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Knowledge, attitude and practice based survey among dentists regarding the usage of CBCT in endodontics

Swathi U B, Pradeep S*, Delphine Priscilla Antony S

Department of Conservative Dentistry and Endodontics, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai-600077, Tamil Nadu, India

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ABSTRACT

Cone Beam Computed Tomography is a diagnostic imaging modality that provides high quality, accurate three dimensional (3D) representations. CBCT in endodontics not only gives a three dimensional evaluation of the region of interest but also an appropriate resolution of images that help give a detailed analysis of the tooth and the surrounding alveolar anatomy. It aids in deciding the treatment plan in various fields of dentistry. CBCT has been proved as an essential diagnostic aid for endodontic practice. Since the use of ionizing radiation involves the patient's and clinician's safety, adequate knowledge about the appropriate usage of CBCT usage should be considered as a necessity. In endodontics, CBCT is a useful tool that helps in the diagnosis of apical periodontitis, resorptions, perforations, root canal morphology, traumatic injuries, voids. This survey was conducted among dentists. Online google forms were distributed of which 307 participants took part in the survey and the questionnaire contained 19 multiple choice questions, based on the demographic data, knowledge, attitude, practice regarding usage of CBCT in endodontics. On analysing the response to the questionnaire, it was found that the participants have overall good knowledge and were well versed regarding usage CBCT for endodontic procedures. This survey provides the reader with a clearer understanding of the appropriate and unwarranted usage of CBCT for endodontic practice. CBCT can be a powerful tool for endodontic diagnosis as well as in treatment planning and follow up.

*Corresponding Author

Name: Pradeep S
Phone:
Email: pradeeps@saveetha.com

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INTRODUCTION

Cone Beam Computed Tomography, involves a transition from two dimensional to three dimensional visualisation. The quality of imaging has improved the diagnostic accuracy, with regard to patient exposure and time consumption (Durack *et al.*, 2011).

Conventional radiographic techniques show some limitations such as anatomic 3D compression (Velvart *et al.*, 2001; Giudice *et al.*, 2008), geometric alteration (Forsberg and Halse, 1994; Cicciù *et al.*, 2012), anatomic obstacles (Paurazas *et al.*, 2000; Giudice *et al.*, 2017). Ex Vivo and In Vivo studies have confirmed the two dimensional radiology presents clear limits in periapical lesion diagnosis (Jorge *et al.*, 2008; de Paula-Silva *et al.*,

2009).CBCT in endodontics not only gives a three dimensional evaluation of the region of interest but also an appropriate resolution of images that help give a detailed analysis of the tooth and the surrounding alveolar anatomy.

Success of endodontic treatment depends on the diagnosis and treatment planning. Regarding root canal therapy, a major difficulty in achieving root canal disinfection involves removal of the bacterial biofilm (Teja and Ramesh, 2019; Noor and Pradeep, 2016). Intracanal medicaments have been used to disinfect root canals between appointments and reduce interappointment pain (Manohar and Sharma, 2018). However, pain perception is a highly subjective and variable experience modulated by various physical and psychological factors (Ramamoorthi *et al.*, 2015). Success of root canal treatment requires proper knowledge of the root canal anatomy and the variations that can be seen in it (Kumar and Antony, 2018). Microorganisms have been established as the sole entity responsible for initiating pulpal and periapical pathologies (Siddique, 2019). MMPs in adult tissues tend to increase in cases of chronic inflammation and destructive bone lesions (Teja *et al.*, 2018). Efficiency of the diagnostic aids plays an important role in the treatment plan. Pulp vitality tests are the valuable diagnostic tool which aids the clinician towards the accurate diagnosis and appropriate treatment planning (Janani *et al.*, 2020). Remineralizing agents such as fluorides, Casein phosphopeptide - Amorphous calcium phosphate (CPP-ACP), xylitol, and bioactive glass can be used to reduce demineralization and enhance remineralization (Nasim and Nandakumar, 2018). CPP-ACP can be considered as the materials of choice in remineralizing early enamel carious lesions (Rajendran *et al.*, 2019). It is very important to be able to properly diagnose a case as it has a huge impact on the success of the treatment.CBCT also plays an important role in identification of cracks, and to visualize any fracture in dento alveolar segment as in case of traumatic injuries (Jose *et al.*, 2020; Rajakeerthi and Nivedhitha, 2019).CBCT has proved to be a useful tool for evaluation of root canal preparation (Ramanathan and Solete, 2015). Another important aspect of the success of endodontic therapy is the role of Coronal restoration. Composites have been preferred for coronal restoration and to prevent coronal microleakage due to their improved esthetic properties, improved adhesive capacity, modern dentin adhesives, and increased mechanical properties (Hussainy, 2018; Ravinthar and Jayalakshmi, 2018).

