



## International Journal of Applied Dental Sciences

ISSN Print: 2394-7489  
ISSN Online: 2394-7497  
IJADS 2018; 4(4): 05-08  
© 2018 IJADS  
www.oraljournal.com  
Received: 06-08-2018  
Accepted: 02-09-2018

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## Evaluation of dentists knowledge and awareness towards cone beam computed tomography used in oral implantology: An original study

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### Abstract

**Background and Aim:** Cone beam computed tomography (CBCT), is a three-dimensional (3D) dental and maxillofacial imaging modality that has been developed in recent years. The aim of this study was to evaluate the current knowledge and awareness about Cone Beam Computed Tomography among general dental practitioner in Ghaziabad District, India.

**Materials & Methods:** This study was exclusively based on a cross sectional ideology which was based on a questionnaire. A total of 200 private dental practitioners of Ghaziabad District, India were asked 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 processed statistically to evaluate knowledge and awareness level.

**Results:** Statistical analysis was done using statistical software Statistical Package for the Social Sciences (SPSS). The recorded data was subjected to suitable statistical tests to obtain p values, mean, standard deviation, standard error and 95% CI.  $P \leq 0.05$  was considered as statistically significant. More than 75% practitioners were having only undergraduate degree whereas 40 practitioners were having undergraduate as well as post graduate degrees. Only 6 practitioners were practicing for more than 15 years. 54 practitioners were unaware of the usage of CBCT. 188 practitioners think that UG dental curriculum is inadequate regarding CBCT.

**Conclusion:** Within the limitations of the study authors concluded that dentists Knowledge and awareness about Cone Beam Computed Tomography was below moderate levels. As CBCT is an emerging boom in the field of oral radiology and implantology, regular awareness camps, educational programs and technique demonstrations must be conducted.

**Keywords:** Prosthodontics, Cone beam computed tomography; Awareness, Implant

### Introduction

In the recent past, three-dimensional (3D) imaging technique Cone beam computed tomography (CBCT) has established many landmarks in the field of dental radiology. Presently, CBCT is mostly advised by oral radiologist (for head & neck diagnosis) and by prosthodontists (for implantology). Dental implant therapy is the most common rehabilitation treatment where CBCT is extensively used. Other usage includes diagnosis of oral and maxillofacial pathologies those are otherwise undetectable by routine 2D radiography [1]. Since it's a newer technique of radiologic investigation, general dental practitioners are usually unaware of its indication, contraindications, advantages, disadvantages, technical issues and related methodology [2]. CBCT was first introduced in 1996. In developing countries including India this technique has been recently introduced. Cone beam computed tomography is a medical imaging technique consisting of X-ray computed tomography where the X-rays are divergent and creating a cone with cone beam CT [3]. After that the cone shaped X-ray beam is moved around the patient to produce large number of images in the form of slices. CBCT images are usually of high quality and it has the capability to produce high resolution images with high diagnostic quality [4-7]. When CBCT installation unit is compared with conventional CT scan unit, CBCT units cost less and require less space. It also has faster scanning speed.

CBCT has wide applications in dentistry [8-9]. During literature searches of the CBCT awareness and knowledge we found that there are very few studies have been done regarding this. Also CBCT usages are becoming essential for prosthodontists. 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 Ghaziabad District, India.

**Materials & Methods**

The present study was conducted to evaluate the current knowledge and awareness about Cone Beam Computed Tomography among general dental practitioner in Ghaziabad District, India. It was completed on a cross sectional and questionnaire model. We studied total 200 private dental practitioners of Ghaziabad District, India. The contact details of the general dental practitioners were obtained from the registry of Ghaziabad District society of dental practitioners. There were total 286 registered in this society. Out of which, 66 were not actively practicing, rest remaining was 220. On further examination we found that 20 of them not responded to our questionnaire. Therefore final sample including in the study was total 200 the general dental practitioners. We have analyzed questionnaire response data of 200 respondents professionally. We had outlined the questions of CBCT knowledge and awareness in a questionnaire format. It was an exclusive close ended questionnaire containing 10 items. We had provided this questionnaire to the dentists at their clinics. We have decided to conduct this study on questionnaire model since they are exceptionally 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. In addition, 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 1 month in which dentists are asked to fill and send back the questionnaire. The importance of this study was explained in detail to all general dental practitioners. Results thus obtained was tabulated and subjected to basic statistical analysis. P value less than 0.05 was considered significant (p< 0.05).

