

## **Knowledge, Awareness And Practice of Sudanese Dentists Towards Oral Radiology And Protective Guidelines**

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### **Abstract:**

**Background:** In dentistry, radiographs are very helpful in detecting oral diseases, cavities, bone related problems, treatment planning as well as follow-up treatments. However, it should be clinically justified to obtain maximum benefit and reduce further effects. This study was conducted to assess the knowledge, awareness and practice of general dental practitioners towards oral radiology and protective guidelines.

**Materials and Methods:** A descriptive cross – sectional study carried out among 198 general dental practitioners working within Khartoum locality during period from January 2016 – April 2016. Data was collected via self administered questionnaires composed of demographic data and closed ended questions regarding their knowledge, awareness and practice towards the hazardous effects of dental x-ray and radiographic protection guidelines. Comparison between variables was assessed by Chi square test with the level of significance set at  $P \leq 0.05$ .

**Results:** The overall correct response among the study population was ranged 26.3% - 74.3%. more than half (55.1%) were aware that dental x-rays are harmful, 40.9% know that x-ray beams cannot be reflected from room walls, 48.5% perceived that x-rays do cause ionization to matter, while 46% had the knowledge of deterministic and stochastic effects and the majority 74.3% recognized that dental radiography is not an absolute contraindication in pregnant women. Significant correlation between the number of years in practice and level of knowledge and practicing protective measure regarding radiation exposure ( $P < 0.05$ ), but no difference were found between male and female dentists ( $P < 0.05$ ).

**Conclusion:** The results indicated insufficient knowledge and awareness regarding x-ray exposure, and practice of protective measures. This outcome necessitates continual education by way of dental radiology courses to ensure maximum safety for both dentist and patient.

**Keywords:** dental radiography, hazard of oral X-ray, Sudanese dentist, x-ray exposure

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### **I. Introduction**

Radiation is the energy that transmits through space and matter. These radiations could either be from a natural source or external or internal sources or a man-made source [1] that mostly contributes to medical and dental radiography.[2] In dentistry, radiographs are very helpful in detecting oral diseases, cavities, bone related problems, treatment planning as well as follow-up after treatments.[3] Oral and maxillofacial radiographic imaging can either be done conventionally “e.g. intraoral, extra oral and occlusal radiography” or by using specific imaging technique “e.g. tomography, CT scan and MRI.[4]

Regardless of the type of X-rays we use, problems arise due to their misuse and those may include patient related effects. These harmful biologic changes can either affect the cells by directly striking the cells and cause alteration of the structure and function of the affected molecules or indirectly by formation of free radicals which react with other free radicals resulting in formation of hydrogen peroxide which can break down large molecules such as proteins and DNA and cause cell damage. [5]

According to the probability of occurrence, biological hazards are classified into: deterministic “non-stochastic” and stochastic effects. Deterministic effects occur when there is a certain dose if exceeded then harmful insults start to appear. Stochastic effect meaning that the amount of exposure doesn't reach the determined dose so there would be no damaging insults. [6] These biological changes can lead to: skin injuries, changes in the blood forming organs and nature of the circulating blood cells, cancers, genetic effects and cataract formation.[3]

Even though dental radiation exposure is considered as minimal, the dentist should evaluate the patient's need and insure that the patient will have the maximum diagnostic benefit and strictly follow the ALARA “as low as reasonably achievable” principle as recommended by The International Commission on Radiological Protection (ICRP).[7] Regarding the risks of x-ray exposure of the patients, staff and operator,

proper protective measures should be taken to reduce damaging effects. Recently, newer technologies have introduced like the use of digital radiography which is rapidly increasing and is now coming to the fore. However, direct digital radiographic use is of a great potential in the dental practice and can be used for clinical and diagnostic benefits, referral purposes, distinct environmental advantages and most importantly lowered radiation dosages.[8,9] In addition, unnecessary radiation exposure should be prevented by the use of lead aprons, thyroid protectors, gonad shields, fast films, film holders and alternative methods for caries detection, which are highly recommended for children, women of childbearing age and pregnant women.[10]

Dentists as health care providers are responsible for prescribing and exposing patients to dental radiographs. Since dental radiographic examination is widely used in dentistry, public health concern should be given to its hazardous effects.[11] Therefore they should have a thorough knowledge about x-ray exposure and be strictly following the ALARA “as low as reasonably achievable” principle as to protect the patient from any unnecessary radiation exposure that may lead to irreversible damage.

