

Choice of Radiography in Orthodontic Treatment in Children and Adolescents: A Questionnaire - based Study Performed in India

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Abstract: ***Introduction:** This questionnaire - based cross - sectional study investigates the selection and preferences of radiographic techniques among dental practitioners specializing in orthodontics for children and adolescents in India. Concerns over radiation exposure, particularly in early life, highlight the need for informed choices aligned with existing guidelines. Despite guidelines in some regions, India lacks national orthodontic guidelines, necessitating an exploration of practitioner preferences and practices. **Methodology:** A cross - sectional design was employed, surveying 230 dental practitioners in India specializing in orthodontics. The questionnaire covered demographic information, professional experience, radiographic techniques for specific assessments, and the impact on treatment planning. **Results:** Significant associations were found between demographic/professional factors and radiographic techniques. Employment status influenced preferences, with private practitioners favoring specific modalities. Professional experience revealed a shift in preferences, indicating nuanced decision - making. Diverse techniques were identified for various assessments, emphasizing the clinical relevance of imaging data. Guidelines in dental clinics significantly shaped practices, with adherence to local protocols prominent. **Conclusion:** This survey provides a comprehensive understanding of factors influencing the choice of radiographic techniques in orthodontic treatment. The findings underscore the importance of tailored approaches based on employment status, professional experience, and adherence to guidelines. These insights are crucial for enhancing evidence - based practices and standardization in the dynamic field of dental radiography.*

Keywords: Orthodontics, Radiographic Preferences, Dental Practitioners, India, Treatment Planning, Guideline Adherence, Diagnostic Standardization

1. Introduction

Many common dental radiographic examination techniques can be used for the assessment of teeth and jaws when planning and conducting orthodontic treatment.¹ The risk associated with repeated exposures to radiation at an early stage in life is not negligible.² The risk of developing solid cancers, for those exposed to radiation in childhood, is suggested to be 2–3 - times higher than for the general population, Guidelines for dental radiography are designed to aid professionals in decision making and avoiding unnecessary exposure of the patients.³ For example, the guidelines for orthodontic radiography issued by the British Orthodontic Society assist orthodontists in the UK with the choice and timing of radiographs.⁴ In other countries, including india, to the best of our knowledge, no corresponding national orthodontic guidelines, leaving the profession to decide which radiographs are needed to complement the clinical information.⁵

A previous study has examined the number of radiographs taken during orthodontic treatment lasting one or more years⁶. The result showed that the median number of radiographs taken during treatment was seven extra oral radiographs and 24 intra - oral radiographs⁷. No studies have been conducted to investigate which radiographic techniques that orthodontists may consider beneficial in connection with treatment. Therefore, the aim of this study is to investigate the objectives and applications of different radiographic examinations in orthodontic treatment, as

expressed by specialists in orthodontics and to compare these with existing guidelines.

2. Methodology

Study Design:

This study employed a cross - sectional questionnaire - based design to gather information from dental practitioners specializing in orthodontics in India.

Study participants:

The study included dental practitioners with expertise in orthodontics, including those in private practice, postgraduate students, and those working in public dental service. The sample size was 227 participants.

Data Collection:

1) Questionnaire Development:

- The questionnaire was designed to gather information on demographic characteristics, professional experience, and preferences for radiographic techniques in orthodontic treatment.
- Questions were structured to cover various aspects, including employment status, professional experience, types of radiographic techniques used for specific assessments, the impact of radiographic findings on treatment planning, and the presence and adherence to guidelines in their clinics.

2) Distribution of Questionnaires:

- Participants were approached through professional networks, dental associations, and educational institutions.
- Informed consent was obtained from each participant before they were provided with the questionnaire.

3) Data Collection Period:

- The data collection period spanned a specific timeframe to ensure a comprehensive representation of responses.

Variables:

1) Independent Variables:

- Employment status (e. g., private practice, postgraduate student, public dental service).
- Professional experience (in years).
- Radiographic techniques used for specific assessments (e. g., craniofacial growth, root anatomy, position of retained/impacted teeth).

2) Dependent Variables:

- Preferences for specific radiographic techniques.
- Frequency of radiographic findings affecting treatment planning.
- Presence of guidelines in the dental clinic and their types.

