



TO STUDY AWARENESS ABOUT RADIATION PROTECTION AMONG DENTAL STUDENTS OF CHENNAI-A QUESTIONNAIRE BASED STUDY

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ABSTRACT

The science of radiology is a double edged sword as it carries both benefit and risk to the patient .The primary risk from dental radiography is the rare chance of radiation-induced cancer. During a radiation exposure in the dental office, the individuals exposed to radiation include the dentist, their staff, people in the reception area and members of the public. The aim of this study was to test the students on their understanding of the importance of radiology and its judicious use. The study was carried out with 15 pretested questions which were closed ended. The study reports that there is significance in the number of radiographs being taken by various years of students ($P < 0.05$). However several questions pertaining to the understanding of the ill effects of radiation, radiation protection and use of digital imaging which is technologically advanced with lesser radiation dose were better understood by the CRRI than the other year students ($P < 0.05$) by virtue of their training. This study portrays that the training in radiology protection and radiation biology which is a syllabus for the fourth year (final year) BDS students can be brought in a little earlier to impart better training and make them more aware on the subject.

KEYWORDS: Radiology, protection, students, awareness, safety



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INTRODUCTION

As a dental professional, the usage of radiograph for diagnosis and further treatment is much more frequent than other fields of medicine. It is reported that around 45% of dental patients require radiographs for diagnosis. Therefore it is necessary that the patient be exposed to the lowest achievable dose of radiation exposure. This is achieved by the ALARA principle (as low as reasonably achievable) that focuses on selection criteria, equipment and quality assurance.¹⁻² Technical advances in radiological equipment have a significant effect on reduction of radiation doses to patients during intra oral and extra oral radiographs. During extra oral radiography, the use of rare earth intensifying screens has reduced the radiation exposure significantly.^{1,3-5} The use of E speed films in place of D speed films significantly reduces intra oral radiation exposures to the patient.^{1,6} Use of rectangular collimators reduces the total tissue exposed to radiation thereby reducing the patient exposure.⁷ Radiation dose reduction is necessary for the dental practitioner as well. The position distance rule also helps in radiation dose reduction when implemented properly.^{8,9} The use of various protection devices such as thyroid collars, lead aprons also help in this cause. The construction of the radiology room also plays a significant role. The construction of the X-ray room with walls coated with lead or gypsum

prevents the release of unexposed radiation to the surrounding environment.¹⁰ This study focuses on the awareness level about radiation protection among dental students. By understanding the behavior of dental students with regard to radiation protection further changes can be made in teaching the same in undergraduate or postgraduate levels. There are studies carried out on the same concept in other places, but in our Country the studies were few and hence the need to carry out this study.

MATERIALS AND METHOD

A self formulated questionnaire composed of 15 questions was circulated among prefinal, final year and interns under BDS students belonging of Saveetha Dental College and Hospital. The study was approved by the Institutional Ethics Committee (IRB 135/2016). There were no inclusion and exclusion criteria and the duration of the study was 30 days. Before the administration of the questionnaire, an informed consent was obtained from the participants. A total of 300 students participated. The participants consisted of 93% females and 7% males between the ages 20 years to 23 years. The data obtained was fed into Microsoft Excel (Redmond WA).

The statistical analysis was performed with SPSS Ver 17 to check for statistical significance.

QUESTIONS

NAME:

YEAR OF STUDY:

1. How many times are you generally exposed to radiation in a week?

- A. several times a day
- B. several times a week
- C. several times a month
- D. none

2. In your opinion how important is imaging in dentistry?

- A. Low
- B. Moderate
- C. High
- D. Very high

3. Mark the various options to reduce radiation exposure to patient that you are aware of?

- A. lead aprons
- B. shields
- C. time of exposure
- D. none
- E. all the above

4. What is the most important organ that must be protected during dental radiography?

- A. gonads
- B. thyroid
- C. skin
- D. bone marrow

5. Do you use film or digital sensor holders regularly while taking an intra-oral radiograph?

- A. yes
- B. no

6. Do you follow the position and distance rule?

- A. yes
- B. no

7. Do you make use of any personnel monitoring devices?

- A. yes
- B. no

8. What are the measures taken to make the X-ray room safe from exposure?

- A. Lead walls
- B. walls constructed of gypsum wallboard
- C. both
- D. none of the above

