



# Comprehensive Assessment of Knowledge and Awareness of General Dental Practitioners about Cone Beam Computed Tomography in Various Prosthodontic Rehabilitative Procedures: An Original Research Study

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*(Received: 16 November 2024*

*Revised: 11 December 2024*

*Accepted: 02 January 2025)*

## KEYWORDS

Cone Beam  
Computed  
Tomography,  
Awareness,  
Implant,  
Knowledge,  
Innovation

## ABSTRACT:

### Background and Aim:

Recently, three-dimensional imaging technique Cone beam computed tomography has established many landmarks in the field of dental radiology. Currently, CBCT is typically advised by oral radiologist (for head & neck diagnosis) and by prosthodontists (for implantology). Dental implant rehabilitation is the most common rehabilitation treatment where CBCT is comprehensively used. The aim of this study was to evaluate the current knowledge and awareness about Cone Beam Computed Tomography in various prosthodontic rehabilitative procedures among general dental practitioner in Bhopal District, India.

**Materials & Methods:** The study was completely based on a cross sectional philosophy using a questionnaire. Initially, a total of 100 private dental practitioners of Bhopal District, India were approached and requested to complete the questionnaire. We used close ended questionnaire containing questions regarding the current knowledge and awareness about Cone Beam Computed Tomography. The questionnaire was distributed among dentists in private clinics. We analyzed the data of dentists who truly responded to this questionnaire. Response was recorded and data was analyzed statistically to assess real knowledge and awareness level.

**Results:** Statistical analysis was completed by statistical software Statistical Package for the Social Sciences (SPSS). The recorded data was subjected to appropriate statistical tests to obtain p values, mean, standard deviation, standard error and 95% CI.  $P \leq 0.05$  was considered as statistically significant. 30 practitioners were belonging to the age range of 32-35 years consequently we can assume that most of the general dental practitioners were belonging to younger age groups. P value was significant in group III of age range 40-43 years. The measured value was 0.01. 24 practitioners



were reported in age group of 40-43.

**Conclusion:** Within the limitations of the study authors concluded that dentists Knowledge and awareness about Cone Beam Computed Tomography about various prosthodontic rehabilitative procedures was at fair levels only. Because CBCT is a promising innovation in the field of oral radiology and implantology, repeated awareness campaigns and educational demonstrations must be performed judiciously.

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## Introduction

Radiography is considered the most common diagnostic tool in daily dental practice, with more than one quarter of all medical radiographs in Europe being made by dentists. Since the breakthrough of x-rays 121 years ago, dental radiographs have been the chief source of diagnostic data in the oral and maxillofacial complex.<sup>1-2</sup> Nevertheless two-dimensional (2D) imaging techniques are incapable to illustrate complicated three-dimensional (3D) anatomical structures and associated pathologies. Two-dimensional imaging modalities have been used in dentistry since the first intra-oral radiograph was taken in 1896. Noteworthy progress in dental imaging techniques has since been made, including panoramic imaging and tomography, which enable reduced radiation and faster processing times. With the progressions in the field of head and neck radiology, it is reasonably easy now to evaluate the bony status both qualitatively and quantitatively. Conversely, the imaging geometry has not changed with these commonly used intraoral and panoramic technologies. Cone-beam computed tomography (CBCT) is a new medical imaging technique that generates 3-D images at a lower cost and absorbed dose compared with conventional computed tomography (CT).<sup>3-7</sup> In implant dentistry, three-dimensional (3D) imaging can be realized by dental cone beam computed tomography (CBCT), offering volumetric data on jaw bones and teeth with relatively low radiation doses and costs. The latter may explain why the market has been steadily growing since the first dental CBCT system appeared two decades ago. A CBCT scanner uses a collimated x-ray source that produces a cone- or pyramid-shaped beam of x radiation, which makes a single full or partial circular revolution around the patient, producing a sequence of discrete planar projection images using a digital detector. These two-dimensional images are reconstructed into a three-dimensional volume that can be viewed in a variety of

ways, including cross-sectional images and volume renderings of the oral anatomy. Since CBCT devices were introduced commercially in the United States in 2001, dentists have come to use the technology in increasing numbers.<sup>8-14</sup> Yet, although CBCT technologies have advanced rapidly across time, concerns have been expressed about whether the information acquired with CBCT imaging warrants the additional exposure risk, as well as about the level of training, education and experience required to interpret the CBCT data set. In view of the increasing availability of CBCT in dental practices, authors aimed to evaluate the current knowledge and awareness about Cone Beam Computed Tomography among general dental practitioner in Bhopal District, India.