European Society of Endodontology suggests usage of CBCT in endodontics for periapical pathology diagnosis in the presence of contradictory signs /symptoms to confirm causes of non odontogenic pathology, maxillofacial evaluation, extremely complex root canal anatomy evaluation before endodontic treatment, evaluation of cases of endodontic failure in surgical endodontic treatment planning and evaluation /management of radicular resorption (Patel *et al.*, 2014).

CBCT can be a powerful tooth for endodontic diagnosis as well as in treatment planning and follow up. This survey aimed to evaluate the knowledge, attitude and practice of dentists in diagnosing and interpreting endodontic treatment with the help of cone beam computed tomography.

MATERIALS AND METHODS

This survey was conducted in May 2020 among dentists, including general dentists, Endodontists,and postgraduates to assess their knowledge, attitude and practice towards the usage of CBCT in endodontics. This questionnaire-based survey consisted of 19 multiple choice questions. Overall, 307 dentists took part in the survey. The questionnaire consisted of demographic details of the participants and questions related to the knowledge, awareness of interpretation of CBCT for endodontic treatment procedures. In this Questionnaire based survey, all the questions were circulated through online forms.

Statistical Analysis

The collected data was converted into excel sheets. SPSS 23.0. Chi square test was used for statistical analysis and Bar graphs were used for a pictorial representation of the results of the study.

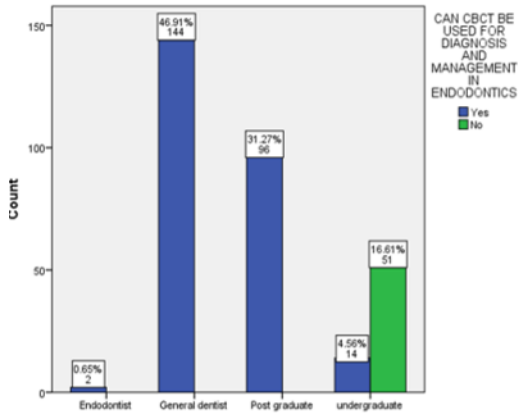
RESULTS AND DISCUSSION

Among 307 responses received from the participants who participated in the survey,55.5% consisted of females and 44.6% males. About 71% of the participants of the survey were of the age group of 20-30 years. Most of the participants were general dentists (46.9%) followed by Endodontic postgraduates (31.3%) and undergraduates (21.1%). 75% of the participants had professional experience of more than 5 years and 25% of the participants had a professional experience within 5 years (Table 1).

