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Patient Perception and Anxiety towards Dental Radiography – A Questionnaire Based Study.

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Abstract

Objectives: This study aimed to assess and evaluate patient perception and anxiety towards dental radiography.

Methods: A cross-sectional, hospital-based study was carried out among 100 patients aged between 18 and 55 years, undergoing dental radiography at A. J. Institute of Dental Sciences, Mangalore. Data on perception and anxiety were collected using a structured, pre-validated questionnaire through interviews or self-administered forms. Data analysis was performed using SPSS version 23 with descriptive statistics.

Results: A total of 100 patients participated, with a majority being females (62%) and young adults (48% aged 18–24 years). Most (80%) had no prior exposure to dental radiography, and overall perception of X-rays was poor, with many considering them unimportant. Anxiety was common, mainly due to fear of radiation, pain, and detection of dental problems, leading 74% to delay or avoid X-rays. Most participants found the procedure uncomfortable and emphasized the need for clear, step-by-step explanations, with verbal communication from dentists being the preferred mode of reassurance.

Conclusion: Present study revealed that patient anxiety and discomfort during dental X-rays stem from poor communication and limited awareness about the procedure. Many patients expressed concerns about radiation exposure and the necessity of X-rays. Improving dentist-patient communication through clear explanations, safety reassurances, and step-by-step guidance is crucial for enhancing patient comfort and reducing anxiety.

Keywords: Dental radiography, Anxiety, Patient perception, Patient education, Oral healthcare

Introduction

Dental X-rays play a crucial role in contemporary dental practice by facilitating precise diagnosis, treatment strategies, and follow-up of oral health issues [1]. Visualizing tooth roots, bone structures, and nearby tissues is crucial for thorough oral health evaluations and X-rays assist in performing intricate procedures like root canals and dental implants. Moreover, dental X-rays serve as a crucial component in monitoring the progression of dental conditions and evaluating the success of treatments over time. Despite their clinical significance, patient anxiety surrounding dental X-rays remains a prevalent issue in dental practices worldwide. This apprehension often stems from a combination of factors, including misconceptions about radiation exposure, fear of potential health risks, and general dental anxiety [2]. Research across various demographic groups has revealed that dental X-ray procedures can trigger considerable anxiety, particularly among adult patients who lack awareness of the low radiation doses used in these examinations [3,4].

Dental anxiety, often progressing to dental phobia, is a significant barrier to oral healthcare, arising from both specific and non-specific factors [5], including traumatic dental experiences, embarrassment, a sense of losing control while seated in a dental chair, mistrust toward the dentist, and fears shaped by second-hand or anecdotal accounts [6,7]. This anxiety creates a vicious cycle wherein individuals avoid routine dental visits, leading to neglected oral health, which subsequently results in dental pain and the need for more invasive treatment [8]. Such experiences further intensify fear and reinforce avoidance, exacerbating the condition. Failing to address dental anxiety can lead to significant issues, such as tooth decay, gum disease, and ultimately tooth loss, all of which negatively affect oral health and reduce overall health. This underscores the profound impact of dental anxiety on both physiological and psychological well-being [9].

The prevalence of dental anxiety varies considerably across populations, with studies reporting rates ranging from 4% to over 50%, depending on cultural, social, and economic contexts. In developing countries, the prevalence is estimated at 4–20%, with Indonesia reporting a higher prevalence of 22% (10Research has shown that in the UK, nearly 48% of adults suffer from dental anxiety. In contrast, studies from Canada reveal that about 9.8% of people have a mild fear of dental appointments, while 5.5% are extremely fearful or terrified. [11, 12]. Studies conducted in England, Wales, and Northern Ireland found that 11.6% of adults experienced significant dental anxiety. Whereas research from India and France indicated that almost 46% of patients experience some level of anxiety, with 6–16% being mildly anxious, 17.3% highly anxious, and up to 12.6% severely anxious. [13, 14]. These variations can be attributed to a complex interplay of factors, including age, gender, cultural influences, previous traumatic dental experiences, parental anxiety, socioeconomic conditions, psychological status, and the broader healthcare environment, all of which shape individuals' perception and response to dental treatment. In addition, lack of clear communication from dental professionals regarding the necessity and safety of radiography procedures can exacerbate patient concerns [15]. Addressing these anxieties through patient education, open dialogue, and the implementation of anxiety-reducing techniques is crucial for improving patient compliance and ensuring that the benefits of dental X-rays are fully realized in oral healthcare.

