

## **Knowledge and Attitudes of Dentists towards Cone Beam Computed Tomography in Khartoum, Sudan.**

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### **Abstract:**

**Objectives:** Cone beam computed tomography (CBCT) has been recognized recently in Sudan but with limited availability. This study will assess Sudanese dentists' knowledge and attitudes towards CBCT.

**Methods:** A questionnaire-based study was performed among dentists in Khartoum Teaching Dental Hospital between October and November 2016. A total of 161 dentists were involved in the study. Twenty close-ended questions were answered by the participants. Data were collected and analyzed using the Statistical Software Package SPSS (version 20).

**Results:** A total of 161 dentists participated in the study. There were 75 (46.4%) males and 86 (53.6%) females. House-officers constituted 50.3%, medical officers 26.7%, registrars 19.9% and newly graduate 3.1%. Seventy seven percent were aware of CBCT and the most common source of information was faculty's lessons. When chi square test applied, there were statistically significant differences in participants' responses by academic qualification ( $p$ -value 0.001). Interestingly only 31.7% of participants had requested CBCT for their patients, and the highest percent was for teeth impaction (33.3%).

**Conclusion:** This study recommends that efforts should be made to improve dentists' knowledge towards Cone Beam Computed Tomography. Also, dental school curricula should be structured to designate more focus to this new technology.

**Keywords:** Cone beam computed tomography, Dentists, knowledge, Medical education, Radiology.

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### **I. Introduction**

Cone Beam Computed Tomography (CBCT) was first employed by Aria and Moshiri and since then it has become the preferred imaging modality for various maxillofacial and dental conditions (1, 2). This imaging technique provided diagnostic images with better insight of the tissues but beam hardening and scattering from dental materials could be one of its drawbacks(3). When compared with conventional CT scanners, CBCT have interactive display modes with better maxillofacial imaging, it's also more suitable for use in dental practices as it require less space, limited beam to dental area, less cost, rapid scan time and reduce radiation doses(4, 5). However, CBCT interpretation need a substantial level of expertise, untrained clinician is likely to have a substantial error rate in the interpretation of CBCT images(6).

Common indications for CBCT in dentistry include dental implants; examination of teeth and facial structures for orthodontic treatment planning; TMJ evaluation; preoperative evaluation of mandibular third molar teeth proximity to the mandibular canal; infection, odontogenic tumors and cysts(7). CBCT technique started by focusing a cone-shaped X-ray beam on a two dimensional (2D) detector that rotates 360u or less around the patient's head to produce a series of 2D images. An algorithm is then applied followed by reconstructions of varying thicknesses to generate accurate three-dimensional (3D) images of bone and soft-tissue surfaces(8, 9).

Previous studies have focused on assessing dentists' knowledge towards digital systems and radiation (10). Recently, with the broad recognition of CBCT, studies have shifted towards assessing this new technology and dentists' attitudes towards it. This study will assess the knowledge and attitude of dentists in Khartoum Teaching Dental Hospital towards CBCT. To the best of our knowledge this is the first study in our country due to its recent recognition and limited availability in only one center.

### **II. Material And Methods**

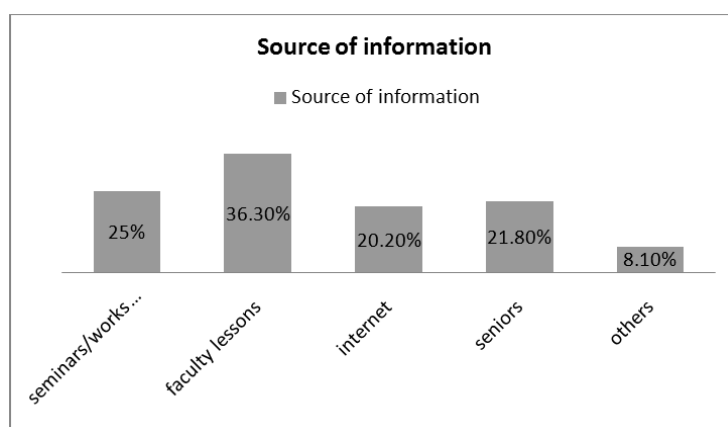
A cross-sectional hospital based study was carried out among postgraduate dentists in Khartoum Teaching Dental Hospital (KTDH) between October and November 2016. The questionnaire was personally handed over to all dentists in the hospital, i.e. newly graduates, house officers, medical officer and registrars. It was a self-administrated and included the demographic details of the participant and their qualification, it also assessed the general awareness towards CBCT, the source of information, knowledge regarding technical aspect and the overall satisfaction during practice. The study was approved by the Ethical Committee of KTDH and a