The objectives of this study were to assess and compare between male and female, newly graduates and experience dentists regarding knowledge and awareness towards the risk of X-ray exposure and commonly used protective measures. Also to assess their practice of the concept of “as low as reasonably achievable” X- ray radiation exposure

## **II. Materials and Methods**

A descriptive cross-sectional study conducted in Khartoum locality, one of the seven localities comprising Khartoum State, which is the capital of Sudan. The study was carried during the period from January 2016 to March 2016 among general dental practitioners working in public hospitals. The sample size was 198, obtained from the total number of 400 general dentists registered in Sudan Medical Council and practicing within the locality in four hospitals. Those who involved in administrative job, specialists or dental students were excluded. Participants were selected randomly from four public hospitals in the locality. Selection was made according to their names and registrations number in medical council by using random table.

Self-administered, close ended questionnaire was used for data collection. Questionnaire was designed according to Prabhat et al.,[6] with some modifications to suit Sudan context. The questionnaire was sectioned into three parts:

Part one: Demographic data consists of 4 items “age, gender, post-graduation experience and working area”.

Part two: Assessment of knowledge, awareness and practice towards the hazardous effects of dental x-ray, this part consisted of 5 items with one response per each item either yes, no or I don’t know.

Part three: Assessment of knowledge, awareness and practice regarding the radiographic protection guidelines, this part contained 7 questions with one response per each item either yes, no or I don’t know. The questionnaire was pre tested by 20 randomly selected general dentists to ensure comprehensibility, reliability, relevant and accuracy in the Sudan context. Cronbach’s alpha test showed the reliability coefficient of 0.86 and found satisfactory for conducting the study. These 20 questionnaires were not included in the final study.

Questionnaires were distributed to the selected dentists by one of the researchers and were handled early morning during the working days and handed up at the end of day. Eligible dentists were requested to participate voluntary and they signed informed written consent.

Data were entered in Microsoft Excel and transferred into SPSS (version 17; SPSS Inc., Chicago, IL). Findings were presented as group proportions, and difference in proportions for a given factor was assessed by the Chi-square test. A *P* value cut off for statistical significance was set at 0.05. The study was approved by the ethical research committee of University of Medical Sciences and Technology and the eligible dentists were requested to participate voluntary. An informed written consent was obtained. Names and any personal related data were kept confidential and were only used for the purposes of the study.

## **III. Results**

The study participants included 198 subjects. Majority graduated less than 2 year (69.7%), while 30.3% had graduated over 2 years.

Regarding knowledge, the overall correct response ranged from 45.5% to 74.2%. 55.1% were aware that dental x-rays are harmful, 40.9% know that x-ray beams cannot be reflected from room walls, 48.5% perceive that x-rays do cause ionization to matter, while 46% had the knowledge of deterministic and stochastic effects and the majority 74.3% recognize that dental radiography is not an absolute contraindication in pregnant women (Table 1)

As far as radiographic protection guidelines are concerned, 29.8% were aware of NCRP and ICRP, while 26.3%, 51.5% were familiar with the ALARA principle and collimators and the uses of filters in dental radiography. Additionally 66.7% were conscious and 41.4% were knowledgeable about the fact that digital

radiography requires less radiation exposure than conventional and that high speed films reduce exposure. Also, 76.8% prefer not to hold the films during exposure and 20.7% use lead aprons regularly.

