

Awareness of Biological Hazards and Radiation Protection Techniques of Dental Imaging- A Questionnaire Based Cross-Sectional Study among Dental Students and clinicians

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Abstract: Radiation hazards are harmful and it becomes insecure when there is a professional negligence. To assess Knowledge, Approach and Perceptions (KAP) of Under graduates (UG), post graduates (PG) dental students and private clinic practitioners towards biological hazards of dental x- ray and appropriate radiographic protection techniques. To compare KAP between UG students, PG students and clinicians. The study comprised of 120 participants who include 40 clinical undergraduates, 40 Post graduates from two dental colleges and 40 private dental practitioners in Gulbarga city. The information was collected through structured multiple choice questionnaires (18 in number). The Knowledge, approach and perception (KAP) level regard to biological hazards effect of x- ray was noted to be high in clinicians among three groups. The Knowledge, Approach and Perception (KAP) level regard to biological hazards effect of x-rays of UG, PG Dental students and practising clinicians was found to be high in clinicians than PGs followed by UGs.

Keywords: radiation hazards, protection, Knowledge, Approach and Perception (KAP)

INTRODUCTION

Radiographs are essential to dentists for Diagnosis, treatment planning, monitoring treatment or lesion development .However, an integral part of radiography is exposure of patients and, potentially, clinical staff to X-rays. No exposure to X-rays can be considered completely free of risk, so the use of radiation by dentists is accompanied by a responsibility to ensure appropriate protection [1].

The effects of x-rays on humans are the result of interactions at atomic levels. These biological effects can be divided into two broad categories: Deterministic and stochastic effects. Deterministic effects are those effects in which the severity of the response is proportional to the dose. These effects occur in all people when the dose is large enough. Deterministic effects have a dose threshold below which response is not seen. By contrast, stochastic effects are those for which the probability of occurrence of the change, rather than its severity, is dose dependent [2].

The stochastic effects thus leave the patient's and the operating personals in a high risk zone as it does not have dose thresholds. Keeping this in mind, the dental radiograph should be prescribed only for a patient when the benefit of disease detection outweighs the risk of damage from x-radiation. In addition, the amount of exposure a patient and the operator receives from dental radiographs depends on the film speed, collimation, technique, exposure factors and protecting barriers used. This necessitates the operator to have

thorough knowledge towards radiation hazards and its protection protocols. The aim of the present study was to assess knowledge, approach and perceptions (KAP) of biological hazards of dental x- ray and appropriate radiographic protection among dental students and private dental practitioners[3].

MATERIALS AND METHODS

The study comprised of 120 participants who include 40 clinical undergraduates, 40 Post graduates from Al-badar Dental College & HKE S. Nijalingappa Dental College and 40 private dental practitioners in Gulbarga city. A questionnaire related to radiation protocol in the form of multiple choices was given to each participant and the response sheets were collected after 30 minutes. KAP assessment was gathered by questionnaire following Prabhat *et al.* [2] with slight modification.

Among the 18 questions; 16 were close-ended and 2 were leading questions. Prior to administration of the questionnaire the institutional ethical committee

approval was obtained and the participants were informed about the importance of the study and included only on voluntary basis. The response from the participants were then computed into a Microsoft excel worksheet and evaluated with SPSS (Statistical package for social sciences, software Version 20.0; Chicago, IL, USA©). Pearson chi-square test and Fisher's exact test was done to evaluate the statistical significance [4].

RESULTS

About 120 samples were enrolled in the present study. The samples included 40 undergraduate students in clinical dental years, 40 Post graduate students and 40 private clinic practitioners, 57.5% of participants were females. (Table 1) The results pertaining to questions given to the participants and their response group, after performing suitable statistical analysis are tabulated in Table 2.