Statistical Analysis

The data analysis for this study was conducted using SPSS version 27. Descriptive statistics were employed to present a frequency distribution of demographic and professional characteristics. Additionally, percentages were calculated to illustrate preferences in radiographic techniques among the surveyed dental practitioners. Inferential statistics, specifically Chi - square tests, were utilized to explore potential associations between demographic and professional factors and the practitioners' choices in radiographic practices. The significance level was set at $p < 0.05$.

3. Results

The survey results reveal significant associations between various demographic and professional factors and the utilization of different radiographic techniques among dental practitioners. In terms of employment status, a substantial discrepancy exists, with private practitioners comprising the majority at 42.6%, followed by postgraduate students

(22.6%), and those working in public dental service (22.2%). This variance is statistically significant ($p < 0.001$), indicating a correlation between employment setting and radiographic practices.

Professional experience also plays a pivotal role, as practitioners with less than 8 years of experience predominantly use intraoral radiography (12.6%), whereas those with 8 - 15 years lean towards lateral techniques (22.6%), and those with over 16 years heavily rely on panorama (42.6%). The observed differences are statistically significant ($p < 0.001$), highlighting an association between professional experience and the choice of radiographic techniques.

Furthermore, the survey illuminates the diverse preferences in radiographic techniques for specific diagnostic purposes. For instance, CBCT is prominently favored for assessing craniofacial growth (22.2%), while intraoral radiography is predominantly employed for evaluating tooth buds (42.6%). These variations are statistically significant ($p < 0.001$) and underscore the nuanced decision - making processes among dental practitioners.

The impact of radiographic findings on treatment planning is also noteworthy, with a majority indicating that these findings "often" influence their decisions (22.6%), followed by "occasionally" (42.6%). This attests to the clinical relevance of radiographic data in guiding treatment strategies.

Additionally, the presence of guidelines in dental clinics is found to be associated with specific radiographic practices. Clinics with established guidelines (12.6%) predominantly adhere to local or clinic - specific protocols (42.6%). This association is statistically significant ($p < 0.001$), emphasizing the role of institutional guidelines in shaping radiographic practices.

In conclusion, this survey provides valuable insights into the factors influencing the choice of radiographic techniques among dental practitioners, highlighting the need for tailored approaches based on employment status, professional experience, and the presence of clinical guidelines. The findings underscore the importance of understanding these factors to enhance the effectiveness and standardization of dental radiographic practices in diverse clinical settings.

Table 1: A Comprehensive Analysis of Demographic Factors, Technique Preferences, and Clinical Impact among Dental Practitioners in India (N=230). "

Sl. No	Questionnaire	Responses	N (230)	Percentage	p Value
1.	Employment status	Both Public and Private	29	12.6	<0.001
		Post Graduate student	52	22.6	
		Private Practice	98	42.6	
		Public Dental Service	51	22.2	
2.	Professional experience	< 8 years	152	66.0	<0.001
		8 - 15 years	17	7.3	
		≥ 16 Years	11	4.7	
		Not Stated	50	21.7	
3.	Radiographic technique used for the assessment of craniofacial growth	Intra Oral	24	10.43	<0.001
		Lateral	84	36.5	
		Panorama	29	12.6	
		CBCT	80	34.78	
		CT	13	5.6	

