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Research Article

**AWARENESS OF DENTAL STUDENT ABOUT RADIATION  
HAZARDS AND SAFETY MEASUREMENTS**<sup>1</sup>Abdullah Obaid Alharbi, <sup>2</sup>Prof. Tarik Ibrahim, <sup>2</sup>Abdulaziz Turki Alsahli,  
<sup>2</sup>Mohammed Abduljawad<sup>1,2</sup> Taibah University - Medina , Saudi Arabia.**Article Received:** August 2019**Accepted:** September 2019**Published:** October 2019**Abstract:***Awareness of dental students about radiation hazards and safety measurements****Aim:** To evaluate the students' knowledge about radiation hazard and protecting methods in Taibah university, Medina, Saudi Arabia in order to improve the students' knowledge about radiation hazards and safety methods in dental clinic.****Methods:** this was an cross-sectional study that recruited dental students who were working at Taibah university dental clinic, Medina, Saudi Arabia. Through convenience sampling, a structured anonymous questionnaires were distributed. Questionnaires has been filled by 165 students who are involved in dental clinic varying from second to fifth academic year, 102 of the participants were males and 63 were females. Descriptive statistics and inferential analysis were performed.****Results****The study sample included 165 dental students of whom 62% were males and 38% were females. Forty-percent of the participants have heard about stochastic and non-stochastic effects, 61 %were aware about ALARA principle. The majority of the participants, 75% believed that radiation exposure has an effect on the thyroid gland, 56% remain at a safe distance during exposures, however, protective lead apron has not been used, also 62% said that x-ray is contraindicated in pregnancy. High percentages of the participants did not know the permissible radiation exposure limit for general public 50% or for the workers 40%.****Conclusion:** The overall level of awareness about radiation hazards and safety measurements among dental students have varied from low to medium. Student must know and use the protection principle to minimize the risk on the patient and the dentist.****Keywords:** Dental – Radiation – Hazards – Safe – X ray***Corresponding author:****Abdullah Obaid Alharbi,**

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**INTRODUCTION:**

Radiography used in dentistry as a diagnostic method to uncover diseases which are invisible clinically. The frequency of taking radiographs is based on certain factors such as an individual's age, severity of a disease and any signs or symptoms of oral disease. There isn't a specific method that fits all situations in which we can determine intervals between x rays. Dentists stick with the "ALARA" principle that was initiated in 1973 by the International Commission on Radiologic Protection, an abbreviation for "As Low as Reasonably Achievable. Dental radiographs represent about 2.5% of the effective dose received from medical radiographs. The dentist's should follow the ALARA Principle [As Low as Reasonably Achievable] to minimize the patient's risk. Limiting radiation exposure can be applied through: ideal film exposure and processing techniques, wear protective aprons and thyroid collars. Also, minimizing the number of x-rays obtained to obtain crucial diagnostic details. [1]

The quantity of radiation delivered in the dental clinic is so low to have the probability of resulting in a harmful effect. The following step in decreasing the patient's exposure is to use appropriate procedures to match the specific examination that will improve radiation to obtain images with maximum diagnostic information and minimizing unnecessary exposure. Thyroid collars should be used during intraoral radiography, especially while dealing with patients younger than 20 years old, in order to protect the radiosensitive thyroid glands. [2,3]

Dentists must evacuate everyone the X-ray room except the patient before taking the radiograph. Protective barrier must separate the workers from the radiation at the time of exposure. The one who is assisting the patient must wear a protective apron 0.5 mm of lead thickness should be used. A lead collar is used for protection of the thyroid gland from radiation. All patients must wear Lead leather or vinyl aprons to protect their organs and pregnant patients, whom undergo exposure. [4]

If it's a must that the dentist need to be in the room and cannot use a shield, he should be standing between 90° and 135° to the source of the beam and minimum 3 meters from the patient being radiographed. [5]

One of the hazards that related to dental x ray is cancer induction. The Uk heath protection agency published that the average of cancer induction for men is 30 to 39 years old of 6.8% per Sv and 5.5% per Sv for women for exposure of the head. That's mean

1 in 15000 men and 1 in 18000 women could develop cancer for each 1Sv from dental x-ray.