**Statistical Analysis and Results**

Responses those obtained from questionnaire exercise were sent for statistical analysis using statistical software Statistical Package for the Social Sciences version 21 (IBM Inc., Armonk, New York, USA). The resulting data was subjected to suitable 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 200 practitioners, males were 130 and females were 70. Total 60 practitioners were belonging to age group >75 years. Only 16 practitioners were belonging to the age range of 41-50 years therefore we can presume that most of the general dental practitioners were belonging to older age groups. P value was significant in group III of age range 61-70 years. Total 60 practitioners were found in the age of >75. Evaluations of knowledge by assessment of the professional degrees were also completed (Table 2). More than 75% practitioners were having only undergraduate degree whereas 40 practitioners were having undergraduate as well as post graduate degrees. Evaluation of knowledge according to number of years of private practice was also done. More than 70% of the practitioners were practicing for less than 5 years. However, 44 practitioners were practicing in the range of 5 to 10 years. Only 6 practitioners were practicing for more than 15 years (Table 3). Questionnaire responses revealed significant outcomes wherein p value was also found to be significant (Table 4). 54 practitioners were unaware of the usage of CBCT. 188 practitioners think that UG dental curriculum is inadequate regarding CBCT. 121 practitioners think that CBCT must be made mandatory for all dental institutions. Only 25 practitioners have attended any CDE/CME/Workshop/Demo/Hands-On on CBCT. 130 practitioners think that CBCT is mostly used for Oral Implantology.

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

Age Group (Yrs)	Male	Female	Total %	P value
41-50	8	8	16 [8 %]	0.08
51-60	20	10	30 [15 %]	1.00
61-70	36	12	48 [24 %]	0.02*
70-75	30	16	46 [23 %]	0.40
>75	36	24	60 [30 %]	0.09
Total	130	70	100%	*Significant

\*p<0.05 significant

**Table 2: evaluation of practitioners by educational degree**

Educational Degree	Number	Mean	Standard Deviation
Under Graduate	157	34.56	14.44
Post Graduate	40	31.67	17.56
Post Graduate + PhD	3	3.67	2.66
Total	200	-	-

**Table 3: evaluation of practitioners according to the number of years of private practice**

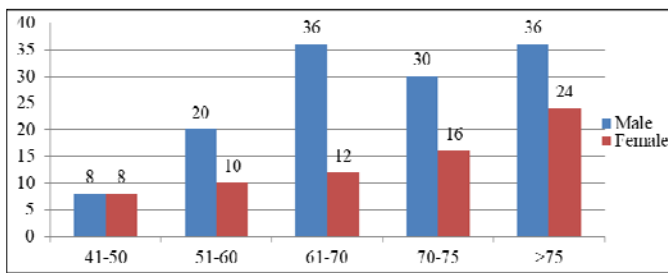
Years of Employment	Number	Mean	Standard Deviation
<5	140	32.77	13.44
5-10	44	32.27	17.16
10-15	10	4.27	3.68
>15	6	2.33	1.32

**Table 4: Questionnaire Responses Evaluation with Related Statistical Inferences**

Questionnaire	Variables	Responses of Practitioners [Yes]	Responses of Practitioners [No]	p Value
1	Are you aware of CBCT in Dental Radiology	146	54	0.010*
2	Do you think it is mostly used for Oral Implantology	130	70	
3	Do you think that CBCT is a excellent diagnostic tool	98	102	
4	Do you think that UG dental curriculum is inadequate regarding CBCT	188	12	
5	Have you ever attended any CDE/CME/Workshop/Demo/Hands-On on CBCT	25	175	
6	Do you think it must be made mandatory for all dental institutions	121	79	
7	Do you think that CBCT could be proved as an ultimate tool in future	91	109	

dentistry and research			
8	Have you ever advised CBCT for at your clinic	32	168
9	Do you really think that 3D imaging is essential for Head and Neck diagnostic procedures	80	120
10	After completion of this questionnaire/study, Are you willing to receive regular updates/news about CBCT	161	39