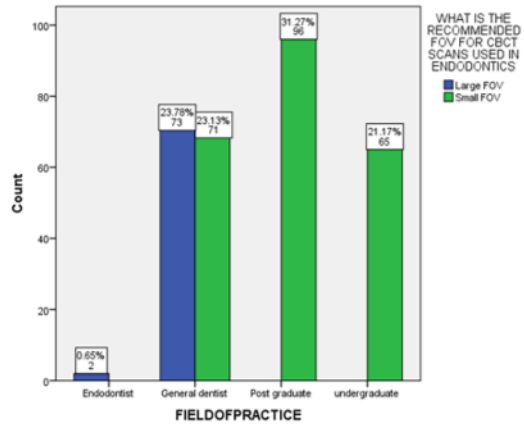
Depending on the knowledge of the participants based on the usage of CBCT in Endodontics, About 83% of the participants were aware that CBCT can be used for diagnosis and management in endodontics. Regarding the field of view, 75% of the participants recommended usage of a small field of

Table 1: Showing Demographic Data of Participants

Demographic Variables	Categories	No of Respondents	Percentage (%)
Gender	Male	137	44.5
	Female	170	55.4
	Total	307	100.00
Age (years)	20-30 years	219	71.3
	31-40 years	88	21.7
	Total	307	100.00
Field of Practice	Endodontic Post Graduates	96	31.3
	General Dentist	144	46.9
	Endodontist	2	0.7
	Undergraduate	65	21.2
	Total	307	100.00
Years of Experience	0-5 years	78	25.4
	6-10 years	228	74.3
	11-15 years	1	0.3
	Total	307	100.00



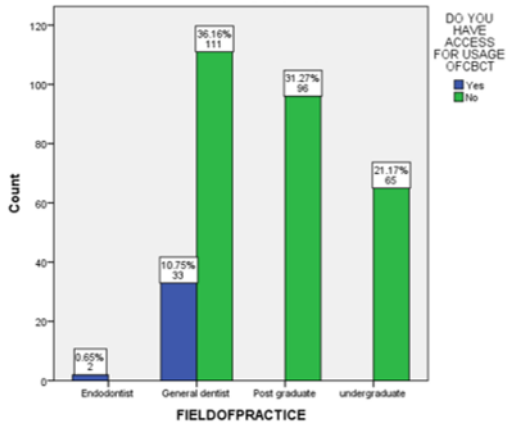
Graph 1: Highest number of responses were given by general dentists (46.9%) who agreed that CBCT can be used for diagnosis and management in endodontics



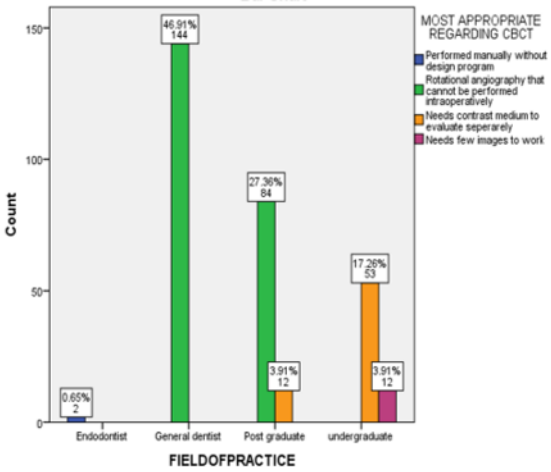
Graph 2: Highest number of responses were given by postgraduates (31.27%) who recommended the use of small field of view for CBCTscans used in endodontics

view of CBCT for diagnosis and management in Endodontics. Most of the participants of the survey did not have access to CBCT for their clinical practice (88.6%). About 74.3% of the participants had good knowledge about the general usage of CBCT. About 83% of the participants of the survey were aware that CBCT can be used for evaluation of calcified canals, missing canals, Internal and External resorption and in identifying periradicular lesions. 74% of the participants preferred usage of CBCT in endodontics, chi square test showed responses of the participants to be statistically significant ($p<0.05$) (Graphs 1, 2, 3, 4 and 5).