Radiation risk is an age dependent, contributed more in young and less in elderly. Young people tissues have more radio- sensitivity. Children have the potential to develop risk of cancer 2 to 3 times more than adults when using the same dose. So using specific pediatric exposure protocol is a must. [6]

Taking radiograph in pregnancy should combine with wearing lead apron to protect the fetus from exposure. There is no need to delay dental radiograph in pregnancy until postpartum but the dentist still need to offer delaying non emergence radiography for pregnant patient. [7]

At the end dental radiography is an important tool for diagnosis .it has hazards but if it's handled in the right way it will be a great value for you in the clinic. Remember always the safety measure and protection wearing.

**Aims and objectives**

The aim of this study is to evaluate the depth of knowledge about radiation hazard and protecting methods among dental students in Taibah university, medina, Saudi Arabia. The objective of this questionnaire will help to improve the knowledge of dental students about radiation hazards and safety methods in dental clinic.

**MATERIAL AND METHOD:**

In this observational Descriptive statistics and inferential analysis, cross-sectional study 165 male and female male and female dental students who are involved in working in dental clinic in Taibah university, medina, Saudi Arabia will be recruited, and they will be chosen by using convenience sampling technique. Any participant who isn't involved in working in dental clinic will be excluded. The close ended manual questionnaire will be distributed among the participants by deliver it in envelopes to students by their classes leaders. This questionnaire will measure the knowledge and awareness of dental students about radiation hazards and protection methods. Questionnaire will be divided to 2 sections; five questions are about dental x ray hazards and twelve questions are about dental x ray protection methods.

**RESULT:**

The aim of this study is to evaluate the depth of knowledge about radiation hazard and protecting methods among dental students in Taibah university, medina, Saudi Arabia. A questionnaire has been

filled by 165 male and female dental students who are involved in working in dental clinic varying from second to fifth academic year. 102 [61.8%] of the participants were males and 63 [38.2%] of them were females. [Table 1]

A total of 165 students were involved in this study. They were asked about general information about radiology. The majority of them said yes about x-ray harmfulness 82.4 % [ fig.1]. 60.6 % were aware about ALARA principle [fig.4]. 76.4% of the students answered yes to digital radiography has less exposure the conventional. 61.8% of the participants said that x-ray is contraindicated in pregnant patient. [Table 2]

Participants who have heard about stochastic and non-stochastic effects counted as 40 % [ fig.5]. Most of the participants said the thyroid gland is the most affected organ in the head and neck region 75.2%. [Table 3]

More than half of the students 55.8% don't wear lead apron on a regular basis. 55.8% of the students know what the safe distance is. [Table 4]

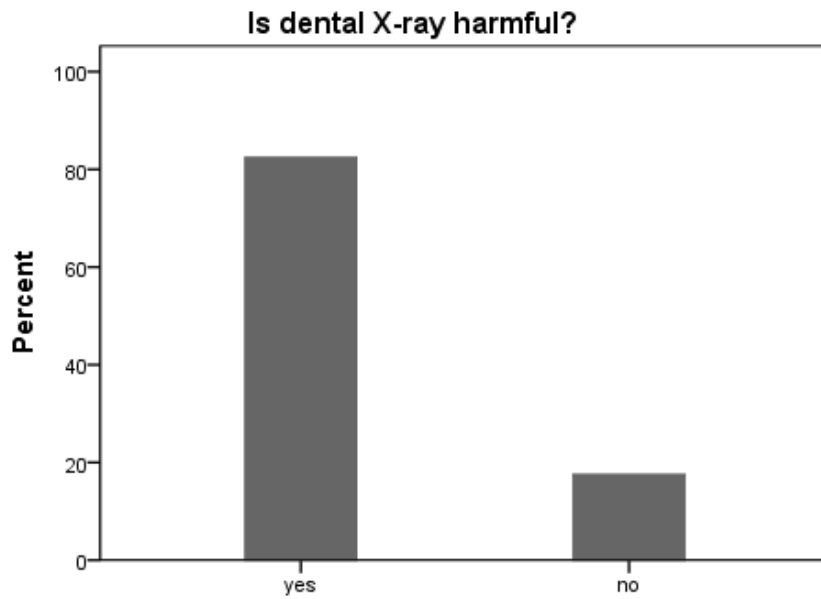
50.3% of the student don't know what the permissible dose for general public is. Also 44.2% of them don't know the permissible radiation dose for the workers [fig6]. As well as 62.4% of them don't know the radiation dose of periapical x-ray. [Table 5]