9. Do you hold the radiographic tube during exposure?

- A. yes
- B. no

10. What type of collimator do you use?

- A. rectangular
- B. round

11. The intra-oral devise used has a

- A. long cone
- B. short cone
- C. idont know

12. In your opinion , which radiographic technique delivers more radiation to the patients?

- A. panoramic
- B. full mouth

13. What technique do you use while taking a peri apical radiograph?

- A. paralleling technique
- B. bisecting technique

14. Can peri apical radiographs be taken for a pregnant woman?

- A. yes
- B. no

15. If yes, how many?

RESULTS

The data obtained was subjected to Chi-square test and the results are as follows:

QUESTION 1

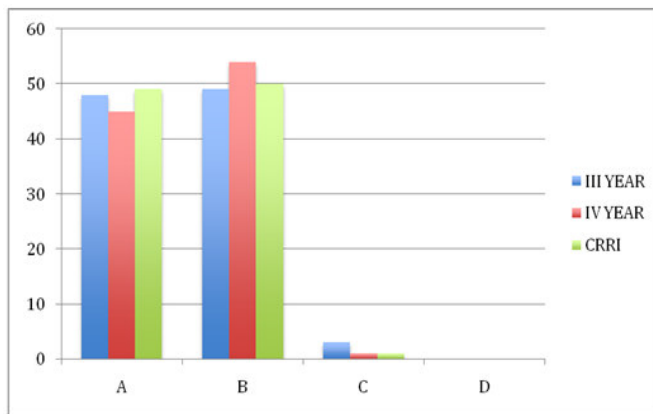
How many times are you generally exposed to radiation in a week?

Table 1

OPTIONS	III YEAR	IV YEAR	CRRI	TOTAL
Often in a day (A)	48(48%)	45(45%)	49(49%)	142(47.3%)
Often in a week (B)	49(49%)	54(54%)	50(50%)	153(51%)
Often a month(C)	3(3%)	1(1%)	1(1%)	5(1.7%)
None(D)	0(0%)	0(0%)	0(0%)	0(0%)

Responses for question 1

It was observed that majority of the participants have been exposed to radiation many times a week but with experience the exposure rate has decreased.(table 1, fig 1) The differences between the groups were statistically not



significant as $P < 0.05$

Figure 1
Graphical representation of the responses

QUESTION 2

In your opinion how important is imaging in dentistry?

Table 2
Responses for question 2

OPTIONS	III YEAR	IV YEAR	CRR I	TOTAL
Low	0(0%)	0(0%)	0(0%)	0(0%)
Moderate	5(5%)	5(5%)	4(4%)	14(4.7%)
High	44(44%)	44(44%)	41(41%)	129(43%)
Very high	51(51%)	51(51%)	55(55%)	157(52.3%)

The results from the participants revealed that none considered that radiation exposure in dentistry was unnecessary (table 2) and also the statistical variation between groups were insignificant as $P > 0.05$.

QUESTION 3

Mark the various options to reduce radiation exposure to patient that you are aware of?

Table 3
Responses for question 3

OPTIONS	III YEAR	IV YEAR	CRR I	TOTAL
Lead apron (A)	25(25%)	1(1%)	0(0%)	26(8.7%)
Shield(B)	27(27%)	0(0%)	1(1%)	28(9.3%)
Exposure time (C)	1(1%)	0(0%)	0(0%)	1(0.3%)
None(D)	0(0%)	0(0%)	0(0%)	0(0%)
All the above(E)	47(47%)	99(99%)	99(99%)	245(81.7%)

The statistical variation among the different groups is significant as $P < 0.05$. (table 3, fig2) The data also shows a clear understanding of radiation protection methods among most of the participants in this study.