## Materials & Methods

This study was performed to calculate the current knowledge and awareness about Cone Beam Computed Tomography among general dental practitioner in Bhopal District, India. It was completed on a cross sectional and questionnaire model. Authors studied total 100 private dental practitioners of Bhopal District, India. The related details of the general dental practitioners were received from the registry of Bhopal society association of dental practitioners. Initially, we noticed that there were total 128 registered in this society. Out of which, 16 were not actively practicing, rest remaining was 112. On further assessment Authors noticed that 12 of them not responded genuinely to our study. Consequently final sample including in the study was total 100 the general dental practitioners. Authors have processed questionnaire response data of 100 respondents efficiently. Authors had framed the questions of CBCT knowledge and awareness in a questionnaire layout. It was an exclusive close ended questionnaire containing 8 items. Authors had given this printed questionnaire to the dentists at their clinics/hospital/workplaces. Authors have determined to



perform this study on questionnaire basis because such studies are remarkably useful to obtain detailed information about personal and group perceptions and opinions. They are also competent of saving time and money while analyzing the subjects at individual levels. Additionally, they also give a broader range of data with better clarification and understanding. The privacy policy and other rights of the study participants were absolutely ensured. Informed consent was obtained from the respondents those were voluntarily ready for participation. To ensure completely stress-free replies, the study was conducted over a period of 30 days in which dentists are asked to fill and send back the questionnaire. The significance of this study was explained in detail to all general dental practitioners. Results thus received was compiled in table and subjected to basic statistical analysis. P value less than 0.05 was considered significant ( $p < 0.05$ ).

### Statistical Analysis and Results

Data gained from questionnaire exercise were sent for statistical analysis using statistical software Statistical Package for the Social Sciences version 22 (New York, USA). The finalized data was subjected to appropriate statistical tests to obtain p values, mean, standard deviation, chi-square test, standard error and 95% CI. Table 1 and Graph 1 showed that out of 100 practitioners, males were 65 and females were 35. Total 8 practitioners were belonging to age group  $>47$  years. 30 practitioners were belonging to the age range of 32-35 years consequently we can assume that most of the general dental practitioners were belonging to younger age groups. P value was significant in group III of age range 40-43 years. The measured value was 0.01. 24 practitioners were reported in age group of 40-43. Evaluations of knowledge by assessment of the professional degrees were also done (Table 2). More than 78% practitioners were having only BDS degree whereas 20 practitioners were having BDS as well as post graduate degrees (MDS). Only two practitioners possessed over and above PhD award. Questionnaire responses showed noteworthy results wherein p value was also found to be significant (Table 3). 22 practitioners were unaware of the usage of CBCT. 95 practitioners think that BDS curriculum is inadequate regarding CBCT. 59 practitioners think that CBCT must be made mandatory for all dental institutions. Only 11 practitioners have attended any

CDE/CME/Workshop/Demo/Hands-On on CBCT. 60 practitioners think that CBCT is mostly used for Oral Implantology. Only 22 practitioners had suggested CBCT at their clinic for miscellaneous reasons. Table 4 shows fundamental statistical description with level of significance evaluation using Pearson chi-square test. For question no 2, 3, 5 the p value was found to be significant.

**Table 1: Age & Gender Wise Distribution of Practitioners**

Age Group (Yrs)	Male	Female	Total %	P value
32-35	18	12	30 [30 %]	0.09
36-39	10	5	15 [15 %]	0.50
40-43	18	6	24 [24 %]	0.01*
44-47	15	8	23 [23 %]	0.90
$>47$	4	4	8 [8 %]	0.08
Total	65	35	100%	*Significant

\* $p < 0.05$  significant

**Table 2: Assessment of Practitioners By Educational Status**

Educational Degree	Number	Mean	Standard Deviation
BDS	78	14.76	8.65
MDS	20	7.39	4.54
MDS + Ph.D	2	1.89	1.98
Total	100	-	-

**Table 3: Questionnaire Responses Assessment With Associated Statistical Inferences**

Questionnaire	Variables	Responses of Practitioners [Yes]	Responses of Practitioners [No]	p Value
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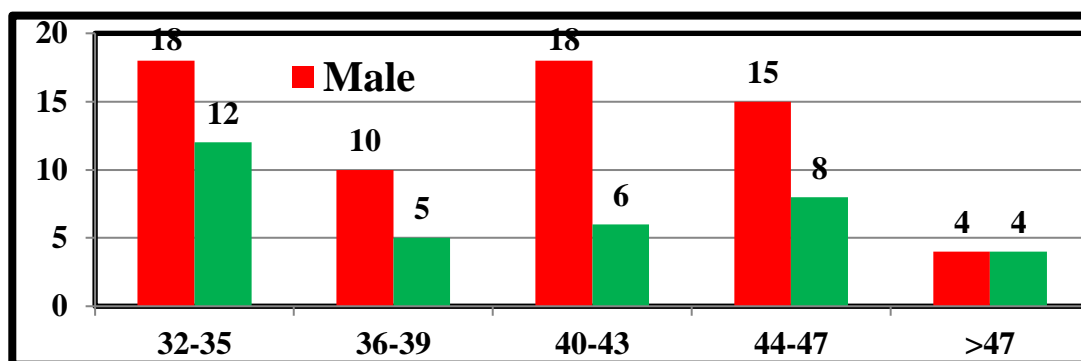
1	Have you noticed ever CBCT in Dental Radiology	78	22	0.020*
2	Do you believe CBCT is important for Oral Implantology	60	40	
3	Do you believe that CBCT is a precise diagnostic tool	44	56	
4	Do you believe that current DCI pattern is insufficient for understanding CBCT	95	5	
5	Have you ever attended any	11	89	