**Table 1: Participant's sex**

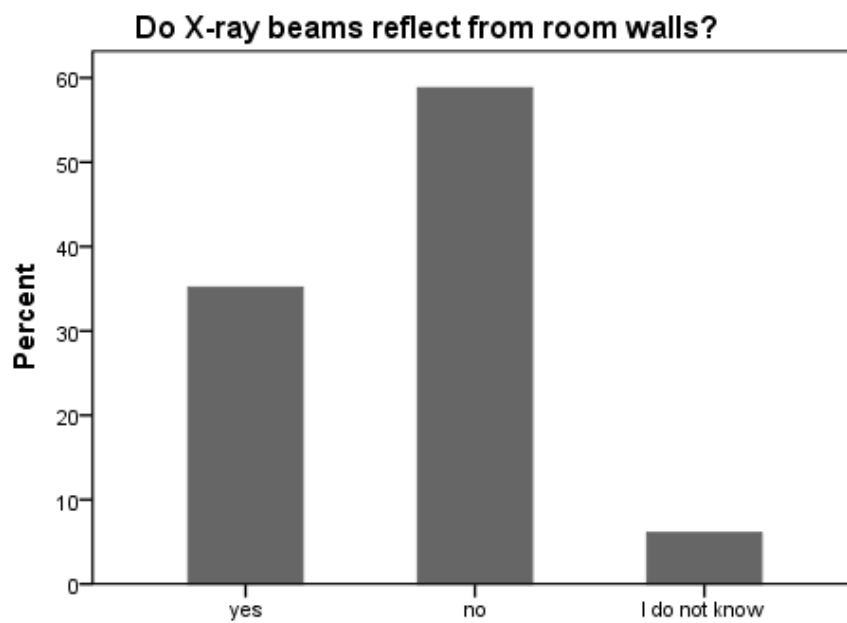
Sex	frequency	percentage
Male	102	61.8
female	63	38.2

**Table 2: General information about dental radiology**

Question	Answer	Frequency	percentage
Is dental X-ray harmful?	Yes	136	82.4%
	No	29	17.6%
	I don't know	0	0
Do X-ray beams reflect from room walls?	Yes	58	35.2%
	No	97	58.8%
	I don't know	10	6.1%
Are you aware of the usefulness of collimators and filters in dental radiography?	Yes	75	45.5%
	No	32	19.4%
	I don't know	58	35.2%
Are you aware of ALARA principle?	Yes	100	60.6%
	No	28	17.0%
	I don't know	36	21.8%
Does digital radiography require less exposure than conventional?	Yes	126	76.4%
	No	22	13.3%
	I don't know	17	10.3%
Is dental x ray contraindicated in pregnant patients?	Yes	102	61.8%
	No	43	26.1%
	I don't know	20	12.1%

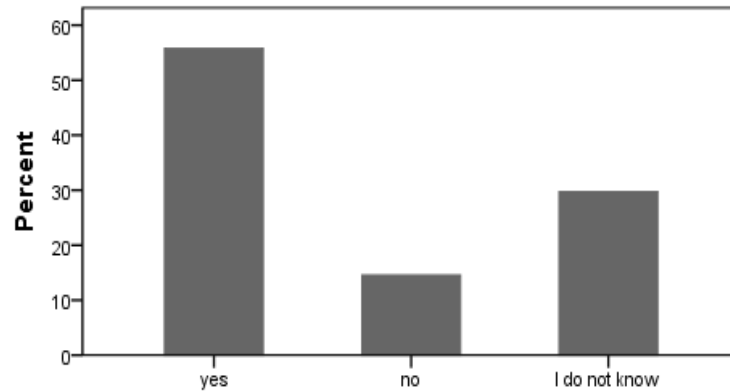


[Figure1]