Table-1: Showing the sex wise distribution of participants among groups

Sex	Group						Total
	UG group		PG group		Clinicians Group		
	Count	%	Count	%	Count	%	
Male	02	5	21	52.5	28	70	51
Female	38	95	19	47.5	12	30	69
Total	40	100	40	100	40	100	120

Table-2: Showing the questions given to the participants and their response group

No.			Groups						p-value
			UGs		Clinicians		PGs		
			Count	%	Count	%	Count	%	
1	In your opinion, how important is the role of imaging in Dentistry?	Low	0	0	0	0	0	0	Chi Square value(df)= 11.85(2), p value = 0.002*
		Moderate	13	32.5	3	7.5	16	40	
		High	27	67.5	37	92.5	24	60	
2	Is dental X-ray harmful?	Yes	33	82.5	26	65	31	77.5	Fisher's exact test, p = 0.239(NS)
		No	6	15	13	32.5	9	22.5	
		Don't Know	1	2.5	1	2.5	0	0	
3	Do X-ray beams reflect from room walls?	Yes	9	22.5	26	65	32	80	Fisher's exact test, p<0.001*
		No	27	67.5	14	35	6	15	
		Don't Know	4	10	0	0	2	5	
4	Are you aware of National council on radiation protection [NCRP] and International commission on radiological Protection [ICRP] recommendations?	Yes	9	22.5	33	82.5	29	72.5	Chi Square value(df)= 40.7(4), p value<0.001*
		No	12	30	7	17.5	6	15	
		Don't Know	19	47.5	0	0	5	12.5	
5	Are you aware of the usefulness of collimators and filters in dental radiography?	Yes	31	77.5	39	97.5	34	85	Fisher's exact test, p = 0.015*
		No	5	12.5	1	2.5	6	15	
		Don't Know	4	10	0	0	0	0	
6	Are you aware of deterministic and stochastic effects?	Yes	7	17.5	27	67.5	20	50	Chi Square value(df)= 23.78(4), p value<0.001*
		No	15	37.5	10	25	10	25	
		Don't Know	18	45	3	7.5	10	25	
7	Are you aware	Yes	20	50	35	87.5	29	72.5	Fisher's exact test, p = 0.001*

	of ALARA principle?	No	13	32.5	5	12.5	5	12.5	
		Don't Know	7	17.5	0	0	6	15	
8	Does digital radiography require less exposure than conventional?	Yes	27	67.5	39	97.5	39	97.5	Fisher's exact test, p <0.001*
		No	2	5	1	2.5	1	2.5	
		Don't Know	11	27.5	0	0	0	0	
9	Does the high speed film require a reduced exposure?	Yes	17	42.5	35	87.5	34	85	Fisher's exact test, p <0.001*
		No	4	10	2	5	4	10	
		Don't Know	19	47.5	3	7.5	2	5	
10	Do you prefer to hold the film or ask the patient to hold the film with their hand during exposure during exposure?	Yes	11	27.5	13	32.5	21	52.5	Fisher's exact test, p value= 0.064(NS)
		No	28	70	27	67.5	19	47.5	
		Don't Know	1	2.5	0	0	0	0	
11	Do x-rays have heritable effects?	Yes	20	50	24	60	23	57.5	Chi Square value(df)= 5.24(4), p value= 0.263(NS)
		No	14	35	14	35	9	22.5	
		Don't Know	6	15	2	5	8	20	
12	Does dental radiograph absolutely contraindicated in pregnant patients?	Yes	18	45	16	40	14	35	Fisher's exact test, p value= 0.349(NS)
		No	20	50	24	60	26	65	
		Don't Know	2	5	0	0	0	0	
13	Should personal monitoring badges be worn by the operator?	Yes	28	70	40	100	40	100	Fisher's exact test, p value<0.001*
		No	10	25	0	0	0	0	
		Don't Know	2	5	0	0	0	0	
14	Will you adhere to the radiation protection protocol in the future?	Yes	24	60	36	90	40	100	Fisher's exact test, p value = 0.003*
		No	1	2.5	3	7.5	0	0	
		Don't Know	5	12.5	1	2.5	0	0	
15	What is the ideal distance an operator should stand while taking intraoral radiographic exposure?	4 feet and 90°-135°	2	5	2	5	3	7.5	Fisher's exact test, p value<0.01*
		4 feet and 60°-90°	6	15	1	2.5	3	7.5	
		6 feet and 90°-135°	14	35	32	80	24	60	
		6 feet and 60°-90°	6	15	4	10	4	10	
		Don't Know	12	30	1	2.5	6	15	
16	Which is the most sensitive organ in dental radiography?	Gonads	0	0	3	7.5	3	7.5	Fisher's exact test, p value<0.001*
		Bone marrow	5	12.5	18	45	29	72.5	
		Thyroid	13	32.5	15	37.5	8	20	
		Salivary glands	22	55	4	10	0	0	
17	Do you use lead aprons and thyroid collar on a regular basis?	Always	10	25	8	20	17	42.5	
		Often	2	5	13	32.5	12	30	Fisher's exact test, p value<0.001*
		Sometimes	4	10	9	22.5	5	12.5	
		Rarely	2	5	4	10	3	7.5	

