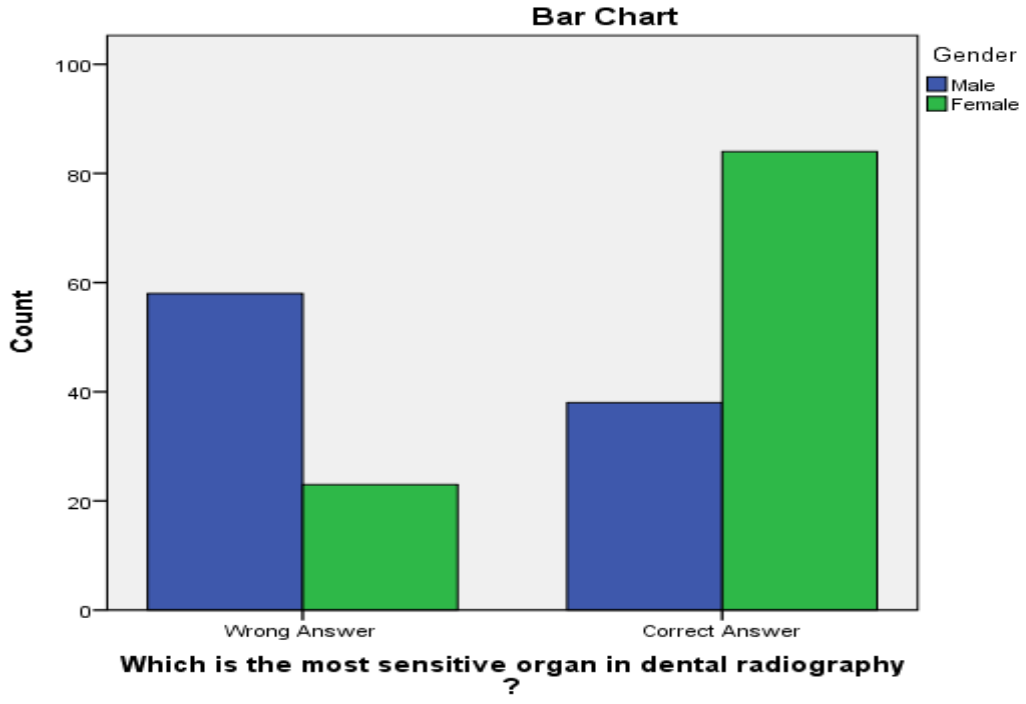


Figure 7: correlation between gender and the answer of the question (For three-dimensional radiography, which one do you prefer?

