

## The Awareness of Iraqi Women, who are Studying or Working in A Medical Context, of The Use of Dental Imaging During Pregnancy

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### ABSTRACT

**Background:** Dental imaging in pregnant females may engender anxiety and consequently, be detrimental to both maternal and foetal oral health.

**Objective:** The aim of this study was to assess the degree of knowledge present in women regarding the use of dental imaging in pregnancy.

**Patients and methods:** Social media platforms were used for the online dissemination of a structured questionnaire to females who were either studying or employed within the medical sector. The questions were designed to elicit the degree of knowledge of the women with respect to the measures taken to protect the foetus from ionising radiation during dental imaging, the safest period for dental images to be acquired, the types of dental radiographs that could be performed and the risk to the foetus (e.g. radiation-induced neoplasia or malformations, as a consequence).

**Results:** A total of 98 subjects, of whom 77.6% (76/98) were aged less than 30 years, filled in and returned the questionnaires. The majority (50%) evidenced a considerable lack of knowledge regarding dental imaging. Opinions proffered suggested that it was safe during the first trimester of pregnancy (14.2%), that panoramic imaging was contraindicated during pregnancy (>50%) and that there was a high risk of associated foetal malformations (14.2%).

**Conclusions:** The data suggested that the study population, who had some level of clinical awareness, had little knowledge of the protective measures undertaken for dental imaging during pregnancy. Students, qualified personnel and healthcare workers would benefit from additional education (e.g. courses or lectures) on this topic.

**Keywords:** Dental imaging, pregnancy, awareness, survey, oral health, cross sectional study, Southern Technical University.

### INTRODUCTION

Imaging in dentistry is a valuable technique for the detection, evaluation and treatment of oral pathologies. However, there are longstanding mistaken perceptions regarding the use of dental imaging in pregnant women. Both the American Dental Association and the American Congress of Obstetricians and Gynaecologists concur that dental radiographs are safe at any juncture during pregnancy providing that measures are taken in order to ensure that the dose of ionising radiation applied is kept to a minimum<sup>(1,2)</sup>.

Since many pregnant females do not know whether or not dental imaging is safe they tend to avoid dental care. However, it is essential that women who are pregnant continue with regular dental checks as there is a strong correlation between maternal and foetal oral health<sup>(3-5)</sup>. A number of researchers have illustrated that dental students and even practising dental professionals are not fully cognizant with respect to the safety aspects of the use of radiation for dental diagnosis<sup>(6-9)</sup>.

Studies which have evaluated the views of practitioners regarding the potential teratogenic consequences and risks of a range of imaging modes have demonstrated a poor degree of knowledge and inappropriate beliefs which may compromise patient health<sup>(10,11)</sup>.

In Iraq, there are few educational initiatives relating to public radiation; this, together with public radiation

lectures and a number of papers which were transcribed into the country's native language of Arabic, led the authors to assess the level of knowledge of females relating to the use of ionising radiation in dental imaging during gestation. A good understanding of safety issues and measures to protect against radiation during imaging techniques is essential in order to encourage pregnant females to feel confident to engage in dental procedures.

### MATERIALS AND METHODS

#### *Study design and participants*

An observational checklist was utilised from earlier research<sup>(12)</sup>. The modified self-assessment questionnaire was distributed electronically between April and September, 2002. The questions elicited the cognizance of females, who were either students or professionals within the medical sector, in relation to the safety of dental images during gestation. Subject inclusion criteria were women, who were at least 18 years of age and resident in Nasiriya, Iraq.

#### *Sample size*

An online sample size calculator (Raosoft, Inc.) was used to determine the necessary population size for the study<sup>(13)</sup>. In order to give a 50% response distribution, and 95% and 5% confidence level and error margin, respectively, the smallest sample size suggested was 160.

However only 98 subjects were recruited once missing data and non-response averages were taken into account.

### **Questionnaire design**

The pre-structured questionnaire was written in the native language of Arabic, and performed anonymously. Content validity, and also visibility and face viability, were assured and pre-tested, respectively, by qualified specialists within dentistry and radiology domains. The questionnaire underwent testing by ten females from the desired population prior to study commencement. The initial page of the survey included information regarding the aim of the study and its voluntary confidential nature, as well as the contact details for the principal researcher. The survey was divided into two parts: (i) elicitation of sociodemographic data; and (ii) nine multiple choice threads relating to knowledge on the safe application of radiographs for dental image acquisition during pregnancy.