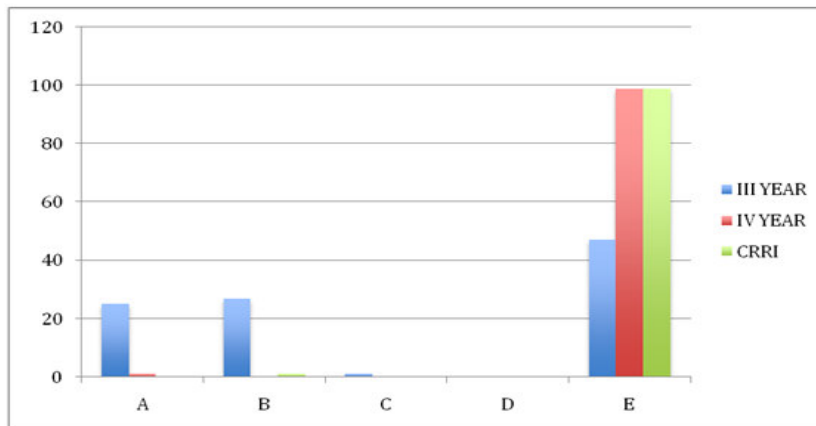


Figure 2
Graphical representation of the responses

QUESTION 4

What is the most important organ that must be protected during dental radiography?

Table 4
Responses for question 4

OPTIONS	III YEAR	IV YEAR	CRRI	TOTAL
Gonads(A)	0(0%)	0(0%)	0(0%)	0(0%)
Thyroid(B)	51(51%)	81(81%)	88(88%)	220(73.3%)
Skin(C)	32(32%)	19(19%)	7(7%)	58(19.3%)
Bone marrow(D)	17(17%)	0(0%)	5(5%)	22(7.3%)

The response for this question among the participants has been primarily among skin and thyroid in the beginning but participants of CRRI have given a clear majority to thyroid as the organ that must be protected during exposure.(table 4, fig 3) This is also observed with the statistical analysis of different groups where the P value is <0.05 and is significant.

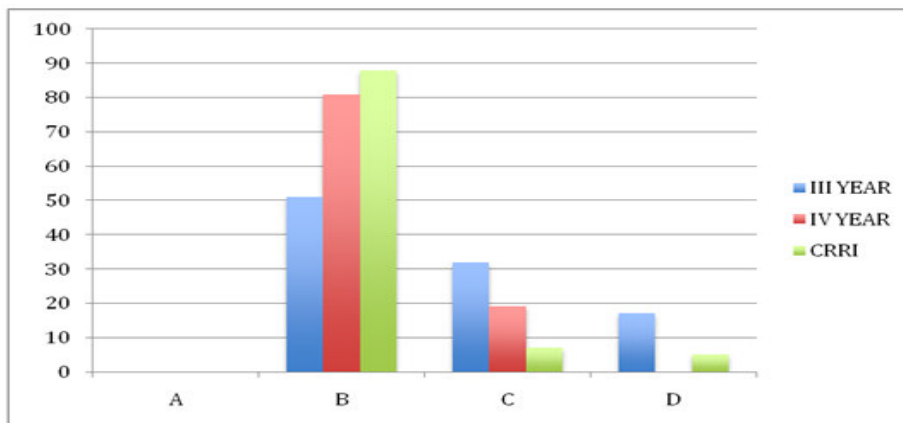


Figure 3
Graphical representation of the responses

QUESTION 5

Do you use film or digital sensor holders regularly while taking an intra-oral radiograph?

Table 5
Responses for question 5

OPTIONS	III YEAR	IV YEAR	CRRI	TOTAL
Yes(A)	31(31%)	66(66%)	75(75%)	172(57.3%)
No(B)	69(69%)	34(34%)	25(25%)	128(42.7%)

The results show that there is a significant increase in the usage of film or digital sensor holders from the III year participants to the CRRI participants thus suggesting the knowledge of the students about radiation protection for the operator as well.(table 5, fig 4) The statistical differences among the various groups were found to be significant as P<0.05.