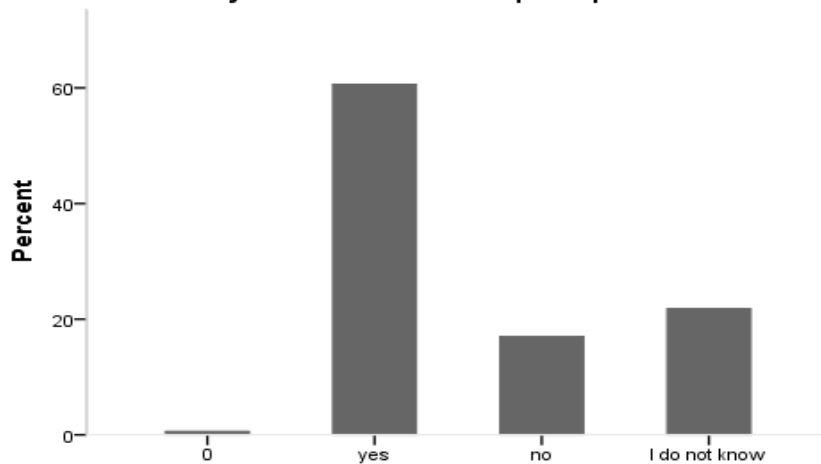
[Figure2]

The safe distance for the operator should be between 90 cm and 135 cm to the source of the beam and minimum 3 meters from the patient being radiographed. Do you think it's a correct measurement?



[Figure3]

Are you aware of ALARA principle?

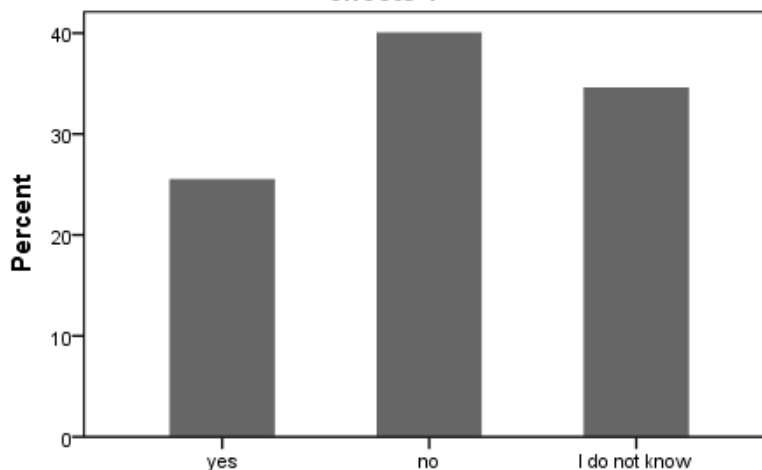


[Figure4]

**Table 3: Radiation hazards**

Question	Have you ever heard about stochastic and non-stochastic effects?		The spermatogenic series cell is one of the most radiosensitive cell. is it a correct statement?		The thyroid gland is the most affected organ in the head and neck region.	
	Frequency	%	Frequency	%	Frequency	%
Yes	42	25.5%	61	37.0%	124	75.2%
No	66	40.0%	19	11.5%	16	9.7%
I don't know	57	34.5%	85	51.5%	25	15.2%

Have you ever heard about stochastic and non stochastic effects ?



[Figure5]