written consent was obtained from all participants. A total of 161 dentists participated in the study. The questionnaire comprised 20 close-ended questions. The completed questionnaires were collected and data was analyzed using the Statistical Software Package SPSS (version 20).

### III. Results

A total of 161 dentists were participated in this study and all of them gave their written consent to participate. Out of the all participants, 50.3% were House-officers, 26.7% were medical officers, 19.9% were registrars and 3.1% were newly graduate dentists. There were representatives from almost every training level of dental practice in this study.

Of all participants, 75 (46.4%) were males and 86 (53.6%) were females. Out of 161 participants, 124 (77%) were aware of CBCT and the most common source of information about CBCT was faculty's lessons followed by seminars/workshops (figure 1).



**Figure 1:** shows source of information regarding CBCT among participants.

Around 90.7% of participants thought it a useful diagnostic tool; 88.2% mentioned that it will be the ultimate tool in the future of dentistry, while 8.7% thought that it will not be used in the future. All the registrars (100%), 76% of house officers, 67% of medical officers and only 20% of the newly graduates were aware of CBCT. There were statistically significant differences in participants' responses by academic qualification when chi square test was performed (p-value 0.001). Table 1

**Table 1:** shows the correlation between the education level and awareness toward CBCT.

	aware of CBCT	Not aware	Total
Newly graduate	1(20.0%)	4(80.0%)	5(100.0%)
house officer	62(76.5%)	19(23.5%)	81(100.0%)
Medical Officer	29(67.4%)	14(32.6%)	43(100.0%)
Registrar	32(100.0%)	0(0.0%)	32(100.0%)
<b>Total</b>	<b>124(77.0%)</b>	<b>37(23.0%)</b>	<b>161(100.0%)</b>

*P value= 0.001*

Interestingly, only 31.7% of participants had ever requested CBCT for their patients and the highest percent was for impaction (33.3%) followed by implants (19.6%). Moreover, 90.7% mentioned that they like to use CBCT in their professional career, and when asked what cases they would request CBCT for, 47.2% mentioned implants.

When participants were asked where CBCT will be used in routine dental practice in the future, 36% said it will be used in all dental specialties while 8.7% mentioned that it will not be used at all. The availability of CBCT machines in dental institutions was recommended by 88.8% of participants. 68.3% of the participants thought that there is inadequate undergraduate teaching regarding CBCT. As for when CBCT should be taught, the majority of participants thought that information on CBCT should be included in academic curricula of dental education at the 4<sup>th</sup>/5<sup>th</sup> undergraduate years (67.1%), in the 3<sup>rd</sup> undergraduate year(18.6%), and at the postgraduate level (11.8%), while 2.5% mentioned that it is not required. Of all participants, only 23% had attended postgraduate courses and 42.9% were willing to attend, while 33.3% replied with "maybe if it's within the budget".

The majority of participants (68.3%) stated that undergraduate teaching did not provide adequate information about CBCT. This can be attributed to the fact that CBCT is a recent advancement in the field of oral radiology. When participants were asked about the advantages of CBCT over other imaging modalities,

44.7% mentioned lower radiation but 16.7% had no idea. Statistically significant differences in participant's responses by academic qualification were reported when the chi square test was done (table 2).