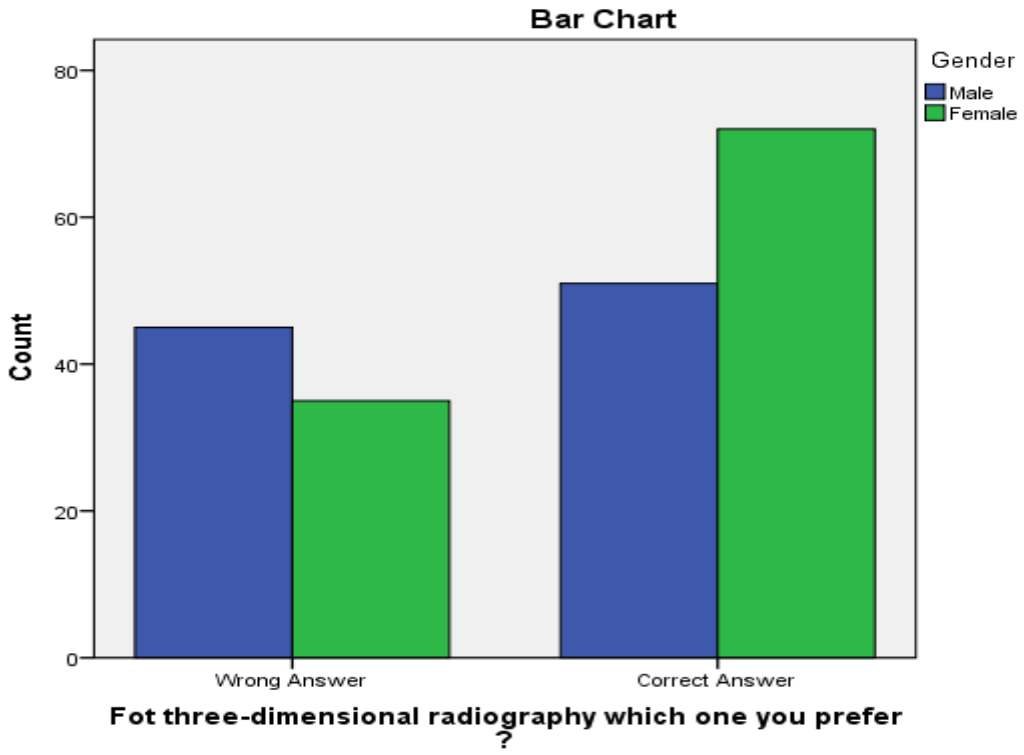


Figure 8: correlation between gender and the answer of the question (Do you change the exposure time according to the tooth radiographed and the built of the patient?

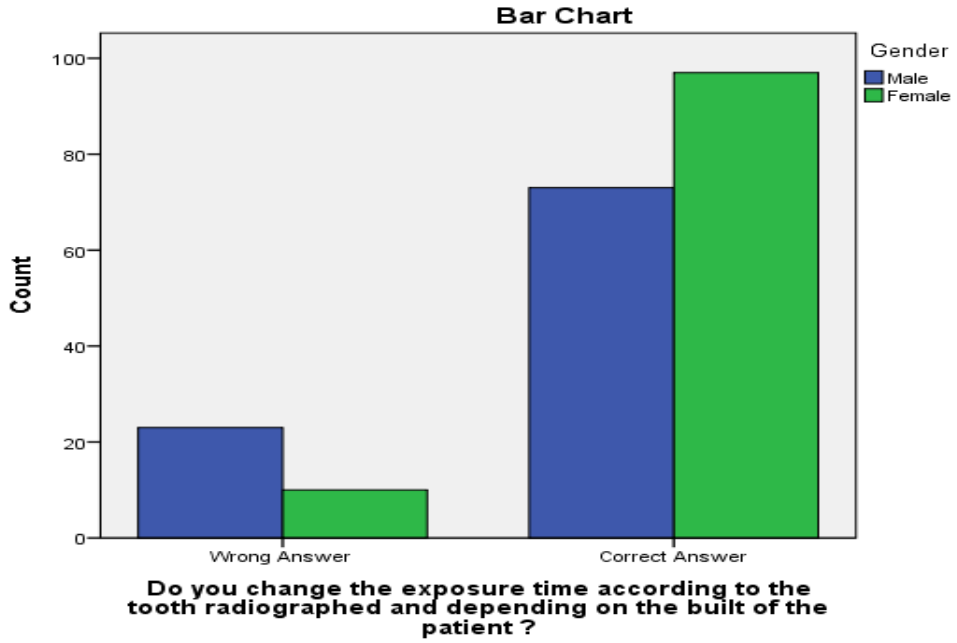


Figure 9: correlation between gender and the answer of the question (In absence of barrier, what is the safe distance from the x-ray source during exposure?)