\*p<0.05 significant



Graph 1: age & gender wise distribution of practitioners

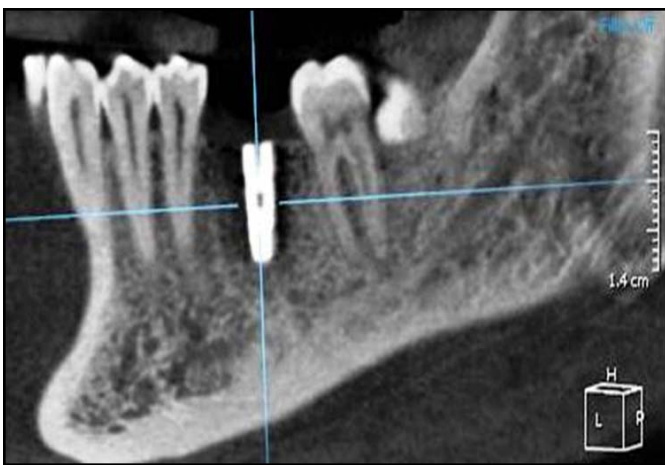


Fig 1: Virtual Implant Placement and Other Measurements Using CBCT

## Discussion

The present study was conducted to evaluate the current knowledge and awareness about Cone Beam Computed Tomography among general dental practitioner in Ghaziabad District, India. As we all know that the selection of a proper diagnostic technique plays a crucial role in the treatment of disease [10-13]. An appropriate diagnostic method can provide essential information, in addition to the minimizing of cost and harm to patients. In dental radiography, efforts have been made to reduce patient exposure to radiation. Cone-beam computed tomography (CBCT) was developed to attain this goal. In India, no published study was done considering the knowledge about CBCT imaging among dentists and this may be due to the ignorance of the new techniques existence and the few number of the CBCT machines [14]. Therefore, it is necessary to shed light and to assess the knowledge in regards to CBCT to initiate continuing dental training on that subject. CBCT has gained importance, as it is associated with benefits, such as increased patient comfort, lower radiation doses, and lower operating costs compared with conventional CT [15]. It has been reported that CBCT provides submillimeter isotropic voxels allowing accurate measurements, with minimal magnification and distortion (error <0.1 mm), allowing safe dental implant insertion. It has been reviewed that CBCT values are influenced by various other additional factors, such as the kind of device used, imaging parameters, and its positioning. Recently, the use of CBCT in dentistry has been significantly increased (Figure 1) [16]. This is mainly due to

the benefits of CBCT, such as patient comfort, lower radiation doses, and lower cost in comparison to the conventional CT [17]. It is not like that all related studies have been done in favor of CBCT. Dental literature has also shown some studies against the CBCT usage. In a study conducted by Nackaerts *et al.*, it was reported that the conventional CT showed stable HU values, whereas CBCT results were not as reliable [18]. They justified themselves saying that CBCT values are influenced by various other additional factors, such as the kind of device used, imaging parameters, and its positioning. Implant-retained dental rehabilitation of missing teeth using CBCT can be considered a preferential diagnostic tool for the bone density evaluation during treatment planning for implant placement. The CBCT images provide 3D outlooks of jawbone both qualitatively and quantitatively. Therefore, for predicting the bone densities in jaws for determining implant sites and other diagnostic procedures, CBCT values could be reliably used.

## Conclusion

Our study results clearly showed the present scenario and status of knowledge/awareness of general dental practitioners regarding CBCT. Within the limitations of the study authors concluded that dentists knowledge and awareness about Cone Beam Computed Tomography was below moderate levels. Most of the practitioners did not know the imperative usage of CBCT since they think that it's only used for some diagnostic procedures. In this modern era, CBCT is chiefly done and advices by 1) Oral Radiologist for various diagnostic procedures of head and neck 2) by Prosthodontists for oral implantology. Since CBCT is a promising innovation in the field of oral radiology and implantology, regular awareness camps, educational programs and technique demonstrations must be conducted. Our study results must be treated as suggestive for predicting clinical outcomes for such critical situations. However, we expect some other large scale studies to be conducted that could further set certain standard norms.

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