



**PATIENT PERCEPTION OF DENTAL RADIOGRAPHS ITS
HAZARDS AND SAFETY PROTECTION: A QUESTIONNAIRE BASED
CROSS – SECTIONAL STUDY**

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Running title: Patient perception on dental radiography

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ABSTRACT

Background: Dental Imaging is an integral part of clinical dentistry and is referred to as main diagnostic aid. However, it carries a potential harm and the exposure to

dental x ray should be minimized where practicable. Therefore, the aim of the present study was to assess the prevalence of knowledge of dental radiograph and safety measures of radiation among patients visiting the dental outpatient department. **Materials & Methods:** A questionnaire with 16 questions regarding dental radiograph and radiation protection was asked to the patients with minimum primary education and willingness to participate.

Results: There was 100% response rate. Although 72.5% of the patients have had dental radiographs taken on them, most of them (72% patients) thought it was to check for tooth decay and rest believed it was a for other reasons. The majority of the patients (83%) relied on their dentists for information regarding dental radiographs. 33% of the patients felt radiographs should be avoided in pregnant ladies. 16% of the patients felt radiographs should be avoided in children. There was a significant association ($p < 0.05$) between the education level of the patients and their disapprovals on radiographing of pregnant ladies.

Conclusion: The radiographs can pose as a potential hazard to health of both dentists as well as the patients. Hence more emphasis needs to be laid on educating the population about hazards and protection, in order to reduce the unnecessary dental radiation exposure.

Key Words: Dental Radiograph, X- ray protection, Radiation hazards

Introduction

X-rays are one of the highly used ionizing radiations which are often frequently used for therapeutic and diagnostic purposes in healthcare.^[1] Dentists routinely use radiographs to diagnose, treat and monitor the treatment progression. Dental radiographs are one of the most frequently undertaken radiographic investigations in the healthcare industry. A survey in the United Kingdom estimated that dentists were taking 19 million dental (inta-oral) radiographs each year.^[2]

There is no doubt on the enormous benefit that the field of radiography has confer on the dental fraternity. However, all dentists should also be aware of the possible harmful effects and risks involved in dental radiography.^[3] There is no any threshold dose to radiation exposure, even a very less dose could cause these harmful biological effects. The International Commission on Radiological Protection (ICRP) also recommended that all patient exposure must be justified and kept as low as possible. So, it is a mandatory to follow ALARA principle “As Low

As Reasonably Achievable” during the routine dental work in which each patient should receive appropriate imaging modality according to their need, with the minimum radiation dose.

Increased consumerism and public expectation of healthcare providers has made the patients more critical on the decisions of the clinicians.^[4] Nowadays, patients have more access to information regarding healthcare issues from the internet, magazines, and their friends. It is vital to obtain an informed consent from the patient before carrying out any radiographic examinations.

Aim and Objective

To assess the prevalence of knowledge of dental radiograph and safety measures of radiation among patients visiting the dental outpatient department thereby evaluating the patients’ view on dental radiography.

Materials and Methods

This cross-sectional study was designed and conducted to assess the patient’s awareness about dental radiograph & protection, safety against X- Rays. The study was carried out in Seema Dental College and Hospital, Rishikesh. Two hundred patients were randomly interviewed who visited in outpatient department from first November 2021 to thirtieth November 2021. This study was approved by Internal Ethical Committee of the Institute.

A structured self-administered pre-validated questionnaire was used based on the reviewed literature. The questionnaire was developed in Hindi as well as English language in the form of multiple-choice questions. A structured questionnaire consisting of 12 questions regarding dental radiography, radiation hazards & protection were asked to the patients. Only those individuals were included in the study who had at least primary level of education so that they can understand the questions better and agreed to participate in the study. Patients below 15 years of age were not included in the study.

The questionnaire consisted of three parts: the cover page with a consent form, request for cooperation, study explanation, importance, and instructions. The second part included socio-demographic questions such as name, age, gender, occupation, and level of education. The third part was designed to assess the perception and attitude of participants toward the basic knowledge of dental

radiography prescription and radiation hazards and protection. The data was collected by a single investigator. Collected data was coded, compiled, and tabulated.