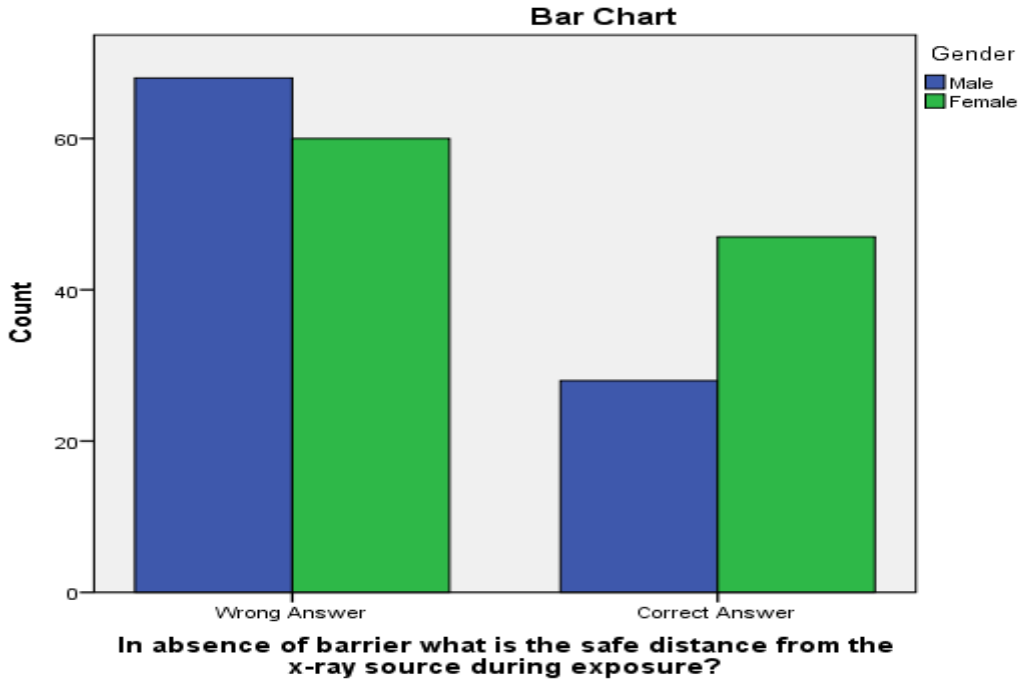


Figure 10: correlation between gender and the answer of the question (Which one according to you will gives less radiation exposure?)

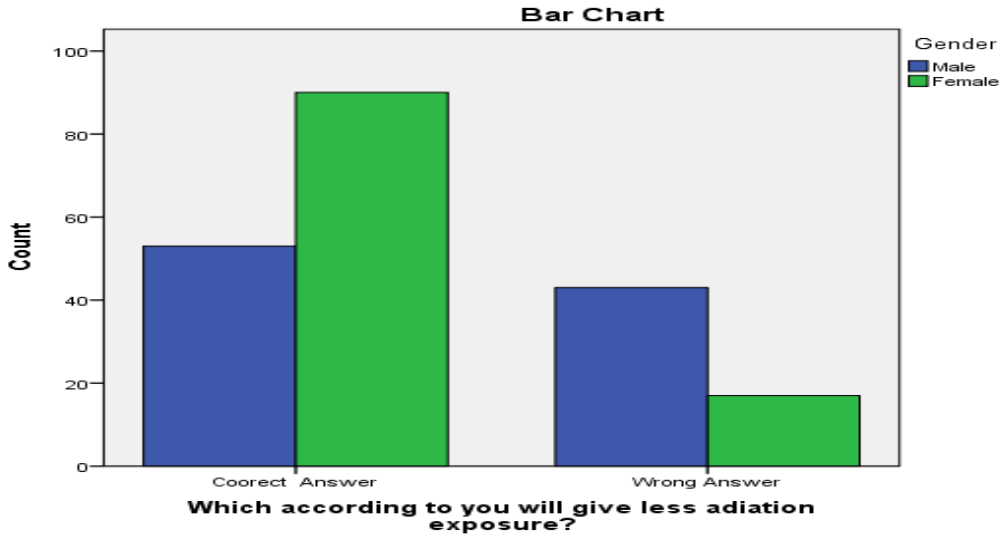


Figure 11: correlation of gender and correct answer of the question (Are barriers like lead walls mandatory to ensure adequate protection for the operator?)

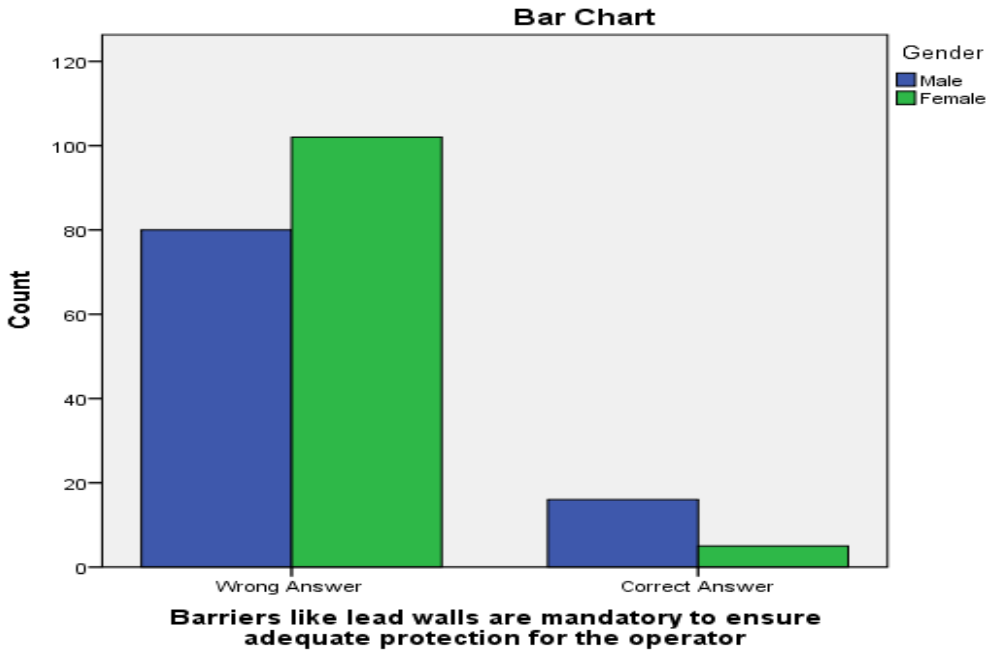


Figure 12: correlation of gender and correct answer of the question (Which technique do you use for peri apical radiography?

