

Assessment of Knowledge and Attitude of Pregnant Women towards Dental Diagnostic Radiation Hazards: A Cross-sectional Study

T SIVASANKARI¹, JAGAT REDDY², KAVIYA³, EZHUMALAI⁴



ABSTRACT

Introduction: Pregnancy is associated with reduced immunity and greater susceptibility to infection than any other population. According to the International Commission on Radiological Protection (ICRP), thousands of pregnant women are exposed to diagnostic medical ionising radiation each year. The effects of radiation exposure can be classified as deterministic or stochastic. The deterministic effects occur principally above a threshold dose, reflecting cell death. The stochastic effect occurs sometimes after exposure and is mainly represented by radiation-induced cancer.

Aim: To evaluate the knowledge and attitude towards dental radiation hazards among pregnant women visiting a tertiary healthcare centre.

Materials and Methods: A cross-sectional, self-designed and structured 15-item questionnaire study was conducted among 84 pregnant women to assess their knowledge and awareness

about radiation hazards at Mahatma Gandhi Medical College, Puducherry, India, from January 2021 to June 2021. The data was collected and statistically analysed using the Chi-square test. The percentage, mean, and standard deviation were calculated for each participant. Cronbach's alpha test was used to assess the reliability of the questionnaire and inter-item statistics.

Results: The study population consisted of pregnant women with an age range of 20-35 years, with a mean age of 27.7 years. The result showed 15 (17.9%) of pregnant women knew that X-rays are harmful to the foetus and 10 (11.9%) of pregnant women were aware that they should reveal their pregnancy status before undergoing dental radiographic procedures.

Conclusion: On an average, 40-80% of pregnant women had a lack of knowledge about dental radiation hazards and their effects, which clearly shows that there is a need for educating pregnant women about the hazards and risks associated with radiation exposure.

Keywords: Diagnostic radiographs, First trimester, Foetus, Safe

INTRODUCTION

Physiological conditions like puberty, pregnancy, and menopause bring about reversible changes in oral health. Pregnant women are more susceptible to gingival and periodontal disease and experience pain in an advanced stage of pregnancy. Premature birth, low birth weight, and pregnancy granuloma development are also increased [1].

Most of the biological responses occurs during the first two weeks of pregnancy because embryo is more sensitive to stochastic effect and if mother is unaware of pregnancy, lead to miscarriage of foetus [2]. Pregnant Women who received diagnostic imaging procedures were allocated as a 25.5 percent teratogenic risk for major malformation, while women in the exposed control group assigned a 15.7% teratogenic risk associated with diagnostic imaging procedures during pregnancy [3]. There are two types of radiation, ionising and non ionising. Ionising radiation is the kind of electromagnetic radiation produced by electromagnetic waves, radioactive isotopes and radiation therapy [4]. Non ionising includes electromagnetic radiation from computer and cellular phones. Most dental diagnostic procedures expose embryo to less than 50 mSv. This level of radiation exposure will not increase reproductive risk and radiation of 200 mSv lead to birth defects. Therefore, "As Low as Reasonably Achievable", (ALARA) was mandatory during dentist routine work [4].

If a pregnant woman is subjected to a radiological examination, it can have deleterious effects on the foetus such as permanent developmental aberrations and anomalies, carcinogenic changes, and, in severe cases, intrauterine death to the foetus [5]. Therefore, it is better to avoid or postpone multiple radiological examinations during the early stages of pregnancy [5]. To the best of authors' knowledge, studies on pregnant women are not available on literature

search. Hence, the present study was conducted to evaluate the knowledge and attitude towards dental diagnostic hazards among pregnant women visiting the Outpatient Department.

MATERIALS AND METHODS

It was a questionnaire-based cross-sectional study which was conducted on pregnant women who visited Mahatma Gandhi Medical College, Puducherry, India, for a period of six months from January to June 2021. The ethical approval of the institution was obtained (IGIDS/IEC/2019/NRPUGKA/OMR/2019).

Inclusion and Exclusion criteria: All those pregnant women who were willing to participate in the study were included, and informed consent was obtained. Mentally and physically disabled, non pregnant women, and participants who are not willing to participate in the study were excluded from the study.