A complete set of the questions and the choices were presented in a separate file. Each of the nine questions was scored with either 1 or 0 for a correct or incorrect response, respectively. The maximum score was therefore 9. The subjects' degree of knowledge was ranked according to their total score, i.e. 0-3, poor; 4-6, fair; 7-9, good.

### **Study variables**

The demographic features recorded included: (i) age, divided into the age ranges: <30 years, 30-39 years, 40-49 years and >50 years; (ii) marital status, i.e. married or single; (iii) education level, categorised as below high school, graduated from high school, college or university, and post-graduate degree, e.g. MSc or PhD; and (iv) department, for which yes/no responses were obtained in response to whether the subject was a student or employed within the sectors of radiation sciences, medicine or alternative.

### **Ethical approval**

**The Institutional Review Board at the Medical Technical Institute, Southern Technical University, Nasiriya, reviewed and revised the study, and gave ethical approval. This work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.**

### **Statistical analysis**

The statistical analysis package employed in this study was the Statistical Package for the Social Sciences, version 26. Subjects' characteristics, viewpoints and knowledge were evaluated with the use of percentages and frequencies, and underwent univariate methods of analysis. A comparison of the knowledge of the women and the research study sample properties was performed using bivariate analysis.

Any potential correlations between the differing predictive indicators and degrees of knowledge were evaluated utilising multinomial logistic regression analysis. Earlier publications provided a source of independent variables for selection<sup>(14)</sup>. Adjustments were carried out for marital status, age, level of education and sector of employment or study. A p value  $\leq 0.05$  was deemed to be statistically significant.

### **RESULTS**

Completed surveys with no omitted data points were acquired from 98 subjects. Most (77.6%) were <30 years of age; these included single and married women. Nearly half (48.9%) had attained a bachelor's degree. All the study recruits were either students or professionals within a clinical discipline.

A score indicating a good knowledge of dental imaging in pregnancy was observed in just 3.1% participants; 50% were identified as possessing inadequate information.

A number of subjects were ignorant of protective measures employed against ionising radiation in dental imaging. The majority of participants indicated that the women should inform the radiologists about this requirement. The fact that any pregnancy trimester was safe for dental imaging was acknowledged by 14.2% subjects. Fewer than 50% believed that two-layer aprons were necessary.

One dose of radiation used for a dental radiograph was believed to be less than the background radiation level by 5.1% participants. When asked about the imaging techniques which could be employed during pregnancy, cone beam computed tomography (CBCT) was viewed as safe by 10.2% and panoramic radiographs by 53%. The risk of malignancy and malformations in the foetus was perceived as negligible by 14.2% subjects (Table 2).

**Table 1: Socio- Demographical characteristics variables of the study sampling population.**

Variable	Groups	Frequency	Percent
Age Groups	<30	76	77.6
	30-39	18	18.4
	40-49	4	4
Marital Status	Marital		
	Single	45	46
	Married	53	54
Educational level	Diploma	54	55.1
	BSC	42	48.9
	MSC	2	2
	PhD		
Department	Nursing	16	16.3
	Community Health	22	22.4
	Medical lab.	40	40.9
	Medicine	20	20.4
Level of knowledge	Good (7-9)	3	3.1
	Fair (4-6)	46	46.9
	Poor (0-3)	49	50

**Table 2: Knowledge about the precautionary measures of taking dental radiographs during pregnancy.**

Knowledge items	Frequency	Percent	Statement are true or false
1- Pregnant women should inform the radiologist if she is pregnant or expecting	95	96.9	T
2- Pregnant women can take radiographs at any trimester	14	14.2	T
3- Pregnant women should wear a lead apron and thyroid collar while taking a dental radiograph	46	46.9	T
4- The radiation dose during pregnancy is less than the usual dose	5	5.1	F
5- Pregnant women can take CBCT	10	10.2	T
6- The risk of fetal malformation due to radiation exposure is very low?	52	53	T
7- The risk of cancer among infants due to radiation exposure is very low?	51	52	T
8- Does panoramic imaging (radiography of the teeth) put the fetus at risk (for example, miscarriage or malformations)?	14	14.2	F
9- Pregnant women can take a panoramic radiograph	52	53	T