From the results obtained there was no significant relationship between males and females regarding the knowledge about the harmful effects of dental x-rays, room walls being reflective to x-ray beams, deterministic and stochastic effects and pregnant women x-ray exposure? While a significant level of association between gender and knowledge about matter ionization by x-ray was found, with males being more knowledgeable than females ( $P = 0.01$ ) as shown in Table 2. According to the result findings, there was a significant correlation between knowledge of general dental practitioners about x-ray exposure and years of experience (Table 3).

#### **IV. Discussion**

The present study was conducted to assess Knowledge, awareness and Practice towards Oral Radiology and protective guidelines among Sudanese males and females dentists of different years of experience with the response rate of 100% similar to others.[12,13] To our knowledge no previous studies focusing on radiation safety have been conducted in the Sudan.

Dental radiation is considered of small dose; however cumulative exposures may lead to irreversible damage. Previous studies have shown increased occurrence of thyroid cancer, salivary gland tumors and intracranial meningioma,[11] but this is not yet confirmed and not applied to the dental radiation. The risk of causing stochastic effects which can occur with minimal doses [6] should not be overlooked. Thereby; In order to prevent such effects a thorough knowledge about x-ray exposure and protective measures is mandatory.

The results demonstrated that the majority of the studied population considered dental x-ray to be harmful, yet a percentage of 55.1% was not promising of a safe future practice. However, this result was similar to the results obtained by Eman & Arnout 2014.[6] The results also showed that less than 50% of the respondents knew that x-ray beams do reflect from room walls. This result indicates that there is a certain lack of basic x-ray knowledge similar to others.[7,12-16]

Regarding pregnant women, a pleasing result was revealed, as most of the involved dentists recognized that dental radiography is not absolutely contraindicated in pregnant women. This result was better than those obtained by Saudi study [6] and Tabriz [17] which indicated insufficient knowledge. Despite that, dental radiographs should not be prescribed to pregnant women unless necessary.[17]

The study also conveyed that only 46% were aware of deterministic and stochastic effects of radiation while the rest were unaware of the possible biological hazards of x-ray exposure. In addition, less than one third of respondents were aware of ALARA principle. This was a disappointing result which was most likely due to insufficient undergraduate education. Lead aprons are patient-protective equipment that reduces scattered radiations. Unfortunately, only 20.7% used lead aprons on a regular basis which was almost similar to that obtained from study in Korea with a percentage of 21.7%, [11] and also agrees with a related study carried out among the Belgian dentists manifesting that 88% of dentists did not use lead aprons regularly.[18] This might be due to a lack of strict regulations regarding safe practice [19] or unavailability of lead aprons. In general, the results reflected poor awareness toward x-ray exposure and precautions, similar results revealed from others, [1,3,10] but from the literature; one study concluded that radiation protection measures were more significant amongst clinical specialists.[20]

In addition, a significant correlation between gender and awareness of usefulness of collimators and filters in dental radiography was noted, with females being more aware than males. The same association was reported in the Belgian study [18] and this may explained that female dentists might have experienced the use of lead aprons during pregnancy. However, this might also be attributed to the caring nature of females.

Moreover, dissimilar to the results obtained in Tabriz, [17] our results indicated that there was a relationship between the number of years in practice and the awareness about the exposure hazards and protective measures in the majority of questions, which is similar to Prabhat et al result.[21] This means the more the dentist exposed to practice the more knowledge and protective measures acquired.

#### **V. Conclusion**

There was an overall lack of knowledge among Sudanese general dental practitioners working within Khartoum locality; regarding radiation exposure and protective guidelines. However, there was a highly significant correlation between number of years in practice and the level of knowledge regarding both radiation exposure and protective measures. Education regarding oral radiology biological hazards and practice safety is recommended in both undergraduate and postgraduate levels.