Statistical Analysis

The data was entered in excel spread sheets [MS Office, 2010, Microsoft Corp, USA]. The data was transferred and analysed using SPSS for windows [SPSS version 22, IBM Corp, Armonk, NY]. Categorical data was analysed using chi-square test. Graphs and tables were used for describing data. The level of significance was set at $P < 0.05$.

Results

All 200 questionnaires were returned, because the interviews were done personally, thus having a response rate of 100%. Out of 200 patients, 116 were males and 84 were females. Majority of participant were in age group of 18-40 years. All the participants had at least primary school education; therefore, communication was not a problem. Most of the patients had higher than high school 65% and 35 % had

Table 1: Distribution of study participants according to age, gender and

Age	11 to 40 years	146 (73)
	41 to 60 years	33 (16.5)
	> 60 years	21 (10.5)
Gender	Male	116 (58)
	Female	84 (42)
Qualification	primary to high school	70 (35)
	post high school to professional	130 (65)

primary to high school education. (Table 1)

Patient's Basic Perception

Next part of the questionnaire was regarding the patients' basic knowledge, experience, and perception on dental x-raying. Interestingly 138 people knew what dental radiographs were and the rest did not have any clue about it. Out of 138 majority belonged to age group of 18-40 years, were males and had education

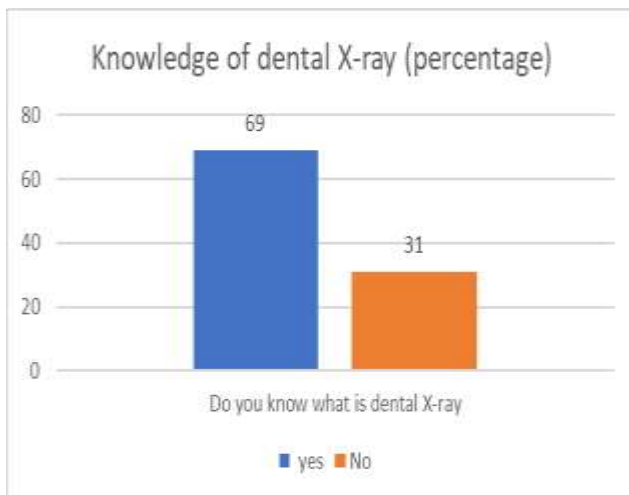
above high school.(Graph 1, Table 2) Most of the patients received the information regarding dental radiographs from their dentists or doctors (83%). Only a small number of patients relied on their family members (8%), friends (6%) and other (3%) sources for information.(Graph 3) Regarding experience with dental radiographic examination, 72.5% of the patients had dental radiographs taken on them. Of these patients, only 87% of the patients received proper explanations regarding diagnosis from the radiographs. (Graph 4, Table 2) When we inquired whether they were aware why the dental radiographs were taken, 94% of the patients said they knew the reason while 6% answered negatively for same. (Graph 2) From individuals with positive response, 72% said it was for tooth decay. 5% and 4% of them believed it was for gum diseases and impacted tooth respectively. 6% believed it as part of routine examination while 13% thought it was done for some other reason.(Graph 5)

Safety

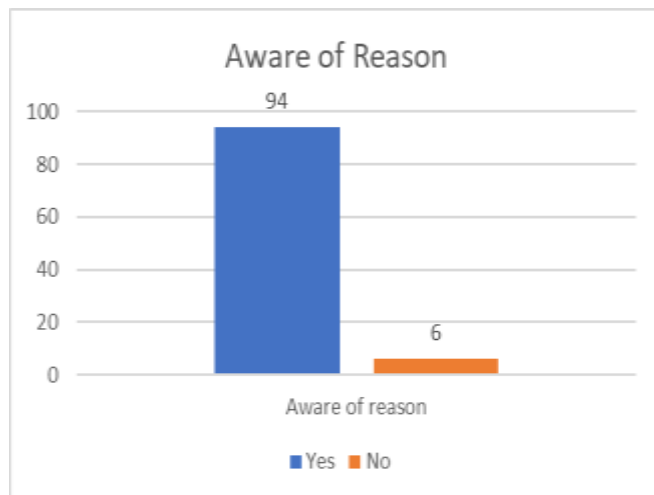
Regarding safety measures during radiation, few questions were put forward. When asked if patients notice any radiation safety signboards outside the X- ray room, only a small number of patients of about 22% had noticed the signboard while the rest had not. (Graph 6) Sadly only 16% of the patients were given safety clothing while taking the X- ray. Moreover, only 13% of the doctors had safety clothing for themselves. (Graph 7,8)