Surveys are crucial for understanding patient perceptions and anxieties regarding dental radiography as these factors significantly impact oral healthcare outcomes. Local cultural norms, health literacy, prior care experiences, and service organizations influence these perceptions, making region-specific data essential. The present study aimed to evaluate patient perception and anxiety regarding dental radiography through a structured questionnaire-based survey. This approach will quantify locally relevant levels of perception and anxiety, identify subgroup differences, and generate actionable insights to tailor risk communication, consent practices, and anxiety-reduction protocols for imaging. These findings will help improve patient compliance and ensure the full realization of dental X-ray benefits in oral healthcare.

Methods

This study carried out in a Dental College, Mangalore, Karnataka, employed a cross-sectional questionnaire method to collect information from patients attending the outpatient department. A structured and pre-validated questionnaire was used to assess patient perception and anxiety towards dental radiography. Each participant was asked to complete a questionnaire regarding their anxiety before the dental X-ray and another questionnaire regarding their perception after the procedure. Data were collected either through direct interviews or self-administered forms, depending on the patient's preference and literacy level. A convenience sampling method was adopted, and participation was voluntary after obtaining informed consent.

The study was conducted over a period of six months, with data collection carried out for two months. Patients aged between 18 and 55 years, visiting the radiology department to undergo dental radiography, were included. Those who were mentally compromised and required emergency radiographs were excluded. The estimated sample size for this study was 100 participants [16]. Ethical clearance was obtained from the AJIDS Ethics Committee (Ref. No. IEC/OMR25/057).

Statistic al Analysis: The collected data were analyzed and subsequently summarized, with the results presented in the form of tables and graphs. Statistical analysis was carried out using SPSS software version 23. Descriptive statistics such as frequency distributions were applied to describe continuous variables.

Results

A total of 100 patients completed the questionnaire. The socio-demographic details of the respondents are listed in Table 1. Among 100 patients, 38% were male and 62% were female. Nearly half of the respondents (48%) belonged to the age group of 18–24 years, while 24% were between 25–34 years, 19% were aged 35–44 years, and 9% fell within the 45–55 years' age group. Regarding prior exposure to dental radiography, 20% reported previous experience, whereas 80% had none. Among those with exposure, 54% had undergone small intraoral X-rays, 14% had experience with panoramic radiographs (OPG), and 32% were uncertain about the type of radiographic procedure they had received.

Table 1. Socio-Demographic details of respondents

Characteristic	Category	Percentage
Age group (years)	18–24	48
	25–34	24
	35–44	19
	45–55	9
Gender	Male	38
	Female	62
Previous experience	Yes	20
	No	80
Type of X-ray treatment received	Small intraoral X-ray	54
	Full-mouth panoramic X-ray(OPG)	14
	Unsure	32

(Figure 1) Illustrates the participants' understanding and perceptions of dental X-rays. When asked about the importance of dental X-rays in diagnosing oral health conditions, only four participants considered them extremely important, another four felt they were somewhat important, 12 remained neutral, 26 believed they were not very important, and the majority (54 participants) stated that they were not important at all. Regarding the necessity of dental X-rays, 25 participants responded yes, while 75 participants did not. When questioned about the awareness of risks associated with dental X-rays, 59 participants reported that they had such information, whereas 41 participants had no prior knowledge. Regarding perceptions of radiation exposure from dental X-rays, 21 participants believed it to be harmful to health, 49 did not consider it harmful, and 30 were unsure.