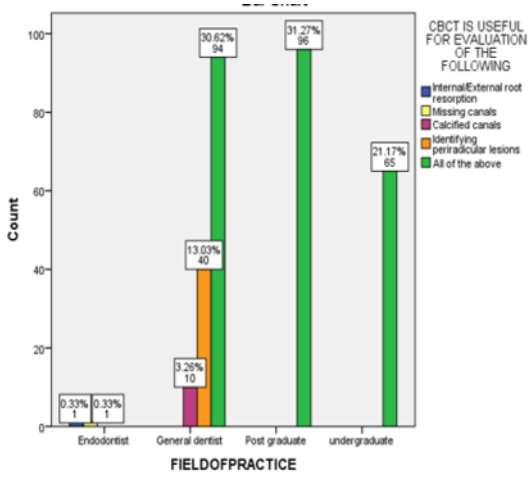
Depending on the attitude of the participants on the usage on CBCT in Endodontics,58% of the participants preferred usage of CBCT for detection of the middle mesial, second mesiobuccal canal and distolingual canals while 22% of the participants preferred usage of panoramic radiographs. Most of the participants preferred usage of CBCT for detection of maxillary sinus before periapical surgery (56%). About 23.8% of the participants preferred usage of panoramic radiographs.68% of the participants preferred usage of CBCT for diagnosis of cervical resorption. Most of the participants used a limited field of view of CBCT for their practice (56%), chi square test showed responses of the participants to be statistically significant ($p<0.05$) (Graphs 6, 7, 8, 9 and 10). The objective of this study was to analyse the skill of CBCT interpreta-



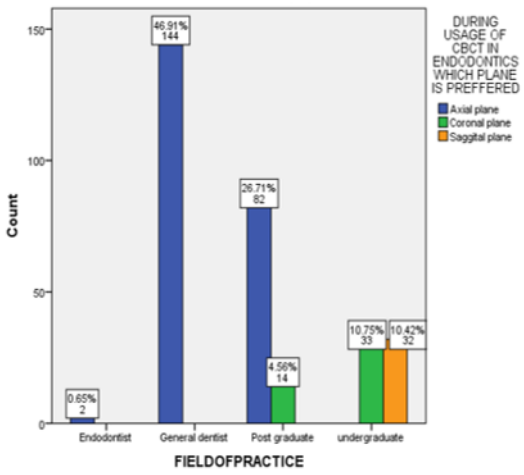
Graph 3: Highest number of responses were given by general dentists (36.16%) who did not have access for usage of CBCT Participants to the question as to whether they have access for usage of CBCT



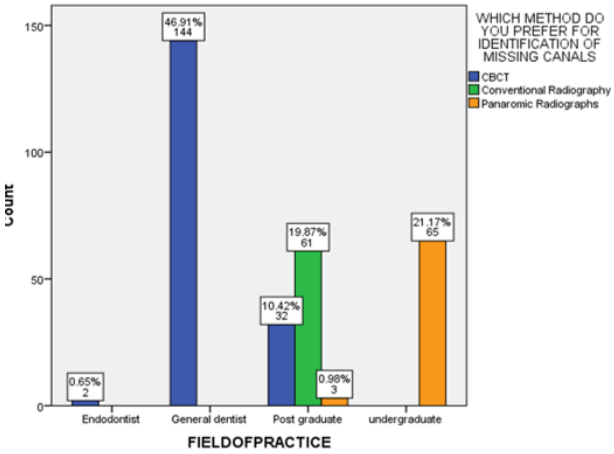
Graph 4: Highest number of responses were given by general dentists (46.9%) who agreed that CBCT cannot be performed intraoperatively



Graph 5: Highest number of responses were given by postgraduates (31.27%) who agreed CBCT is useful for evaluation



Graph 6: Highest number of responses were given by general dentists (46.9%) corresponding to the use of axial plane during usage of CBCT in endodontics



Graph 7: Highest number of responses were given by general dentists (46.9%)who agreed that CBCT is the most preferred method for identification of missing canals

tion among dentists for endodontic treatment procedures. Accurate diagnosis is of utmost importance in dental practice. Based on professional experience, it was found that about 74% of the dentists who participated in the survey had more than 5 years of professional experience (Graphs 11, 12, 13, 14 and 15). This study discusses the ability of CBCT to detect the presence of resorption, root fractures, treatment of root canal system and detection of missing canals. According to the literature review, more periapical lesions were detected before and after primary root canal treatment using CBCT compared with periapical radiography (Durack *et al.*, 2011). Previous reports showed that the size of the periapical lesion is often underestimated using periapical radiograph (Schwartz and Foster, 1971).