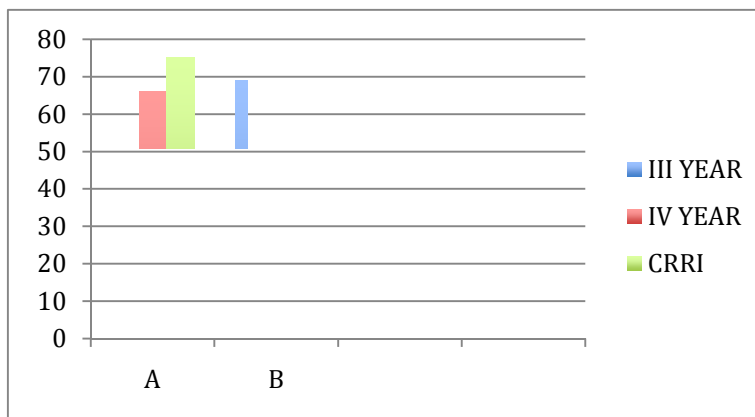


Figure 4
Graphical representation of the responses

QUESTION 6

Do you follow the position and distance rule?

Table 6
Responses for question 6

OPTION	III YEAR	IV YEAR	CRR I	TOTAL
Yes(A)	34(34%)	16(16%)	9(9%)	59(19.7%)
No(B)	66(66%)	84(84%)	91(91%)	241(80.3%)

The data shows that most of the students do not follow the position and distance rule and thus are at a risk of unnecessary risk of radiation exposure.(table 6, fig 5) The Statistical result was also significant as $P < 0.05$ when comparing the different groups.

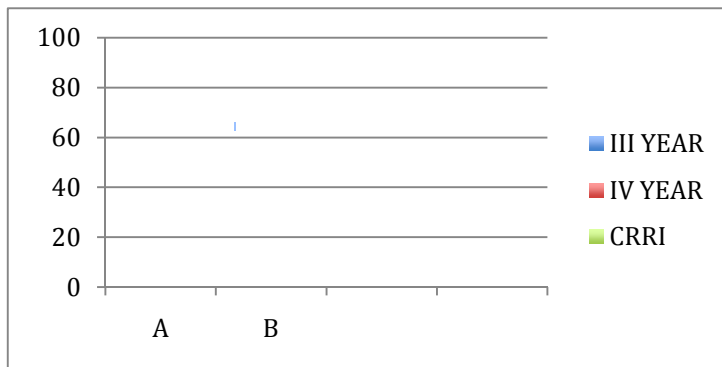


Figure 5
Graphical representation of the responses

QUESTION 7

Do you make use of any personnel monitoring devices?

Table 7
Responses for question 7

OPTION	III YEAR	IV YEAR	CRR I	TOTAL
Yes(A)	5(5%)	5(5%)	2(2%)	12(4%)
No(B)	95(95%)	95(95%)	98(98%)	286(96%)

The answers obtained from the participants clearly shows that most of them do not use any personnel monitoring devices and are clearly unaware of the levels of radiation they are exposed. (table 7, fig 6) The statistical analysis among the varied groups are not significant as $P > 0.05$.

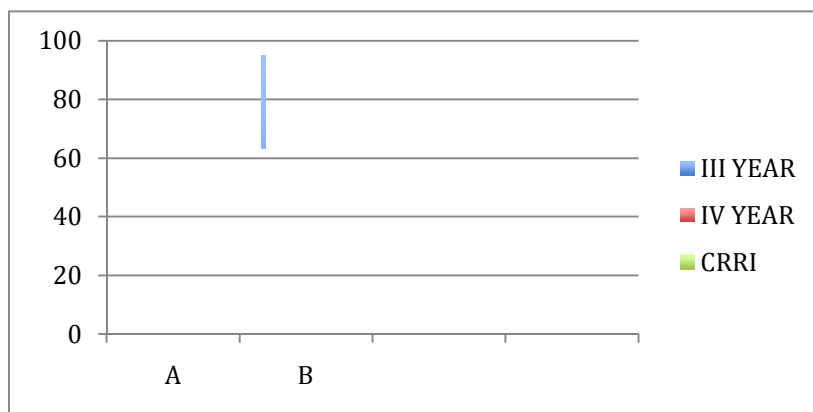


Figure 6
Graphical representation of the responses

QUESTION 8

What are the measures taken to make the X-ray room safe from exposure?