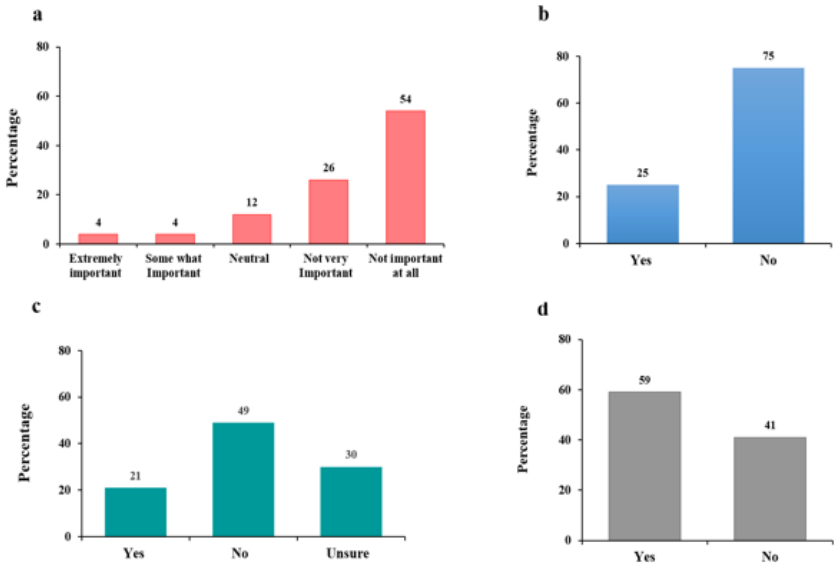

Figure 1. Illustration of participants understanding and perception regarding dental x-rays. a) Importance of dental X-rays in diagnosing oral health conditions. b) Information regarding the necessity of dental x-rays. c) Perception of the harmful effects associated with dental X-ray procedures. d) Having information regarding the risks associated with Dental X-rays.

These results indicate a significant lack of understanding and appreciation for dental X-rays among participants. The majority view X-rays as unimportant and unnecessary, with mixed perceptions regarding associated risks and health impacts. These findings highlight the need for improved patient education on the importance and safety of dental X-rays in oral healthcare.

With regard to the responses related to anxiety about dental X-rays (Figure 2), 42% reported not being anxious at all, 44% felt slightly anxious, 10% were moderately anxious, 3% were very anxious, and 1% described themselves as extremely anxious. The major reasons for concern included fear of radiation exposure (50%), concern about potential pain (22%), anxiety about possible dental problems being detected (14%), concerns regarding the cost of the procedure (10%), and uncertainty regarding its necessity (4%).

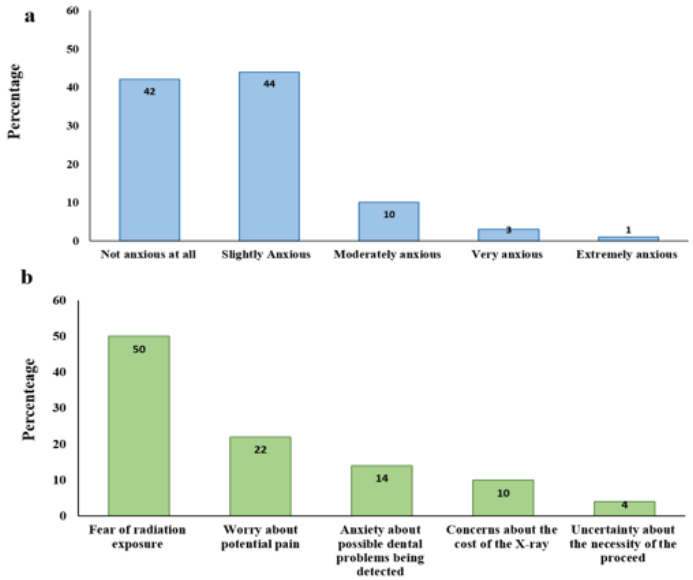

Figure 2. Patient anxiety towards dental radiography. a) Participant responses concerning anxiety associated with dental X-rays. b) The major reasons of concerns about taking dental radiographs.