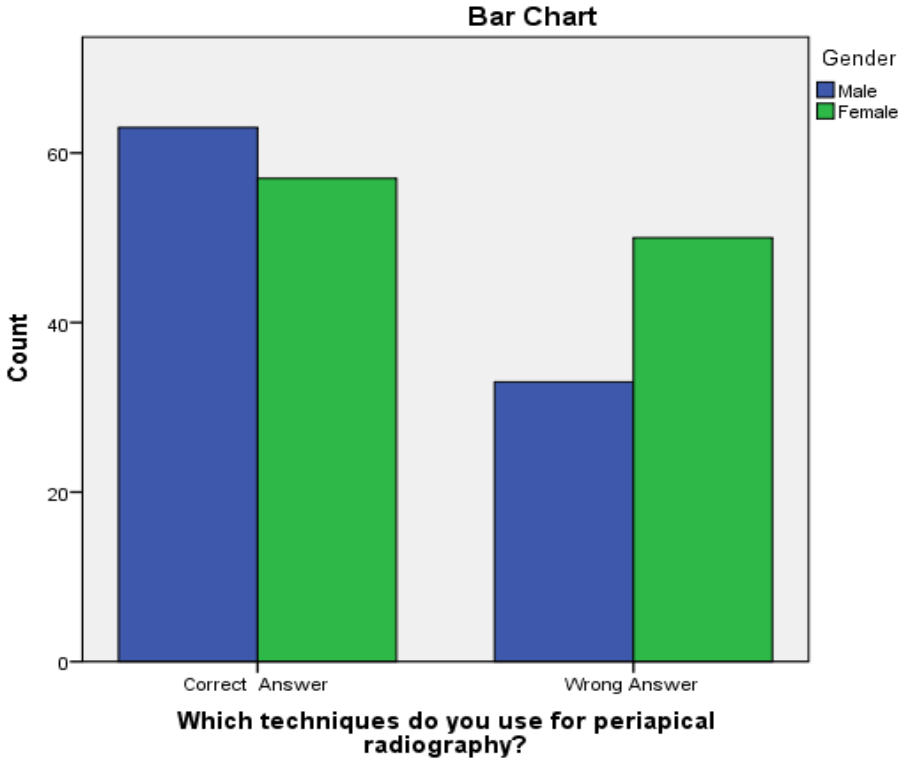
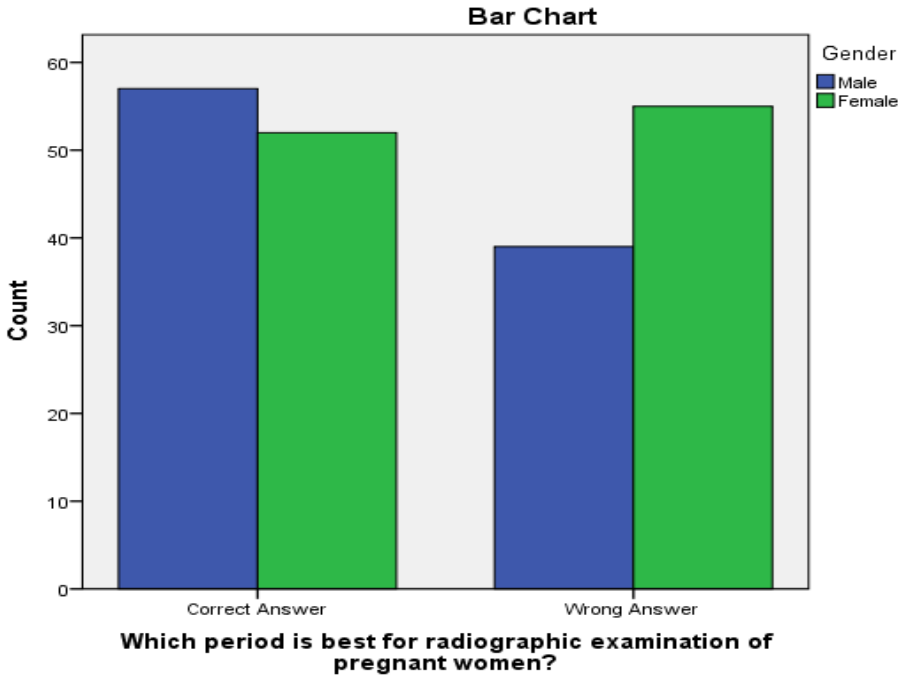


Figure 13: correlation of gender and correct answer of the question (Which period is best for radiographic examination of pregnant women?)