Table 8
Responses for question 8

OPTIONS	III YEAR	IV YEAR	CRRI	TOTAL
Lead wall	74(74%)	78(78%)	84(84%)	236(78.7%)
Gypsum wall	18(18%)	12(12%)	9(9%)	39(13%)
Both	8(8%)	10(10%)	7(7%)	25(8.3%)
None	0(0%)	0(0%)	0(0%)	0(0%)

The results obtained shows that many are unaware that even gypsum wallboards can be used to construct the x-ray room similar to using lead for construction of the walls.(table 8) The P value was found to be more than 0.05 during statistical analysis, thus it is insignificant.

QUESTION 9

Do you hold the radiographic tube during exposure?

Table 9
Responses for question 9

OPTION	III YEAR	IV YEAR	CRRI	TOTAL
Yes	69(69%)	65(65%)	74(74%)	208(69.3%)
No	31(31%)	35(35%)	26(26%)	92(30.7%)

It is seen that most of the participants hold the radiographic tube during exposure that leads to unnecessary radiation but a slight reduction is seen with progression in the course.(table 9) The difference among the various groups is observed to be insignificant as P>0.05.

QUESTION 10

What type of collimator do you use?

Table 10
Responses for question 10

OPTION	III YEAR	IV YEAR	CRRI	TOTAL
Rectangular	20(20%)	20(20%)	25(25%)	65(21.7%)
Round	80(80%)	80(80%)	75(75%)	235(78.3%)

The data received states that significant amount of participants use the round collimator that leads to more radiation exposure than the rectangular collimator.(table 10) Thus, the statistical differences among the various groups were for not to be significant as P>0.05.

QUESTION 11

The intra-oral device used has a

Table 11
Responses for question 11

OPTIONS	III YEAR	IV YEAR	CRRI	TOTAL
Long cone(A)	28(28%)	31(31%)	19(19%)	78(26%)
Short cone(B)	30(30%)	40(40%)	25(25%)	95(31.5%)
I don't know(C)	42(42%)	29(29%)	53(56%)	127(42.3%)

The obtained data for this question shows that most of the students are unaware of the type of cone used in their intro oral X-ray device.(table 11, fig 7) The statistical data among the different groups were observed to be significant as P<0.05.

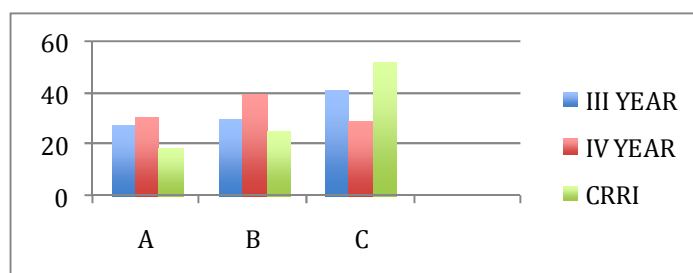


Figure 7
Graphical representation of the responses

QUESTION 12

In your opinion, which radiographic technique delivers more radiation to the patients?

Table 12
Responses for question 12

OPTIONS	III YEAR	IV YEAR	CRRI	TOTAL
Panoramic(A)	36(36%)	22(22%)	5(5%)	63(21%)
Full mouth(B)	64(64%)	78(78%)	95(95%)	237(79%)

The response to this question clearly shows that majority of students were aware the hazardous effects of a full mouth series than a panoramic imaging in respect to radiation exposure.(table 12, fig 8) The difference among different groups was observed to be significant on subjection to statistical evaluation (P<0.05).