A large proportion of participants (74%) admitted that they had delayed or avoided a dental X-ray due to fear or concern, whereas 26% did not. In addition, 70% reported feeling nervous at the sight or sound of the X-ray machine, whereas 30% did not experience such anxiety. When compared to other imaging procedures, such as chest radiography or CT scans, 71% indicated that they felt more anxious about dental X-rays, while 29% disagreed. Regarding strategies to reduce anxiety, 42% believed that observing other patients undergoing dental X-rays would make them feel more comfortable, whereas 58% did not share this view. Notably, a significant majority (84%) agreed that increasing public awareness about the safety of dental X-rays could help alleviate patient anxiety, whereas 16% did not consider it beneficial.

Further analysis of the data reveals additional insights into patients' experiences and preferences regarding dental X-ray procedures. Most participants found dental X-rays uncomfortable, with only 10% reporting comfort. The majority suggested improvements, primarily emphasizing detailed explanations from dentists 67%). To reduce anxiety, respondents prioritized clear explanations of the procedure's purpose, followed by step-by-step guidance and radiation exposure clarification (40%). Verbal explanations from dentists were the preferred mode of receiving information (65%), whereas smaller proportions preferred pamphlets or printed materials (14%), informative videos or animations (15%), and online resources such as websites or social media (6%).

Association of Previous Experience of Dental X-rays with Perceived Importance and Anxiety

Table 2. Association between Prior Dental X-ray Experience and Patients' Views on the Significance of Dental Radiographs

Previous Experience	Extremely Important	Somewhat Important	Neutral	Not Very Important	Not Important at all	Total
No (n = 80)	2	3	7	20	48	80
Yes (n = 20)	2	1	5	6	6	20
Total (N = 100)	4	4	12	26	54	100

Statistical test: Chi-square test of independence, χ^2 (4, N = 100) = 8.65, p = 0.070 (not significant).

A Chi-square test of independence was conducted to investigate the association between prior experience with dental radiography and patients' views on its significance. The results showed that the relationship was not statistically significant (χ^2 (4, N = 100) = 8.65, p = 0.070).

Table 3. Association between Previous Experience with Dental Radiography and Patient Anxiety Levels

Previous Experience	Not anxious at all	Slightly anxious	Moderately anxious	Very anxious	Extremely anxious	Total
No (n = 80)	31	40	8	1	0	80
Yes (n = 20)	11	4	2	2	1	20
Total (N = 100)	42	44	10	3	1	100

Statistical test: Chi-square test of independence, χ^2 (4, N = 100) = 12.36, p = 0.015 (significant).

A Chi-square test of independence indicated a significant association between patients' anxiety levels and their previous experience with dental radiography, χ^2 (4, N = 100) = 12.36, p = 0.015. Those who had undergone radiography before were more inclined to describe themselves as "not anxious" or "slightly anxious," while those without such experience were more frequently found in the "very anxious" and "extremely anxious" categories.

Discussion

The survey provided to the patients was straightforward and comprehensible. The demographic profile of the participants in this study reflects a predominance of young adults, with nearly half belonging to the 18–24-year age group. The limited prior exposure to dental radiography, with only one-fifth of the participants reporting any experience, highlights a potential gap in awareness and familiarity with radiographic procedures among patients. Furthermore, the uncertainty expressed by a significant proportion regarding the type of radiographs they had undergone suggests limited patient education or recall about diagnostic procedures, which may have implications for their perception and anxiety levels regarding dental radiography.