**Table 3: Multinomial logistic regression showing predictors of knowledge level**

Characteristics	Groups	Odds Ratio	95% CI	P-value
Age Groups	< 30	Ref	Ref	0.586 NS
	30 _ 40	1.077	0.341 – 3.404	
	41 _ 50	2.800	0.369 – 21.221	
Marital Status	Single	Ref	Ref	0.467 NS
	Married	0.720	0.296 – 1.750	
Educational level	Diploma	Ref	Ref	0.584 NS
	BSc	1.281	0.524 – 3.130	
	MSc	0.741	0.633 – 0.867	
Department	Nursing	Ref	Ref	0.401 NS
	Medical Lab	0.984	0.296 – 3.274	
	Community	0.347	0.069 – 1.742	
	Medicine	1.467	0.184 – 11.718	

NS: Not significant at P>0.05.

The relationships between the subjects’ knowledge level and the predictive indicators were explored using multinomial logistic regression analysis. The questions relating to the knowledge included aspects such as the protective procedures employed and the potential misbeliefs relating to dental imaging for diagnostic purposes in pregnant women. No correlations between the sociodemographic factors, i.e. age, marital status, education level and department, and the knowledge level were identified (**Table 3**). This indicates that although the subjects had heterogeneous backgrounds, the population included in the study had an inadequate level of cognizance in relation to the safety of acquiring dental images in gestation.

**DISCUSSION**

Dental imaging techniques are a major contributor to dental practice. They provide essential diagnostic information, and the data can be disseminated amongst professionals’ peers for second opinions and recommendations. Conventionally, dental imaging is presumed to be contraindicated in pregnant women and especially, during the first stage of gestation in order to safeguard the foetus. Nevertheless, issues with oral health may arise at any juncture during pregnancy, necessitating radiographic investigations in order to establish a precise diagnosis and to guide treatment. Frequently, anxiety is demonstrated by pregnant women with respect to dental images owing to concerns regarding the potential risk of malignancy and development anomalies within the foetus. Both maternal and foetal well-being may be adversely impacted by consequent delays in therapy. The aim of the current research was to explore the cognizance of females with

respect to the application of dental imaging techniques in gestation.

When protective protocols with respect to radiation were applied, dental imaging has been shown to be safe in pregnancy <sup>(15)</sup>. The application of radiographic inclusion criteria, lead apron, thyroid collar, high-speed film or digital techniques, and of particular note, rectangular collimation, can diminish the radiation dosage delivered <sup>(16)</sup>. A ten-fold reduction in radiation dose can also be achieved by employing digital sensors or an F-speed film in conjunction with rectangular collimation for bitewing and full mouth radiographs <sup>(17)</sup>.

There was a disappointing lack of awareness of radiation safety in pregnancy demonstrated in the study’s subjects. Only a few knew that it was safe to perform dental imaging at any gestational stage as long as protective protocols were followed. Approximately two-thirds of the cohort questioned or believed that such imaging techniques could not be utilised at any juncture. Most participants assumed that pregnancy was a contraindication to CBCT. Over 50% had little awareness regarding the ways in which the patient could be protected against the necessary radiation during dental imaging techniques. Many had false impressions, e.g. that a particular lead apron, or one comprising two layers of lead, was required for pregnant individuals. The American Association of Physicists in Medicine has published a rationale for avoiding the use of shields for the foetus or gonads owing to the lack of evidence supporting any risk from diagnostic imaging techniques <sup>(18)</sup>. However, although lead shielding is no longer deemed a requisite, it offers the patient reassurance <sup>(18-20)</sup>.

The observed lack of knowledge may reflect the scarcity of public educational initiatives with respect to radiation. Individuals' dental physicians may fail to explain the facts about radiation safety and hazards to their patients, as identified in 40% of patients evaluated by **Al Flaeh et al.** <sup>(21)</sup>.