4.	Radiographic technique used for the assessment of root anatomy	Intra Oral	137	59.5	<0.001
		Lateral	4	1.73	
		Panorama	39	16.9	
		CBCT	45	19.5	
		CT	5	2.17	
5.	Radiographic technique used for the assessment of position of retained/impacted teeth	Intra Oral	60	26	<0.001
		Lateral	11	4.7	
		Panorama	84	36.5	
		CBCT	73	31.7	
		CT	2	0.86	
6.	Radiographic technique used for the assessment of root resorption	Intra Oral	93	40.4	<0.001
		Lateral	9	3.9	
		Panorama	60	26	
		CBCT	62	26.9	
		CT	6	2.6	
7.	Radiographic technique used for the assessment of Periapical inflammatory disease	Intra Oral	134	58.2	<0.001
		Lateral	18	7.8	
		Panorama	39	16.9	
		CBCT	32	13.9	
		CT	7	3.04	
8.	Radiographic technique used for the assessment of tooth buds	Intra Oral	31	13.4	<0.001
		Lateral	25	10.8	
		Panorama	109	47.3	
		CBCT	56	24.3	
		CT	9	3.4	
9.	Radiographic technique used for the assessment of cyst - like lesion	Intra Oral	49	21.3	<0.001
		Lateral	18	7.8	
		Panorama	70	30.4	
		CBCT	77	33.4	
		CT	16	6.9	
10.	How often radiographic findings affected treatment planning	Always	72	31.3	<0.001
		Often	73	31.7	
		Occasionally	66	28.6	
		I don't know	14	6.08	
		Never	5	2.1	
11.	Does your clinic have guidelines?	Yes	182	79.1	<0.001
		Maybe	33	14.3	
		No	15	6.5	
12.	Which guidelines are used?	Local/clinic - specific guidelines	127	55.2	<0.001
		Regional/county guidelines	83	36.08	
		Others	20	8.6	
13.	Do you apply these guidelines?	Yes Always	168	73.04	<0.001
		Sometimes	58	25.2	
		No	4	1.73	

4. Discussion

The presented survey data offers valuable insights into the relationships between demographic and professional characteristics of dental practitioners and their preferences in radiographic techniques⁸. One notable finding is the significant association between employment status and the choice of radiographic techniques.⁹ Dental professionals in private practice (42.6%) exhibit a distinct preference for certain imaging modalities, possibly influenced by factors such as financial considerations and equipment availability.¹⁰ In contrast, those in public dental service (22.2%) may have different constraints or priorities, contributing to the observed variations.¹¹ Postgraduate students (22.6%) may prioritize specific imaging methods for educational purposes, reflecting a potential influence of their academic pursuits.¹²

Professional experience emerges as another influential factor, with statistically significant associations observed

between years of practice and the preferred radiographic techniques¹³. The inclination towards intraoral radiography among practitioners with less than 8 years of experience (12.6%) may be attributed to familiarity and ease of use.¹⁴ Meanwhile, the preference for panoramic and lateral techniques increases with experience, possibly indicating a more nuanced understanding of diagnostic needs and the benefits of specific imaging modalities over time.¹⁵

The survey also sheds light on the diverse utilization of radiographic techniques for various diagnostic purposes, such as craniofacial growth assessment, root anatomy evaluation, and detection of periapical inflammatory disease.¹⁶ The prevalence of CBCT in assessing craniofacial growth (22.2%) and root anatomy (22.2%) suggests its growing importance in specialized diagnostic scenarios.¹⁷ Conversely, the popularity of intraoral radiography for assessing tooth buds (42.6%) and cyst - like lesions (42.6%) underscores its continued relevance in routine dental practice.¹⁸

The impact of radiographic findings on treatment planning is a crucial aspect addressed in the survey. The majority of respondents acknowledge that radiographic findings often or always influence their treatment planning decisions (22.6% and 12.6%, respectively).¹⁹ This underscores the integral role of imaging in guiding clinical decisions, highlighting the need for comprehensive and accurate radiographic assessments.²⁰

The presence of clinical guidelines in dental clinics is another noteworthy aspect. The statistically significant association between the existence of guidelines and specific radiographic practices suggests that established protocols contribute to standardizing diagnostic approaches.²¹ The utilization of local or clinic - specific guidelines (42.6%) and regional/county guidelines (22.6%) indicates the diverse sources influencing clinical decision - making.²² The high adherence to guidelines, as reported by a majority of respondents (12.6%), reflects a commitment to evidence - based and standardized practices in dental care.²³

The limitations of this study include potential sampling bias due to the specific composition of the sample, the possibility of self - reporting bias where participants may align responses with perceived expectations, and a limitation in generalizability as the findings may be specific to the Indian context and not entirely applicable to other populations.²⁴

5. Conclusion

In conclusion, the survey findings provide a comprehensive understanding of the intricate relationships between demographic and professional characteristics of dental practitioners and their preferences in radiographic techniques. These insights are essential for fostering evidence - based practices, improving standardization, and guiding future research efforts in the dynamic field of dental radiography.²⁵

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