The findings on patient perception reveal a considerable gap in awareness and understanding regarding the role of dental radiography in oral healthcare. Despite its established diagnostic value, the majority of participants perceived dental X-rays as either unimportant or unnecessary, with more than half explicitly dismissing their relevance. This negative perception could stem from limited prior exposure to radiographic procedures, as noted in the demographic analysis, or from insufficient communication by dental professionals regarding their benefits. These findings align with numerous studies that have indicated patients lacking prior dental experience tend to be more anxious compared to those who visit the dentist frequently or regularly [17]. Although more than half of the respondents reported awareness of risks associated with dental X-rays, this knowledge may not be balanced by an understanding of the relatively low radiation doses involved and the protective measures typically employed. Such one-sided awareness can reinforce misconceptions, leading to heightened anxiety and reluctance towards undergoing radiographic examinations.

In relation to anxiety, the findings further demonstrate that while a proportion of participants (42%) reported no anxiety, the majority expressed varying levels of concern, with 44% feeling slightly anxious and a smaller percentage reporting moderate to extreme anxiety. Fear of radiation exposure emerged as the most prominent source of apprehension, followed by worries about pain, the possibility of uncovering dental problems, and financial costs. A prior study has indicated that avoiding dental appointments could be the primary factor leading to poor oral health in individuals with increased dental anxiety [18]. This aligns with our findings, where 74% of participants confessed to postponing or skipping dental X-rays due to fear.

Interestingly, many participants (70%) also associated anxiety with the physical presence of the X-ray machine itself, and a majority (71%) reported feeling more anxious about dental X-rays compared to other imaging procedures. Notably, 84% believed that increasing public awareness about dental radiograph safety could reduce anxiety, highlighting education as a key intervention.

The current study did not identify a statistically significant association between prior dental radiography experience and patients' views on the significance of dental radiography. This implies that simply being familiar with the procedure may not significantly affect whether individuals deem radiography crucial for diagnosing oral health issues. Those without previous experience seemed to hold similar opinions to those with experience, suggesting that perceptions might be more influenced by general knowledge, educational background, or previous interactions with dental professionals than by direct experience with the procedure. [19]. These results underscore the need for well-structured patient education strategies to enhance the understanding of the diagnostic importance of dental radiography, irrespective of prior exposure (20).

In contrast, a significant association was observed between previous dental radiography experience and patient anxiety [3]. Individuals with previous experience tended to report lower anxiety levels, whereas those lacking prior exposure showed comparatively higher anxiety, including feelings of being very or extremely anxious. This observation supports the idea that familiarity with clinical procedures can alleviate patient anxiety and increase comfort during diagnostic interventions [17]. This highlights the importance of dental professionals offering clear explanations, reassurance, and possibly demonstrations to first-time pa-

tients, as these actions may help reduce anxiety and enhance the overall patient experience.

In addition, the responses regarding the experience and suggestions for improvements suggested a need of clear verbal explanations from dentists along with demonstrations of safety measures and clarification about radiation exposure. These results underscore the need for structured patient education programs to clarify the diagnostic importance of dental radiographs, address safety concerns, and foster informed acceptance. Such strategies could effectively reduce anxiety and improve patient compliance in clinical practice.

Conclusion

The study findings indicate that patient perception and anxiety toward dental X-rays are closely linked to inadequate communication and limited awareness about the procedure. The discomfort reported by a large proportion of participants may reflect underlying fear of radiation exposure or uncertainty about the necessity of X-rays, as also observed in the perception and anxiety results. Strengthening dentist–patient communication, particularly through clear verbal explanations, reassurance regarding safety measures, and step-by-step guidance, appears to be the most effective approach to improving patient comfort and reducing anxiety related to dental radiographic procedures.

Declarations

Author Contributions

All the authors contributed to the study concept and design. (Elaborate)

Funding

The authors received no specific funding for this work.

Conflicts of interest/Competing interests

The authors declare no competing interests.

Data availability

The datasets generated during and/or analyzed during the current study are included in the manuscript and supplementary file.

Ethics Approval

The study was approved by the AJIDS Ethics Committee (Ref. No. IEC/OMR25/057).

Consent to participate

In this study, informed consent was obtained from all participants.

Consent for publication

All the authors consented to the publication

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