DISCUSSION:

Exposure to radiation increases the incidence of congenital anomalies in neonates, cancer development, and also be a cause of short life span. Although the amount of radiation to which the patient expose during diagnostic dental radiography is less than other fields, risks cannot be ruled out. Considering this, radiation protection protocol must focus on avoidance of the occurrence of deterministic effects and to decrease likelihood of stochastic effects by minimizing the exposure of patients and the operators. This objective can be achieved if the interns and dental students have sufficient knowledge about protection against radiation and its application in clinical situations. (1, 2).

In our study, we aimed at detection of the degree of knowledge, attitude and practice of dental students and interns towards radiation safety and protection in Qassem Province.

Analysis of the correct and wrong answers of participating students and interns showed that 79 students (39%) have wrong answers while 124 students (61%) have correct answers as revealed in **table 1**. This differs from **Prabhat, et al.** (4) study whose results showed that 77.3% of the participants had correct answers. This means that knowledge and practice of dental students about radiation protection is average and requires improvement by education programs and more practicing.

By comparing the degree of knowledge to gender, our results showed that females have more knowledge than males indicated by their high proportion of correct answers in 6 questions, while males showed high proportion of correct answers in 3 questions only. This guides us that males need more education programs and concentration on increasing their knowledge and improving their practice regarding radiation safety and practice.

Analyzing of the questions results separately about the knowledge of dental students and interns showed that 96.6% of students and interns think that dental x-rays are harmful while 100% of Indian students and interns in ***Prabhat* study** (4) know that it is harmful.

Our study showed that 86.7% of students and interns are aware of international commission on radiological protection (ICRP) \ National council on radiation protection &measurements (NCRP) recommendations while 93.9% Indian ones in ***Prabhat* study** (4) are aware of these recommendations.

Analyzing of the questions results separately regarding the practice of dental students for the protective

measures against radiation exposure showed that 59.1% of students and interns in our study prefer to use paralleling technique for peri-apical radiography which is lower than ***Najla Faraz*** (9) study whose results showed that 75% of dentists use it. 42.4% of dental students and interns in our study prefer to use rectangular collimator while only 8% of dentists in Jeddah in ***Najla Faraz*** (9) study use it. 48.8% of students and interns in our study prefer to use E-speed in peri-apical radiology while 36% of dentists in ***Najla Faraz*** (9) study use it. 70% of our participants in Qassem study are more aware of using film holder by comparing with Korean dentists which they are less aware of its usage and their percentage is 21.7% as shown in **Lee, B. D study.** (7) However, 55.2% of dental students and interns explain radiation risk\benefit to patients which is less than the percentage of Korean dentists in ***Lee, B. D***(7) study whose results showed that 63.2% of them explain these risks and benefits to patients .

There are no researches in Saudi Arabia that measure the knowledge of dental students of X-rays in dental clinics. Only a study was conducted in Jeddah and involved dentists not students.

All these results guide us to variable responses and average knowledge of dental students about radiation protection and safety, so it is needed to be improved through improving this part in their curriculum, organizing more education and practicing programs for them.

The limitations of our study are its small sample size and that it included only dental students and interns of one province in Saudi Arabia, so its results cannot be generalized. More studies are required to get a global idea about students and interns' awareness.

CONCLUSION AND RECOMMENDATION:

Through our results, we found that the knowledge and practice of radiation safety among dental students and interns in Qassem Province is average and have to be improved to be optimal especially among males. We suggest to provide more educational programs and courses for students before entering clinics and dealing with patients to avoid harms for both students and patients.

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The authors have no conflict of interest regarding this research.
Authors' contributions:
Rajesh and Azhar have conceived and designated the study. Vanketesh has reviewed many researches and prepared the questionnaire. Azhar has collected, organized, analyzed and interpreted data, also she has written the initial draft. Vanketesh has revised it and wrote the final manuscript.

Consent: All authors have critically reviewed and approved the final draft and are responsible for the content and similarity index of the manuscript.

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