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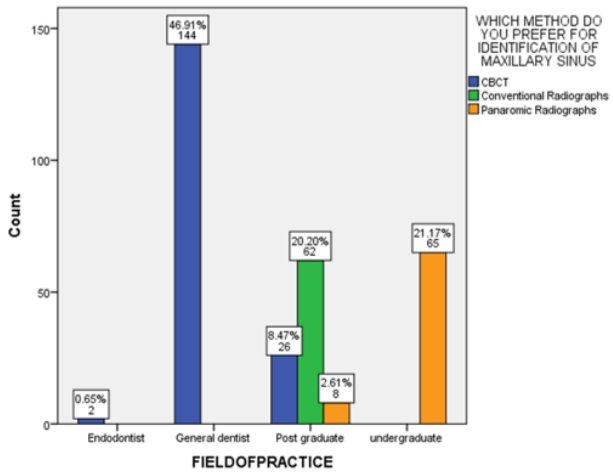
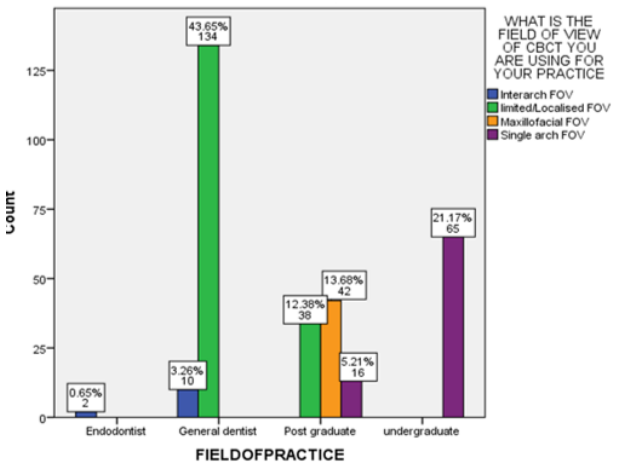
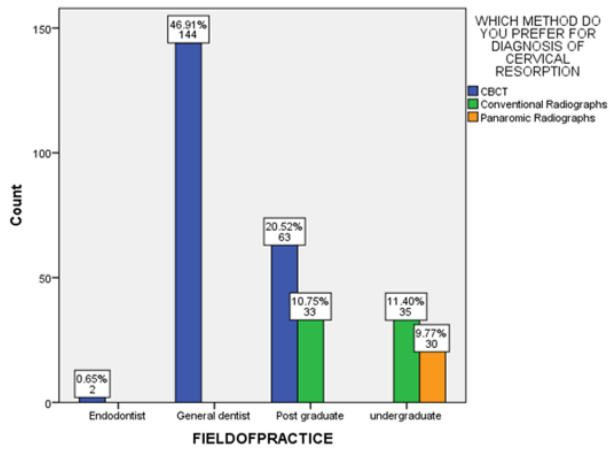