Sample size calculation: Sample size was calculated based on study conducted by Sajjan P et al., [6]. A convenience sampling technique is utilised for subject selection. Total sample size was 84. The self-designed questionnaire was designed on the basis of study done by Bahanan L et al., [7] on women awareness regarding the use of dental imaging during pregnancy. The pilot study was conducted for 15 patients to assess the feasibility of the study. The validity and reliability of questionnaire was measured. The Kappa value of 0.8 and Cronbach value of 0.82 shows that the questionnaire had an excellent internal consistency and reliability.

Questionnaire

The questions were designed in the form of "YES, NO and DO NOT KNOW". For the illiterate participants the questionnaire was explained in the local vernacular language and their responses were noted appropriately. This questionnaire consisted of two sections:

Section A: It included details about the demographic variables of the subject.

Section B: It included the structured questionnaire regarding knowledge and awareness of radiation hazards. It includes nine questions for assessing the knowledge and five questions for attitude.

A score for the given question was assigned, it was summed up and then it was divided by the total number of question and the percentage was calculated for each participant. The total possible score for the knowledge questions was nine, and correct answers obtained a score of 1, while wrong answers and don't know got a score of 0.

STATISTICAL ANALYSIS

The data was analysed with STATA. Microsoft Excel was used to collect data. The total number of questions and the percentage mean and standard deviation were calculated for each participant. Cronbach's alpha test was used to assess the reliability of the questionnaire with a score value of 0.82, and inter-item statistics were measured using the kappa test with a value of 0.80.

RESULTS

A multiple-choice questionnaire was presented to 84 pregnant women. In section A, the demographic details showed that the age group ranged from 20-35 years of pregnant women, with a mean age of 27.7 years [Table/Fig-1]. The last section focused on their knowledge of radiation and its effects. Out of total, 42 (50%) of pregnant women were aware of the radiation hazard symbol placed outside the X-ray room and 15 (17.9%) of pregnant women knew that X-rays were harmful to the foetus. Only 10 (11.9%) of pregnant women are aware that they should reveal their pregnancy status before undergoing dental radiographic procedures. Only 25 (29.4%) of the pregnant women were aware that dental radiographs could be taken with proper protective measures.

Age (years)	Frequency (%)
20-25	28 (33.3%)
26-30	33 (39.2%)
31-35	23 (27.3%)

[Table/Fig-1]: Age Distribution of study participants.

About 22 (26.2%) of them were aware that they should not hold the dental film during radiographic exposure. Only 23 (27.4%) of women had knowledge about how often they should go for exposure to dental diagnostic procedures. About 19 (22.6%) of women knew about the side-effects of diagnostic radiographic procedures during pregnancy. Only 18 (21.4%) of pregnant women felt that there was a moderate or high-risk to the unborn baby from exposure to dental radiation during pregnancy [Table/Fig-2]. The mean knowledge and attitude scores were 0.48 ± 0.10 and 0.45 ± 0.11 , respectively.

S. No.	Knowledge related questions	Response	n, %
1.	Are you aware of the radiation hazard symbol placed outside the radiation room?	Yes	42 (50%)
		No	4 (4.8%)
		Don't know	38 (45.2%)
2.	Are you aware that you should not hold the dental film during exposure?	Yes	22 (26.2%)
		No	20 (23.8%)
		Don't know	42 (50.0%)
3.	Are you aware that you need radiation protection while exposing to diagnostic radiographs?	Yes	20 (23.8%)
		No	15 (17.9%)
		Don't know	49 (58.3%)
4.	Are you aware that dental radiographs can be made with proper protective measures?	Yes	25 (29.7%)
		No	14 (16.7%)
		Don't know	45 (53.6%)

5.	Do you know that you should reveal your pregnancy status to the dentist before undergoing dental radiographic procedure?	Yes	10 (11.9%)
		No	23 (27.4%)
		Don't know	51 (60.7%)
6.	Are you aware that safe levels of radiation exposure exist for pregnant women during the making of dental X-ray?	Yes	9 (10.7%)
		No	7 (8.3%)
		Don't know	68 (81.0%)
7.	Do you know how often you can be exposed to radiation during dental diagnostic procedure in pregnancy?	Yes	23 (27.4%)
		No	21 (25.0%)
		Don't know	40 (47.6%)
8.	Do you know that dental consultation is required two months before planning for pregnancy?	Yes	20 (23.8%)
		No	21 (25.0%)
		Don't know	43 (51.2%)
9.	Do you know that dental X-ray beams reflect from the X-ray room walls?	Yes	9 (10.7%)
		No	7 (8.3%)
		Don't know	68 (81.0%)