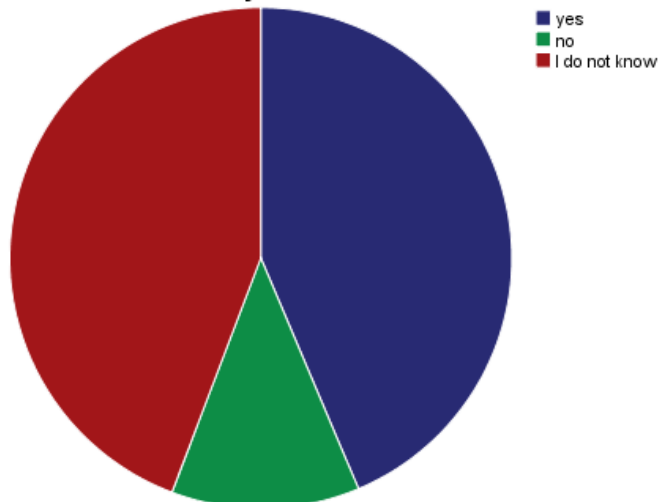
Table 4: radiation safety measurements

Question	Answer	Frequency	percentage
Should the operator wear monitoring badges?	Yes	145	87.9%
	No	9	5.5%
	I don't know	11	6.7%
Do you use lead aprons on a regular basis?	Yes	57	34.5%
	No	92	55.8%
	I don't know	16	9.7%
The safe distance for the operator is 90and 135degree to the source of the beam and 3 meters from the patient. Do you think it's a correct measurement?	Yes	92	55.8%
	No	24	14.5%
	I don't know	49	29.7%
The most effective shape of positioning indicating device [PID] is rectangular	Yes	66	40.0%
	No	26	15.8%
	I don't know	72	43.6%
Should the dental radiographer stand behind a protective wall while taking an x ray ?	Yes	139	84.8%
	No	10	6.1%
	I don't know	15	9.1%

Table 5: radiation doses

Question	The maximum permissible radiation dose for worker is 50mSv/year. Is it a correct dose?		The maximum permissible dose for general public is 5mSv/year. Is it a correct dose?		The radiation dose for periapical x ray is 0.005mSv. Is it a correct dose?	
	Frequency	%	Frequency	%	Frequency	%
Yes	72	43.6%	59	35.8%	37	22.4%
No	20	12.1%	23	13.9%	25	15.2%
I don't know	73	44.2%	83	50.3%	103	62.4%

The maximum permissible radiation dose for worker is 50mSv/year. Is it a correct dose?



[Figure6]

### DISCUSSION:

X-ray is considered one of the most important diagnostic method in dentistry to uncover diseases which are invisible clinically. As it has many advantages but if it's used recklessly and without following the safety measurements it will harm either the operator or the patient. Following the safety measurements must be implemented by all workers near the x-ray. [8]

This cross sectional study, had been performed on 57 undergraduate students of Taibah University of dental school, Medinah, Saudi Arabia. 66.7% of the clinical group said that x-ray is harmful. They were asked if X-ray beams reflect from room walls and 33.3% of them answered no. students were asked about stochastic and non-stochastic effect 33.3% of them said yes. [9] While in Departments of Restorative Dentistry and 1 Radiology, University of Benin, Benin, Nigeria cross sectional study no student knew the correct annual radiation dose limit for a dentist and 17.9% of the student knew what does ALARA mean. 58.3% of them knew the correct answer that it should be 3 meters as a minimum distance. [10]

In our present study an observational descriptive cross-sectional study method has been used on 165 male and female dental students who are involved in working in dental clinic in Taibah University, medina, Saudi Arabia. Close ended manual questionnaires have been distributed among the participants. The study aim is to evaluate the awareness of dental students about radiation hazards and safety measurements without comparing between males and females students. Passing through the

results of the present study, 82.4% said that x-ray is harmful and 58.8% of the students answered no for, do x-ray beams reflect from room walls.

Participants who don't know about stochastic and non-stochastic effects counted as 40% it's consider high percentage in dental students which they must know about it. When they were asked about maximum annual dose for a dentist 43.6% of them knew the right answer and 60.6% knew what ALARA principle is while 55.8% picked the right answer when they were asked about the safe distance for the operator.

### CONCLUSION:

From the result we got from our study we noticed that the level of awareness about radiation hazards and safety measurements vary from low to medium. Student must be know and use the protection principle to minimize the risk on the patient and the dentist.

### Recommendations:

The result we got showed that we will have future dentists with low to medium level of awareness about the radiation safety measurements and hazards which will lead to future harm to either the dentist or the patient. So we need to make our radiology subject more valuable and increase the awareness among the new students. For the students who took the course we have to do a refreshment for them like a short program about radiation hazards and safety methods.

### Acknowledgments:

to my supervisor prof.Tarek Mohamed and

prof.tamer hifnawy for their appreciated efforts ,and all students who participated in this study .