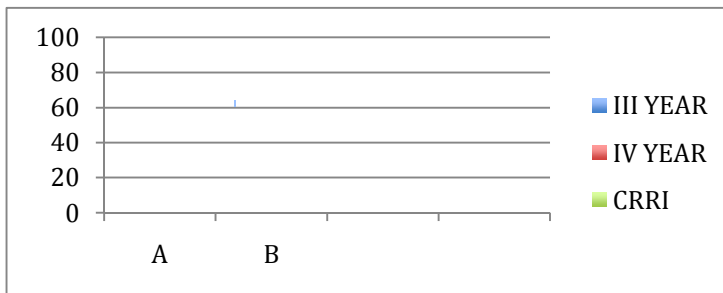


Figure 8
Graphical representation of the responses

QUESTION 13

What technique do you use while taking a peri-apical radiograph?

Table 13
Responses for question 13

OPTIONS	III YEAR	IV YEAR	CRRI	TOTAL
Paralleling(A)	25(25%)	17(17%)	6(6%)	48(16%)
Bisecting(B)	75(75%)	83(83%)	94(94%)	252(84%)

This question was responded by most of the students that they use the bisecting angle technique than the paralleling angle technique. (table 13, fig 9) On evaluation, the statistical data proved to significant (P<0.05).

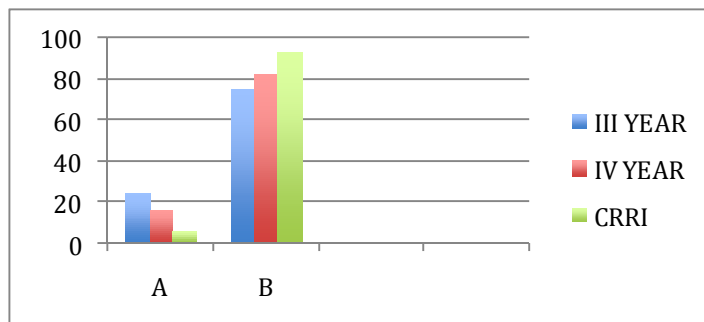


Figure 9
Graphical representation of the responses

QUESTION 14

Can peri-apical radiographs be taken for a pregnant woman?

Table 14
Responses for question 14

OPTIONS	III YEAR	IV YEAR	CRRI	TOTAL
Yes(A)	8(8%)	2(2%)	9(9%)	19(6.3%)
No(B)	92(92%)	98(98%)	91(91%)	281(93.7%)

It is observed that most participants in this study feel that a pregnant woman should not be exposed to radiation.(table 14, fig 10) The statistical data was found to be insignificant between the groups studied (P>0.05).

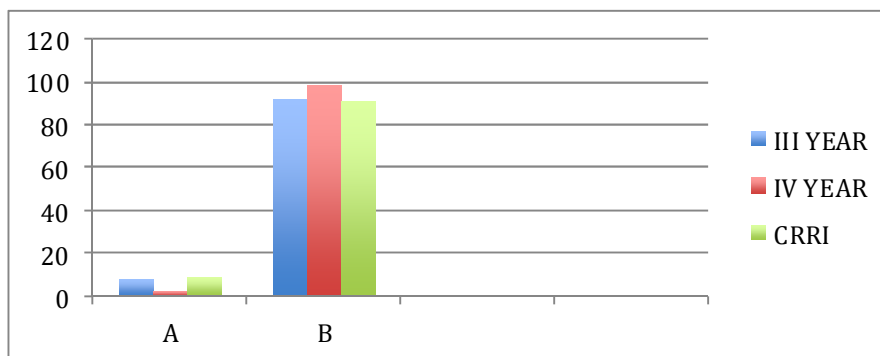


Figure 10
Graphical representation of the responses

QUESTION 15

If yes, how many?