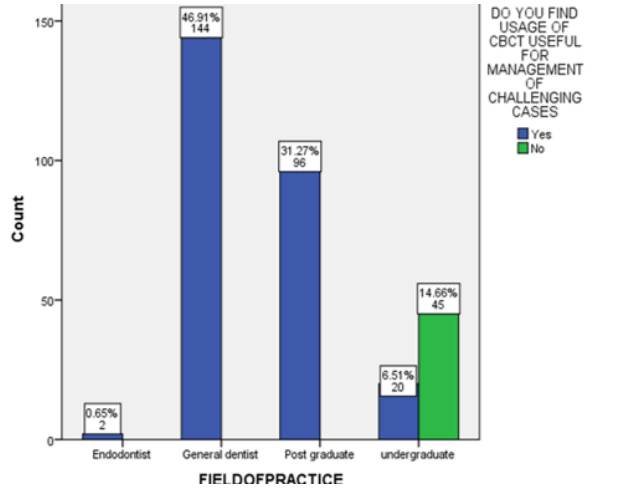
Graph 8: Highest number of responses were given by general dentists(46.9%)who agreed that CBCT is the most preferred method for identification of maxillary sinus



Graph 10: Highest number of responses were given by general dentists (43.65%)who agreed on usage of Limited/localised field of view of CBCT



Graph 9: Highest number of responses were given by general dentists (46.9%)who agreed that CBCT is the most preferred method for diagnosis of cervical resorption

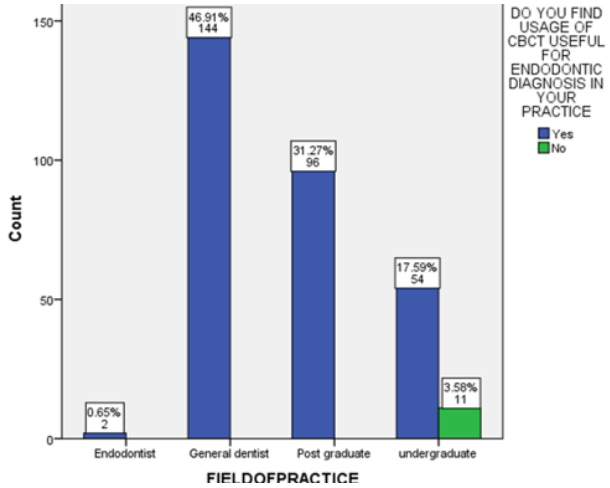


Graph 11: Highest number of responses were given by general dentists (46.9%)who agreed that CBCT is useful for management of challenging cases in endodontics

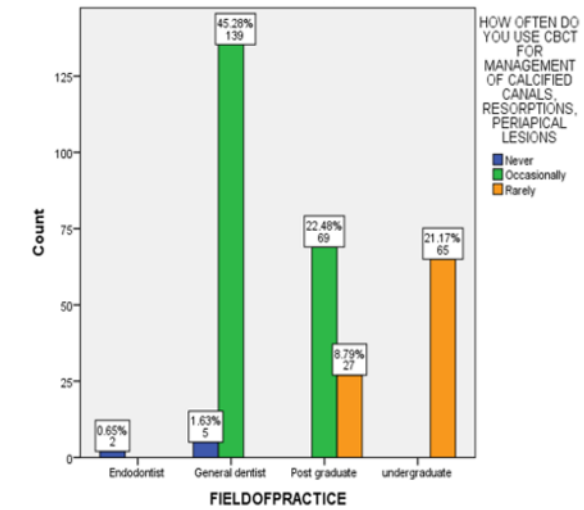
Another study compared CBCT with a panoramic radiograph and reported that usage of CBCT can lead to the detection of more periapical lesions than PAN (Estrela *et al.*, 2009).

On the assessment of tooth morphology and its complication, it was stated that CBCT accurately detected presence /absence of mesiobuccal canals compared with the gold standard of the clinical section in the presence of untreated /missed canals in intraoral periapical radiography (Abella *et al.*, 2012). In another study, Tu et al., investigated the prevalence of distolingual roots identified with periapical radiograph and CBCT showed a prevalence of 21% and 23% respectively. They concluded that multiple periapical radiographs (25-degree mesial tube shift)to CBCT is required to assess the presence of distolingual roots (Tu *et al.*, 2007; Kamburoğlu *et al.*, 2011).