		Never	15	37.5	6	15	3	7.5	
		Don't Know	7	17.5	0	0	0	0	
18	If never/rarely/sometimes, why not?	No availability of apron and collar	10	25	7	17.5	10	25	Fisher's exact test, p value<0.001*
		Due to weight of the apron and collar	0	0	7	17.5	0	0	
		Common apron and collar for all	7	17.5	9	22.5	6	15	
		follow only position rule	9	22.5	1	2.5	0	0	
		follow only distance rule.	14	35	16	40	24	60	

DISCUSSION

Till date many studies were directed for the measurement of radiation exposure and had shown the increased occurrence of cancer, abortion, fetus mutagenic changes, cataracts and shortening of life span. Even though the previous statement being non-definite and non-applicable for diagnostic dental radiography, it is still acceptable to apply stochastic biological hazards effect [6].

Stochastic effects are those effects which follow the probability of occurrence of biological hazard effects, dose independent compared to deterministic effects (i.e. the patient may either shows biological damaging effect or not affected at all, with a minimal radiation exposure). Therefore, the radiation protection protocol should focus on prevention of the deterministic effects occurrence and to reduce the probability of stochastic effects, that is why dentists should be restricted to the “As Low As Reasonably Achievable” ALARA principle concept[5-7].

In order to achieve these goals, a thorough knowledge about the biological hazards of x- ray, is a must, in order to do proper radiation protection protocols. In the light of above context, the present study consisted of Undergraduate students, Postgraduate students and private practitioners.

In our study, when the participants were asked about the significance of imaging in dentistry about 92.5% clinicians, 67.5 % UGs & 60 % UGs considered it to be high. This reflects the less clinical experience of UGs. The results of next question showed that 81 % of the participants consider x-ray to be harmful but still to low percentages that make them keen in taking safety measures against this harm.

When the participants were questioned about their awareness of deterministic and stochastic effect: 17.5 % of the UGs, 50 % of the PGs and 67.5 % of the clinicians, answered yes. About 55.84 % participants answered yes when they were asked about the heritable effects of radiation. This means that about 45-55 % of them were unaware of the probability of occurrence of radiation biological damage, either by under or over estimation of radiation biological hazard effects.

Only 35 % UGs & 60 % PGs know the ideal distance an operator should stand while taking intraoral radiographic exposure. A good response (67.5 %UGs, 97.5 % PGs, 97.5 % clinicians) was seen from the participants when they were asked about the difference between the conventional and digital radiography in terms of exposure required. In the present study, 83 % participants claimed that they will adhere to radiation protection protocol in their future clinical practice. This is in accordance with the results obtained with study done by Prabhat *et al.* [2].

The results of this survey, which highlights the difference of knowledge regarding various aspects of dental radiography and radiation protection amongst the Dental practitioners, PG students and UG students’ needs to be considered in the overall context of the country. In the current study design, immediately after the collection of questionnaire from the participants, the correct answers with brief explanation were given to them to assure the basic knowledge about the radiation hazards and protection protocol.

CONCLUSION

From the response obtained through our study, it is obvious that the KAP level of the biological hazards effect of x- ray was high with clinicians than with PGs and least with the UGs. Similar studies with

reassurance programme and workshops at regular intervals should be carried out at institutional and national level for strict adherence of regulation protocol.

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