**Table 2:** shows correlation between participants' knowledge towards CBCT and their qualification.

CBCT characteristics	Newly graduate	house officer	Medical Officer	Registrar	P value
Lower radiation dose compared to CT scan	0 (0.0%)	31 (38.3%)	15 (34.9%)	26 (81.3%)	0.001
Short scanning time	4 (80%)	25 (30.9%)	5 (11.6%)	6 (18.8%)	0.002
Easier image processing	0 (0.0%)	18 (22.2%)	0 (0.0%)	10 (31.3%)	0.001
Less expensive than CT scan	0 (0.0%)	11 (13.6%)	1 (2.3%)	19 (59.4%)	0.001
Data reconstruction can be performed on a personal computer	0 (0.0%)	24 (29.6%)	21 (48.8%)	10 (31.3%)	0.056
No idea	1 (20%)	18 (22.2%)	8 (18.6%)	0 (0.0%)	0.04

#### IV. Discussion

Cone beam CT (CBCT) has recently become very useful for oro-facial and dental imaging. When compared with conventional CT scan, CBCT is less costive, requires less space, has rapid scanning time, and beam is limited to the required area with less radiation doses (11, 12). Disadvantages include: beam hardening, scatter from dental materials and poor soft-tissue contrast(12).

CBCT is relatively new to Sudan, There is only one CBCT unit in the country in comparison to 20 CBCT units in Turkey(13), 3000 CBCT units in the USA and 800 in Germany(14). A few dental schools have recently started including theoretical lessons on CBCT. Considering the availability of only one CBCT center throughout the entire country however, it is not surprising that CBCT education remains limited to only theoretical lessons.

Awareness regarding CBCT was found to be at 77%, which is higher than findings reported in Turkey(59.6%)(13) and South India (42.5%)(15), but lower than those reported in studies in Mangalore(16) which revealed a 100% CBCT awareness. The majority of dentists in this study reported that they had learned about CBCT from faculty lessons, unlike Kamburog et al who found that in Turkey seminars were the most common source of information about CBCT(13).

Reddy et al reported in their study that 85.9% of M.D.S staff was aware of CBCT. In contrast, 100% of registrars in this study were aware of CBCT, which is higher than other groups. Also in the present study we found that some dentists (31.7%) had never requested CBCT during their careers. This can be explained by the unavailability of CBCT at their work place; 88.8% of them acknowledged the need for a CBCT at their work place. Kamburoğlu et al's findings were in accordance with the present study, as they highlighted the difficulties of knowledge acquirement without practical experience(13). A similar finding was reported by Shetty et al (16) and Lavanya et al(17).

Dölekoğlu et al's(18) study revealed that implants and cyst-tumor diagnosing was the most common reason for CBCT requesting among Turkish dentists. The study was supported by the findings of Arnheiter et al(19) and Yalcinkaya et al(20). In the present study the most common indication for CBCT was teeth impaction applications (33.3%), followed by implants (19.6%). A significant difference in responses was observed by educational level; none of the newly graduates had requested CBCT in comparison to 84.4% of registrars. Kamburog et al (13) did not report such a difference in their study in Turkey. Reddy et al reported that 51.6% of dentists had already attended courses related to CBCT imaging. A lower percent was reported in the present study (23%).

In the present study we found that 44.7% of dentists mentioned that CBCT has less radiation when compared to CT scan imaging. Moreover, 16.8% of dentists did not have any idea about CBCT image characteristics. This could be explained by the unavailability of CBCT at their work place. A similar finding was reported in the literature where most respondents were unsure about radiation exposure and the majority did not have any idea about the imaging characteristics of CBCT(17).

#### V. Conclusion

CBCT is one of the most remarkable new developments in dentistry. The limited use of CBCT could be attributed to CBCT units' unavailability at institutions and insufficient undergraduate teaching. Our recommendations are to increase the number of continued education programs, modification of dental radiology curricula to include more details regarding CBCT and to include CBCT units in each institution.

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