Hazards

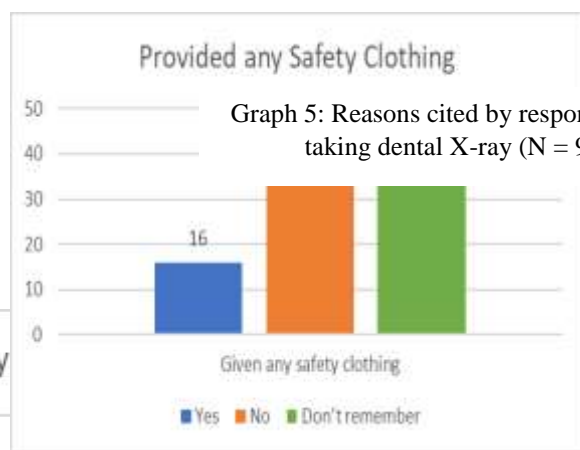
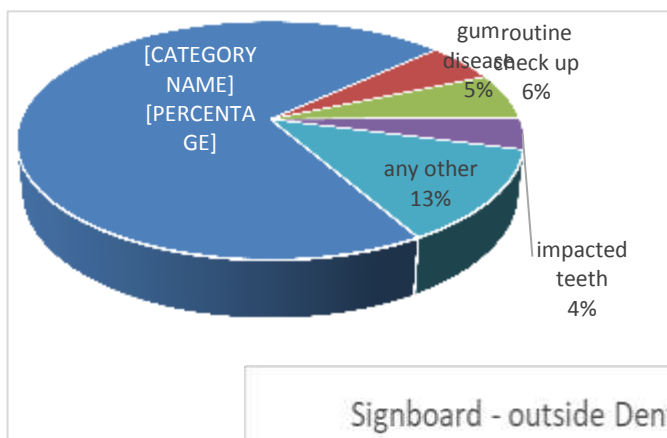
Further section of the questionnaire was about radiation hazards. About 68.5% of patients felt that taking radiographs was necessary, 4% of the patients felt that they were hazardous to their health while 27.5 % had no clue about hazardous effects of radiations.(Graph 9, Table 2) We also inquired specifically how the patients felt about radiography for pregnant ladies and children. There is almost same percentage of the patients felt radiography should be avoided (33%), it was necessary (32%) for pregnant females. Strangely, a high percentage of the patients (35%) also did not have any idea about the role of X- rays for pregnant ladies. About 51% of the patients said it should be done, if necessary, 16% not to be done and 33% had no clue on dental radiography for children. (Graph 10,11 & Table 2)



Graph 1: Knowledge of Dental X-ray



Graph 2: Study participants response on their awareness of reasons



Graph 5: Reasons cited by respondents for taking dental X-ray (N = 94)