	CDE/CME/Workshop/Demo/Hands-On on CBCT			
6	Do you think it must be made mandatory for all dental institutions	59	41	
7	Do you believe that CBCT could be proved as an crucial tool in future oral and maxillofacial research	49	51	
8	Have you ever suggested CBCT at your clinic	22	78	
<b>*p&lt;0.05 significant</b>				

**Table 4: Fundamental Statistical Description With Level Of Significance Evaluation Using Pearson Chi-Square Test**

Question No.	Mean	Std. Deviation	Std. Error	95% CI	Pearson Chi-Square Value	df	Level of Significance (p value)
1	2.53	0.252	0.160	1.96	2.433	1.0	0.086
2	2.76	0.264	0.000	1.96	2.242	2.0	0.020*
3	2.53	1.346	0.078	1.96	2.498	1.0	0.010*
4	2.98	0.434	0.035	1.96	1.556	1.0	0.080
5	2.23	0.276	0.025	1.96	2.550	3.0	0.001*
6	1.57	0.352	0.029	1.96	2.463	1.0	0.435
7	1.38	0.132	0.016	1.96	1.231	1.0	0.341
8	2.34	0.349	0.033	2.33	1.219	1.0	0.324
<b>*p&lt;0.05 significant</b>							

**Graph 1: Age & Gender Wise Distribution of Practitioners**





## Discussion

Cone beam computed tomography has truly modernized all these areas of dental surgery. As we all know that the usage of cone-beam computed tomography (CBCT) has expanded well the field of oral and maxillofacial radiology. It also provides three dimensional volumetric information which is used for re-constructing dental and related maxillofacial structures with isotropic resolution and high dimensional accurateness. Imaging is the most significant and most commonly used diagnostic tool in dentistry. More than one quarter of all medical radiographs in Europe is made by dentists; in some countries this number even approaches 50% (e.g. Sweden).<sup>15-18</sup> The significance of radiographs for dental diagnosis is illustrated by the fact that hardly two weeks after discovery of the x-ray by WC von Röntgen, German dentist Walkhoff already made a first radiographic image of human teeth. For more than a century this type of dental radiographs has been the dominant source for diagnostic information on the maxillofacial complex, jaws and teeth. Yet, 2D projective techniques cannot fully display complicated 3D anatomical structures and related pathologies such as impacted teeth, root resorption, apical granulomata, periodontal breakdown, cystic lesions or benign tumors.<sup>19-20</sup> In the eighties, a first revolution came with the introduction of digital dental (radiographic) imaging in dentistry. As with other radiographic modalities, CBCT imaging should be used only after a review of the patient's health and imaging history and the completion of a thorough clinical examination. Dental practitioners should prescribe CBCT imaging only when they expect that the diagnostic yield will benefit patient care, enhance patient safety or improve clinical outcomes significantly. CBCT technologies offer an advanced point of care imaging modality that clinicians should use selectively as an adjunct to conventional dental radiography.<sup>21-34</sup> The selection of CBCT for dental and maxillofacial imaging should be based on professional judgment in accordance with the best available scientific evidence, weighing potential patient benefits against the risks associated with the level of radiation dose. Our study aimed to evaluate the current knowledge and awareness about Cone Beam Computed Tomography among general dental practitioner in Bhopal District, India. Authors noticed few very imperative responses while executing the study.

## Conclusion

Our study results outcomes undoubtedly illustrate the present status of knowledge/awareness of studied general dental practitioners regarding CBCT. Within the limitations of the study authors concluded that dentists Knowledge and awareness about Cone Beam Computed Tomography in various prosthodontic rehabilitative procedures was at fair levels only. Since, the CBCT is a promising innovation in the field of oral radiology, prosthodontics and implantology, repeated awareness campaigns and educational demonstrations must be performed judiciously. Our study results should be considered as suggestive for assuming clinical outcomes for such critical circumstances. Nevertheless, we anticipate some other large scale studies to be conducted that could further establish certain standard guidelines in these perspectives.

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