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**Appendices****Radiation hazards and safety measurements**

Dear colleague,

Would you please take a part in our study which it aims to assess the level of knowledge and awareness of radiation hazards and methods of protection among dental students.

Any published data will not identify any one individual.

We would like to thank you in participating in our study ,your time and effort.

For further information about the study you can contact with :

Abdullah Obaid Alharbi

0595009344

2008adriano@live.com

General information		
Age:		
Gender:	male	female
Nationality:	saudi	Non saudi
Year of study:		

**Radiation hazards and safety measurements**

ID NO:-----

Date:-----


Radiation hazards and safety measurements

Would you please answer the questions by choosing one of the following [yes-no-I don't know]

No.	Question	Yes	No	I Don't know
1	Is dental X-ray harmful?			
2	Do X-ray beams reflect from room walls?			
3	Have you heard about stochastic and non stochastic effects ?			
4	Are you aware of the usefulness of collimators and filters in dental radiography?			
5	Are you aware of ALARA principle?			
6	Does digital radiography require less exposure than conventional?			
7	Is dental x ray contraindicated in pregnant patients?			
8	Should the operator wear monitoring badges?			
9	The spermatogenic series cell is one of the most radiosensitive cell .is it right ?			
10	Do you use lead aprons on a regular basis?			
11	The safe distance for the operator should be between 90° and 135°to the source of the beam and minimum 3 meters from the patient being radiographed. Do you think its right measurement?			
12	The maximum permissible dose for radiation worker is 50mSv/year .is it a right dose ?			
13	The maximum permissible dose for general public is 5mSv/year . is it a right dose?			
14	The radiation dose for periapical x ray is 0.005mSv do you think its right ?			
15	Thyroid gland is the most affected organ in the head and neck region.			
16	The most effective shape of positioning indicating device [PID] is rectangular			
17	Should the dental radiographer stand behind protective wall during taking x ray ?			

## Ethical clearance

Kingdom of Saudi Arabia  
Ministry of Education  
Taibah University  
College of Dentistry  
Research Ethics  
Committee  
TUCD-REC  
08/03/2017



المملكة العربية السعودية  
وزارة التعليم  
جامعة طيبة  
كلية طب الأسنان  
لجنة أخلاقيات البحوث

Study Reference No.: TUCDREC/20170305/AOAIHarbi

Subject: Approval of the study: – “Awareness of dental student about radiation hazards and safety measurements” by the Ethics Committee

Dear Mr. Abdullah Obaid Alharbi, 5<sup>th</sup> Year Student

Please be advised that Taibah University, College of Dentistry Research Ethics Committee (TUCDREC) has reviewed and discussed your application to conduct the research mentioned above in the Dept. Oral Basic and Clinical Sciences (Division of Dental Radiology), at Taibah University with yourself as the Corresponding Investigator.


**TUCDREC has decided the following for your protocol:**


Unconditional Approved       Conditional Approved  
 Deferred       Rejected

The TUCDREC expects to be informed about the progress of the study, any Serious Adverse Events occurring in the course of the study, any revision in the protocol and patient information/informed consent and ask to be provided a copy of the final report.  
You may not initiate changes in approved research protocol without TUCD-REC Review and approval except when necessary to eliminate apparent immediate hazards to study subjects.  
While The TUCDREC has provided this decision. The committee, however, takes this occasion to your draw attention to that this resolution is purely ethical and in no form, it is to be construed to mean the conduction of or the end of the conducted research.

Since it is a good practice to involve the parent of a child in decision- making and to keep their confidence, it is also as good to assess that the person giving this consent (parent) is in a position capable of taking that particular decision, i.e., competent, for the consent form to be valid.  
This TUCDREC is organized and operated according to the Saudi National Regulation of the National Bioethics Committee, Guidelines of the Declaration of Helsinki, International Conference of Harmonization ICH, and the United States Codes of Federal Regulations and registered in the Office of Human Research Protection under the IORG #: IORG0008371 which Expires on: 13<sup>th</sup> January 2019, FWA00023781, which Expire on 13<sup>th</sup> January 2021, IRB# 00010037

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