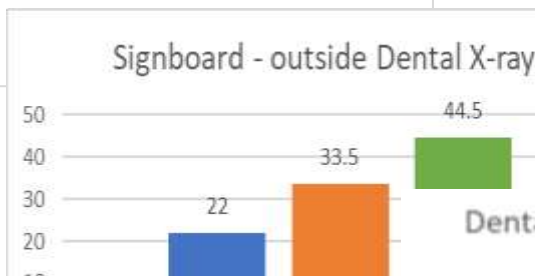
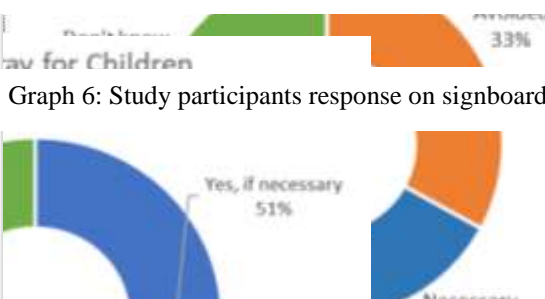
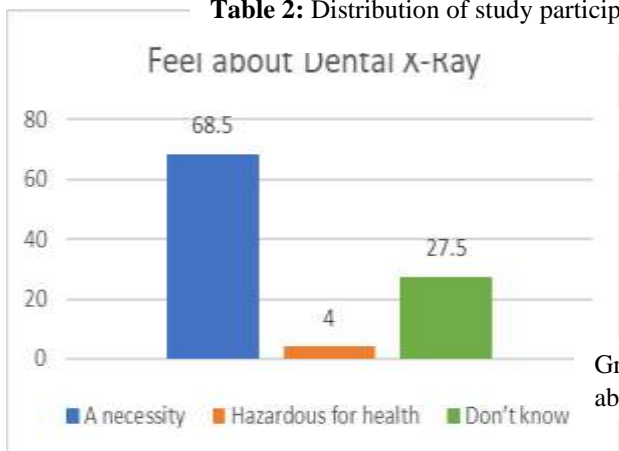
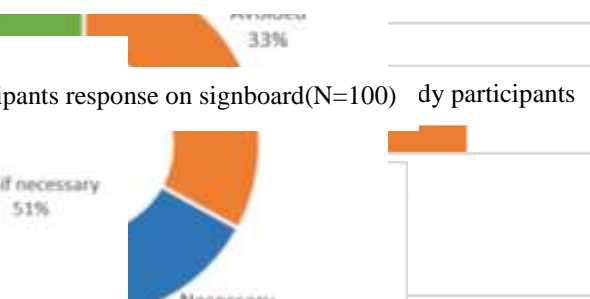


Table 2: Distribution of study participants responses according to their age, education and gender



Graph 3: Source of knowl about Dental X-ray (N = 100)



Graph 4: Distribution of participants on explanations on diagnosis



Graph 10: S Dental X-ray Females(200)

Graph 9: Participants perspective on Dental X ray(N=200)

	AGE GROUPS			EDUCATION		GENDER	
	11-40	41-60	More than 60	Primary to High School	More than High school	Male	Female
Do you know what is dental X-ray? Yes (69%) No (31%)	97	27	14	44	97	78	60
Have you undergone any dental radiograph? Yes (100) No (38)	64	22	14	30	70	53	47
	33	5	0	14	24	25	13
If yes, were you aware about the reason dental radiograph was taken. Yes (94) No (6)	61	21	12	25	69	50	44
	3	1	2	5	1	3	3
Did you receive proper explanation regarding							

diagnosis? Yes (87)							
No (13)	59	19	9	23	64	44	43
	5	3	5	7	6	9	4
What did you feel about radiograph taking? Necessity							
Hazardous	98	28	11	42	95	79	58
Don't know	5	2	1	2	6	5	3
	43	3	9	26	29	32	23
What do you think about dental radiography for pregnant females? Avoided							
Necessary	53	11	5	11	55	34	32
Don't know	43	8	3	17	47	38	26
	50	14	13	42	28	44	26
What do you think about dental radiography for children?							

Avoided							
Necessary	83	14	5	28	74	57	45
Don't know	25	4	3	3	29	20	12
	38	15	13	39	27	39	27

Discussion

The questionnaire given to the patients was simple and easy to understand. The majority of patients were male and in age group of 18-40 years. Furthermore, all the participants had at least primary school education; therefore, communication was not a problem. Majority of them had higher than high school 65% and 35 % had primary to high school education.

The first question was asked in the questionnaire was do you know what is dental x-ray? 69% of the respondents (60- females and 78 males) did know about the dental x ray while rest 31 % were not aware. This is probably due to their educational background which would have enabled them to read and communicate with their dentists. ^[4] The next question was from where you received information about dental x ray? Most of them obtained information from their dentists/doctors and only small number (17%) relied on other sources. This highlights the important role dentists play in dissemination of knowledge with regard to dental radiographs. Next highest are family and friends. This shows that patients more rely on their relative's advice rather than social media.^[8]

72.5% (100) of the patients had experienced dental radiographic examination and majority of study participants who have had dental X-ray belong to 11 to 40 years of age and that was statistically significant ($P = 0.015$) while there was no significant difference in the distribution of study participants who have had dental X-ray with respect to gender and qualification. When patients were asked the reason for taking radiographs, most of them (94%) were aware of reason while 6 % were not aware at all and it was found that those with education higher than high school were aware of reason and was statistically significant. 72% were aware of the reason for what a radiograph was taken. Most of them said it was for tooth decay while rest said it was done for gum disease, impacted tooth and any other reasons.