Attitude related questions

10.	Do you feel that there is high /moderate risk to the unborn baby on exposure to dental radiation during pregnancy?	Yes	18 (21.4%)
		No	17 (20.2%)
		Don't know	49 (58.3%)
11.	Do you feel that there are any side-effects due to diagnostic radiographic procedure during pregnancy?	Yes	19 (22.6%)
		No	20 (23.8%)
		Don't know	45 (53.6%)
12.	Do you feel that dental radiographs made with X-Rays are harmful?	Yes	15 (17.9%)
		No	24 (28.6%)
		Don't know	45 (53.5%)
13.	Do you feel the first trimester is not safe for dental diagnostic radiographs during pregnancy?	Yes	20 (23.8%)
		No	15 (17.9%)
		Don't know	49 (58.3%)
14.	Do you feel that dental radiographs can be avoided during pregnancy?	Yes	41 (48.8%)
		No	11 (13.1%)
		Don't know	32 (38.1%)
15.	Do you think the wearing a lead apron can protect you from dental radiation exposure?	Yes	31 (36.9%)
		No	17 (20.2%)
		Don't know	36 (42.9%)

[Table/Fig-2]: Questionnaire.

DISCUSSION

The present study was conducted to assess the knowledge and attitude of pregnant women towards dental radiation hazards. To make a definitive diagnosis, radiographs play a vital role during dental treatment [7].

Pregnancy is a unique and complex period with various physiologic changes that support the formation and maturation of new life. The oral cavity is the mirror of the human body as it reflects and influences systemic health. Prenatal health is heavily influenced by maternal oral health, so pregnant women must receive consistent and timely dental care [8]. A significant dilemma exists about dental treatment during pregnancy especially with respect to the use of X-rays. In an emergency situation where a radiological examination is indispensable, it should be carried out with proper care [9].

In this present study, the radiation symbol placed outside the X-ray room was known by 42 (50%) of the study population. In a survey of dental students, Srivastava R et al., discovered that seven out of 10 (76.4%) were aware of the radiation hazard symbol [10]. This shows that 50% of pregnant women are educated and aware about the radiation symbol. It is important to know about the radiation symbol to ensure the safety of patients as well as staff to avoid accidental exposure.

In this current study, the pregnant women's knowledge was assessed about various protection methods during exposure and 22 (26.2%)

that radiographic film should not be held with fingers while taking a radiograph. Arnout AE and Jafar A, found that 46.7% of dental undergraduates [11]; whereas, Prabhat MP et al., reported that about 97% of undergraduates knew about this [12]. Thus, the knowledge is less among the pregnant females as compared to dental students.

In this study, only 11.9% of the study population knew that they should reveal their pregnancy status before dental radiographic procedures, which means more public awareness programmes need to be conducted to educate the public. In an emergency situation where a radiological examination is indispensable, it should be carried out with proper care [13]. Due to a lack of knowledge about dental radiation, it could increase the anxiety of pregnant women during dental treatment.

In this present study, awareness about how often pregnant women can be exposed to dental radiographic procedures was reported by 23% of the study population. The first two weeks of pregnancy are more sensitive to biological reactions, during which the mother is unaware of her pregnancy, leading to spontaneous abortion of the foetus. X-rays should not be done on pregnant women unless necessary [4].

In this study, nine people (10.7%) were only aware that dental X-rays can reflect off the walls of X-ray rooms. In a study by Arnout E et al., 69.7 (82.9%) of them answered that X-rays could be reflected from the walls of the room, which is inconsistent with the results of this study [14]. The findings indicated that the study population's knowledge of dental radiation was insufficient and that dentists and radiologists should play a key role in educating the study subjects [15].

In the present study to assess the attitude of pregnant women regarding the radiation risk to the unborn baby of exposure to dental radiographs during pregnancy, 18 (21.4%) of women responded "yes". However, in the study by Arnout E, 33.3% of the undergraduate dental students answered that it is absolutely contraindicated to make dental radiographs too [14].