Over 50% of individuals referred for imaging do not ask about the safety precautions that will be offered. As stated above, the ignorance of the patient may mirror that of their dentist. A wide-ranging literature review highlighted the global issue relating to the awareness of dental practitioners and the use of imaging techniques in pregnant women; their knowledge, as well as that of their students and interns, has been shown by several researchers to be substandard <sup>(22-24)</sup>. For instance, 67% dentists were found to believe that periapical radiographs could only be acquired safely in the second stage of pregnancy; panoramic radiographs were deemed to be contraindicated by 69% <sup>(23)</sup>. In another study, 2% dental practitioners considered dental imaging sufficiently safe for usage throughout gestation whereas 44% deemed that it should be avoided altogether in pregnancy <sup>(22)</sup>. A further survey indicated that 50% dentists in Jordan would avoid panoramic radiographs in pregnancy; under one-third lacked knowledge regarding their safety <sup>(8)</sup>. A study by **Llea et al.** <sup>(6)</sup> observed that only urgent dental imaging would be undertaken in pregnancy by over two-thirds dental practitioners. One explanation for dentists' reluctance to use dental imaging in gestation is that they lack cognizance of the reduced radiation dose requirement where digital imaging rather than traditional film is utilised. The poor knowledge level may exacerbate the consternation of dental physicians and pregnant females who are looking for oral health treatment. Thus, ongoing professional development with respect to the imaging modalities available and the measures taken to minimise the required radiation dose is essential.

The information possessed by the subjects about the quantity of radiation required for imaging in comparison to the background radiation dose was also suboptimal, with most being unable to compare the latter to the radiation requisite for a periapical radiograph. One bitewing radiograph, if taken using a photostimulable plate and a rectangular collimator, is equivalent to under a single day's exposure to background radiation <sup>(17)</sup>.

In the National Council on Radiation Protection and Measurements Report No. 177, it is stated that during a complete set of intraoral radiographs, the foetal radiation exposure is between 4- and 6-fold lower than its background radiation exposure amount for the entire pregnancy <sup>(12)</sup>.

In the present study, only a modest proportion of subjects thought that congenital abnormalities were unrelated to dental imaging; over 50% held the opposite

view, believing that the risk was significant. Under a third of dental practitioners in a study by **Raz et al.** <sup>(9)</sup> thought that the radiation required for diagnostic imaging did not affect the rate or congenital abnormalities or cognitive impairment in the foetus. In order for there to be a significant risk of congenital anomalies arising from radiation exposure, the International Commission for Radiation Protection has quantified a threshold dose of at least 100- 200 mGy. This is considerably elevated in comparison to the dose delivered to the foetus during diagnostic image acquisition, a figure which includes nuclear imaging modalities. No studies have yet demonstrated, either in humans or animals, that the spectrum of radiation doses utilised in diagnostic work leads to enhanced teratogenesis <sup>(15,25,26)</sup>. It is challenging to gauge the risk of childhood malignancy from dental imaging techniques, as the radiation exposure is so low <sup>(17)</sup>.

The risk of oncogenesis following dental imaging was unclear to the subjects in this study. The cohort was divided into three opinions, i.e. that the risk was increased, modest or absent. The studies that have followed up survivors from the atomic bombs detonated in Hiroshima and Nagasaki have provided evidence of the way in which radiation exposure can lead to carcinogenesis. Nevertheless, no link between the dose of radiation and the latter has been recognised by epidemiological research <sup>(17,25,26)</sup>. One cerebral CT scan delivers a radiation dose to the foetus of between 0 and 0.005 mGy <sup>(25,26)</sup>.

There are numerous limitations to this research, e.g. the lack of an obvious causality, and the application of the snowball sampling technique which reduces the ability of the study data to be generalised and increases the risk of selection bias, which may engender intrinsic and extrinsic legality. In the future, this work could be extended to incorporate the perspectives of obstetricians on the radiation dosage and risk associated with dental imaging in pregnant women. Additional studies could be carried out to establish the effectiveness of teaching initiatives that are customised to educate individuals regarding exposure to radiation and its associated risk.

## CONCLUSION

The data collected in this study illustrated that the women in the study population had an inadequate level of knowledge regarding the issues relating to dental imaging in pregnant women. Generally, the hazards associated with these techniques were considerably overestimated, a mind-set which could generate anxiety and cause a delay in obtaining required dental care. The cognizance of the subjects has an immediate impact on their actions and views of dental treatment, and so it is essential to create community awareness initiatives

which are designed to teach the public about radiation doses, safety and the protective procedures which should be taken. Women who are pregnant should be fully informed by their dental practitioners about the advantages and hazards associated with diagnostic dental imaging.

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