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**Table (1): Knowledge, awareness and practice of general dentists regarding oral radiology protective guidelines**

<b>Knowledge, awareness and practice regarding X. ray protective guidelines</b>	Yes	No	I don't know
Awareness of ALARA <sup>a</sup> principle	52 (26.3%)	117 (59.1%)	29(14.6%)
Awareness of National Council on Radiation Protection and International Commission on Radiological Protection recommendations.	59(29.8%)	114(57.6%)	25(12.6%)
Awareness of usefulness of collimators and filters in dental radiography.	102(51.5%)	78(39.4%)	18(9.1%)
Knowledge of digital radiography requires less exposure than conventional.	132(66.7%)	34(17.2%)	32(16.1%)
Knowledge of high speed film requires a reduced exposure.	82(41.4%)	44(22.2%)	72(36.4%)
Practice of holding the films during exposure.	34(17.1%)	152(76.8%)	12(6.1%)
Use of lead aprons on a regular basis.	41(20.7%)	137(69.2%)	20(10.1%)

\* "as low as reasonably achievable"

**Table (2): Association between knowledge and awareness of general dental practitioners and gender towards x-ray exposure**

Knowledge & awareness toward X ray exposure	Response	Gender		P. value
		Male	Female	
Dental x - ray is harmful	Yes	30(61.2%)	79(53.0%)	0.583
	No	18(36.7%)	65(43.6%)	
	I don't know	1(2.0%)	5(3.4%)	
X-ray beams reflect from room walls	Yes	24(49.0%)	66(44.3%)	0.434
	No	17(34.7%)	64(43.0%)	
	I don't know	8(16.3%)	19(12.8%)	
Aware of deterministic and stochastic effects	Yes	26(53.1%)	65(43.6%)	0.087
	No	19(38.8%)	61(40.9%)	
	I don't know	4(8.2%)	23(15.4%)	
Dental radiography absolutely contraindicated in pregnant patients?	Yes	9(18.4%)	37(24.8%)	0.650
	No	38(77.6%)	109(73.2%)	
	I don't know	2(4.1%)	3(2.0%)	

**Table 3:** Association between knowledge of general dental practitioners about x-ray exposure and years of experience.

Knowledge & awareness about X ray exposure		Year of experience			P value
		Less than a year	1- 2 year	More than 2 years	
Is dental x - ray harmful?	Yes	25(41.7%)	51(55.4%)	33(71.7%)	0.029*
	No	33(55.0%)	37(40.2%)	13(28.3%)	
	I don't know	2(3.3%)	4(4.3%)	0 (0%)	
X- Ray beams reflect from room walls?	Yes	22(36.7%)	41(44.6%)	27(58.7%)	0.039*
	No	24(40.0%)	42(45.7%)	15(32.6%)	
	I don't know	14(23.3%)	9(9.8%)	4(8.7%)	
X-ray cause ionization to matter?	Yes	22(36.7%)	47(51.1%)	27(58.7%)	0.049*
	No	16(26.7%)	18(19.6%)	13(28.3%)	
	I don't know	22(36.7%)	27(29.3%)	6(13.0%)	
Aware of deterministic and stochastic effects of X ray radiation	Yes	23(38.3%)	42(45.7%)	26(56.5%)	0.050*
	No	24(40.0%)	37(40.2%)	19(41.3%)	
	I don't know	13(21.7%)	13(14.1%)	1(2.2%)	
Is dental radiograph contraindicated in pregnant patients?	Yes	6(10.0%)	26(28.3%)	14(30.4%)	0.032*
	No	51(85.0%)	64(69.6%)	32(69.6%)	
	I don't know	3(5.0%)	2(2.2%)	0(.0%)	
Aware of ALARA* principle	Yes	9(15.0%)	23(25.0%)	20(43.5%)	0.022*
	No	41(68.3%)	54(58.7%)	22(47.8%)	
	I don't know	10(16.7%)	15(16.3%)	4(8.7%)	

\*"as low as reasonably achievable"