Out of all participants, only 87% of the participant received proper explanations regarding the diagnosis of the radiograph. Patients need to be educated on the result of the findings so that they can appreciate having radiographs taken and can understand its importance in diagnosis of the disease.

We asked the participants generally if they think dental radiographs are harmful or not. 68.5% of the participants felt it was not harmful, 4% felt that it was harmful to their health & 27.5% had no clue. These results were almost similar to the study done by Kathiravan Purmal et al.^[3] & Nandhini G Ashok, V Jayanth Kumar^[7]. Most participant with age group of 18-40 years and with qualification above high school felt that dental x ray is a necessity. Those who said it was not harmful indicated that it can give a better view of the bone which cannot be seen clinically, whereas those who said it was harmful stated that it might cause harm to the body. Patients should be educated that there is always a risk in any procedure but if the benefit of the procedure outweighs the risk, then it should be recommended.

Regarding safety measures during radiation few questions were put forward. The signboards regarding the radiation were noticed only by 22% of the people. It highly suggested that either a signboard was not put properly in a noticeable area or was not put at all. It is highly recommended that in clinical or hospital setting radiation safety board should always be placed in a noticeable area so that they are clearly be seen by patients.^[3] Regarding safety clothing only 16% of the participants have been provided with safety clothing and only 13% noticed radiography personnel was wearing any safety clothing during exposure with x rays. We recommend that to increase the use of safe lead clothing, for both radiation operator and patients, to avoid harmful effects of radiation.

When asked specifically on their opinion about taking dental radiographs on pregnant patients 33% of them said they would not allow it, 32% said this is necessary and 35 % had no clue. Whereas in study by Kathiravan Purmal et al.^[3] 57% said radiation is harmful. This shows their ignorance about the dosage in dental radiography. Dental radiographs may be prescribed for pregnant patients because the dose is very low and the beam is not directed toward the developing fetus.^[10] A study by Hujoel *et al.*^[11] is frequently quoted to show the effects of dental radiographs to the developing fetus. This study was severely criticized by the

dental community because of its inadequacies. Brent ^[12] exposed the deficiency of that study and mentioned about epidemiologic and animal studies that involved radiation to the thyroid, pituitary and head did not cause fetal growth retardation as a result of these exposures.

When we asked if it's alright to expose children to dental radiography, their opinions were divided. 16% said should not to be done, however 51% of the participants said they don't mind if it is really necessary and 33% had no clue. In Nandhini G Ashok, V Jayanth Kumar^[7] study 37% said dental radiography should be avoided in children. Above 2 inference regarding dental radiography in pregnant females and children clearly advocates a extensive need of patients education regarding radiations and their harms in pregnant women, children and general population. Majority of participant in the age group of 18-40 years felt that taking radiograph was a necessity however participant education with above high school felt it should be avoided both were statically significant. Usually there will be no damage of clinical significance caused by low level X-rays used in dental radiography. However, the younger individual has higher vulnerability to radiation as of the large number of cell divisions occurring in young children. Children also have a higher proportion of the bone marrow located in the skull than adults. Smith^[13] had shown in a calculation of risk estimates that about one induction of malignant disease per one million dental exposures of 5 year old children can be expected.

Conclusion

As most of the patients rely on their dentist for information regarding dental radiography, the dental surgeon must remove any fear the patients would have regarding this by providing accurate and evidence- based facts. They also need to inform the patients about the reasons for taking radiographs and their interpretations after the procedure. Among patients there is a definite lack of knowledge on the possible harmful effects of dental X ray or the benefit derived from dental radiography. The limitation of this study was that random sampling and done in a institution based in urban area. The results might be different if it was done in a private clinic setting or a rural uphill area of Uttarakhand. The result showed that patients do not have a clear understanding why dental radiographs are

taken or their benefits. There is also a definite lack of knowledge regarding the safety during dental radiography.

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