Table 15
Responses for question 15

OPTIONS	III YEAR	IV YEAR	CRRI	TOTAL
0	93(93%)	98(98%)	91(91%)	282(94%)
1	5(5%)	0(0%)	3(3%)	8(2.7%)
2	2(2%)	2(2%)	6(6%)	10(3.3%)

The response received from these participants very few of the students are in favor of taking radiographs for a pregnant woman.(table 15) There was no significant difference between the different groups during statistical analysis ($P>0.05$).

DISCUSSION

The application of dental radiography for efficient diagnosis and treatment planning is been significantly increasing over the years.¹¹ However, with increased application, there is an increased risk for unwanted exposure of both the patient and the operator. Proper technique, positioning, equipment used all play a pivotal role in the radiographic protection of both the patient and the operator.^{2,4} In this survey conducted among dental students, we observe that with years of study and practice, the students are capable of taking proper radiograph without unnecessary retakes. This result correlates with the studies done in Turkey¹², Belgium¹³ and Canada¹².The results of the study suggests that the participants are well aware of the importance of imaging in dentistry and various methods of radiation protection such as thyroid collars, lead apron, x-ray rooms constructed with lead or gypsum walls ,which is similar to the results obtained in a study conducted in Ukraine.¹³When the respondents were questioned about the important organ to be protected during dental radiography a total of 73.3% answered as thyroid. This is synonymous with the result of the Ukrainian study where 66% of the respondents were aware that thyroid should be protected.¹³This study also shows that a majority of students do not follow the position distance rule and these results are similar to those obtained from a study conducted by S Shahab ¹⁴ where only 36% of dentists followed the position distance rule for their own protection. It was also observed many did not use any personal monitoring devices to assess the level of radiation they were exposed to.In order to reduce re-taking of radiographs due to positioning error many dentists tend to hold the radiographic tube during exposure even though this action tends to pose as a

radiation hazard. In this survey, irrespective of the year of study majority of students (69.3%) held the radiation tube during exposure. This is similar to results obtained by the study conducted by Byung-Do Lee et al in Korea.¹⁵The use of a collimator, particularly a rectangular collimator helps us restrict the receptor area of the x-ray beam and prevents unnecessary patient exposure ¹⁰. But the results of the current shows that only 21.7% of the dentists prefer rectangular collimators when compared to the round collimators even though its use would reduce the effective radiation by 60% ¹⁰. This is similar to the outcome of other studies conducted in Sweden (29%).¹⁶ Other studies showed much less awareness about the same as in those conducted in Belgium (6%) ¹³, Turkey (5.5%) ¹²and Canada (8%).¹³The use of a long cone helps to reduce excessive X-ray divergent beams thus minimizing patient radiation dose.¹⁰ this study shows that only 26% of the students prefer long cone. Some other studies in Turkey (52.3%) ¹², England and Wales (63%)¹⁸showed higher use of long cones while studies in Ukraine showed only 15% of use of long cones.¹⁴The respondents in this survey when questioned about amount of radiation for a full mouth series versus panoramic radiograph, the results obtained (63%) were similar to those obtained by a study conducted in Noida.¹⁸In this survey it is observed that most of the students preferred the bisecting angle technique (84%) even if the paralleling technique has exposure to thyroid due to scattered radiation and produces accurate images.¹⁸ This is similar to results obtained from study conducted in Noida ¹⁸also most of the participants were apprehensive about taking radiographs for pregnant women which correlates to results of studies conducted in Ukraine ¹⁵, Noida ¹⁸ and to recommendations given by Praveen BS et al.¹⁸

CONCLUSION

This study was conducted in a Dental institution with intra oral and extra oral dental radiographic facilities. From this study it was observed that the interns were much more knowledgeable in using radiograph judiciously. But it was observed that majority of students; irrespective of year of study do not follow radiation protection measures even though they were aware of

the same. Thus, it is necessary that all students must be given proper training to help them understand the importance of radiation protection and it must be made sure that they follow the same.

CONFLICT OF INTEREST

Conflict of interest declared none.

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