In the present study, 15 (17.9%) mentioned that dental radiographs made with X-rays are harmful. According to Swapna AL et al., around 59% of the students in the study believed that dental X-rays were harmful [16]. Basheer B et al., conducted a study on dental students at Taibah University, Madinah, and showed that 66.7% of the clinical group who answered yes that X-rays are harmful and 33.3% of the clinical group who answered no about whether X-ray beams are reflected from room walls [17].

In the present study, 20 (23.38%) of the study population were aware that the first trimester is not safe for dental radiographic procedures. No study was conducted to assess the knowledge of pregnant women about the safest period of exposure. Bedre AS and Sharma S, revealed that only 2% of dentists knew that dental imaging is safe during pregnancy [18].

Srivastava R et al., mentioned in their study that dental radiographs should be taken only on an emergency basis [10]. This observation indicates that the first semester is the most sensitive period during pregnancy and that the exposure threshold for the development of definitive defects increases after the main organogenesis period. The study conducted by Moustafa R et al., on awareness of radiation hazards during pregnancy among females on general radiology showed the radiation risk is higher in the first trimester than in other groups of the study [19]. Study conducted by Sharma SR et al., revealed that congenital malformations are not associated with dental imaging. Pregnant women believed that there was an increased risk of congenital malformation. The threshold should exceed 200 mGy to develop foetal malformation [5].

It is essential that practising radiologists provide information in order to raise radiation awareness among pregnant women. However, to the best of authors' knowledge, Jeelani S et al., conducted a study among pregnant women and general dentists to assess their

perception towards oral health and the knowledge and attitude of general dentists about the radiation hazards and protection during dental diagnostic imaging [20]. In the study by Jeelani S et al., study, it was concluded that general dentists lacked knowledge and attitude regarding pregnant women's oral health status and that the majority of pregnant women's knowledge about oral health was poor [20]. Bedre AS and Sharma S, explained that most general dentists did not follow good radiological practise and did not explain the associated risk to the patients. They must be given sufficient information and understanding to enable them to make the right decisions about their healthcare [18].

Limitation(s)

The main limitation in this study was that it included only pregnant women, with limited study participants. This study may be vulnerable to self-selection bias due to the method of participant recruitment, affecting both internal and external validity. The study could be planned on pregnant and non pregnant women with a larger sample size and different study cohorts. Future research should concentrate on a larger sample size and a diverse range of study participants.

CONCLUSION(S)

The key finding of this study revealed that pregnant women lack knowledge about dental radiation and they need proper education methods to ensure that dental X-rays are not harmful and that they can also have dental treatment without any fear. It is important to educate pregnant women through community-based education methods. On an average, 40-80% of pregnant women had a lack of knowledge about dental radiation hazards and their effects. Oral health and radiation hazard awareness education should be implemented in the prepregnancy stage to prevent exposure to diagnostic ionising radiation during pregnancy. Public policies may be developed regarding radiation hazard awareness among the pregnant population.

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PARTICULARS OF CONTRIBUTORS:

1. Reader, Department Oral Medicine and Radiology, Indira Gandhi Institute of Dental Sciences, Sri Balaji Vidyapeeth (Deemed to be University), Puducherry, India.
2. Professor and Head, Department Oral Medicine and Radiology, Indira Gandhi Institute of Dental Sciences, Sri Balaji Vidyapeeth (Deemed to be University), Puducherry, India.
3. Intern, Indira Gandhi Institute of Dental Sciences, Sri Balaji Vidyapeeth (Deemed to be University), Puducherry, India.
4. Senior Statistician and Research Consultant, Deanery Research, Sri Balaji Vidyapeeth (Deemed to be University), Puducherry, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Dr. T Sivasankari,
Reader, Department Oral Medicine and Radiology, Indira Gandhi Institute of Dental Sciences, Sri Balaji Vidyapeeth (Deemed to be University),
Pillayarkuppam-607402, Puducherry, India.
E-mail: sankarisenhil10@yahoo.com

PLAGIARISM CHECKING METHODS: [\[Jain H et al.\]](#)

- Plagiarism X-checker: Apr 27, 2022
- Manual Googling: Sep 09, 2022
- iThenticate Software: Sep 22, 2022 (15%)

ETYMOLOGY: Author Origin**AUTHOR DECLARATION:**

- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. NA

Date of Submission: **Apr 18, 2022**
Date of Peer Review: **May 25, 2022**
Date of Acceptance: **Sep 10, 2022**
Date of Publishing: **Nov 01, 2022**