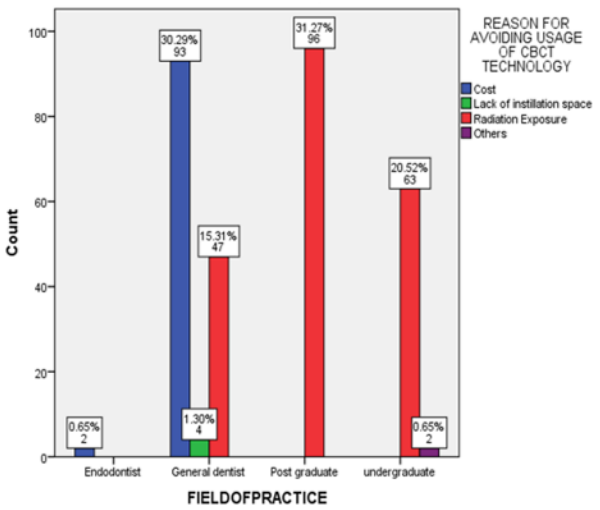
Bornstein et al. confirmed that limited CBCT imaging is a valuable diagnostic tool to evaluate anatomically certain areas like maxillary sinus before periapical surgery (Bornstein *et al.*, 2011). These findings are in agreement to the results of the survey. Upon detection of external, internal, invasive root resorption, Ex Vivo studies have reported on the superior diagnostic accuracy of CBCT over periapical radiography in the detection of simulated external resorption (Bernardes *et al.*, 2012; Eskandarloo *et al.*, 2012). This survey is in agreement with these findings. True size, location and extent of periapical lesions can be detected with the help of CBCT (Bornstein *et al.*, 2011; Ren *et al.*, 2013).



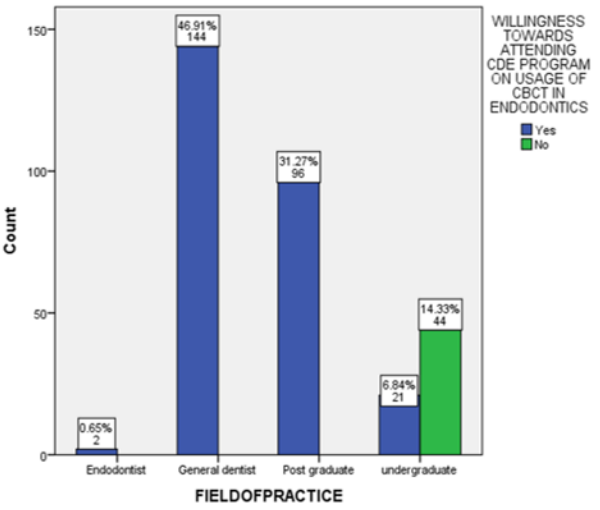
Graph 12: Highest number of responses were given by general dentists (46.9%)who agreed that CBCT is useful for management of challenging cases in endodontics



Graph 13: Highest number of responses were given by general dentists (45.28%)who agreed that CBCT is occasionally used for management of calcified canals, resorptions and periapical lesions in endodontics



Graph 14: Highest number of responses were given by postgraduates (32.27%) who agreed that usage of CBCT is avoided mainly due to radiation exposure



Graph 15: Highest number of responses were given by general dentists (46.9%)who gave the willingness to attend CDE programs based on usage of CBCT in endodontics

This survey was done to assess knowledge on CBCT technology for better diagnosis and treatment planning in endodontics.

CONCLUSION

CBCT has been proved as an essential diagnostic aid for endodontic practice. Since the use of ionizing radiation involves the patient's and clinician's safety, adequate knowledge about the appropriate usage of CBCT usage should be considered as a necessity. This survey was done to assess knowledge, attitude and practice on the usage of CBCT technology among dentists. This research showed that the majority of the participants had a good level of knowledge, attitude towards usage of CBCT and were well versed regarding usage of CBCT in endodontics. This survey provides the reader with a clearer understanding in the appropriate and unwarranted usage of CBCT for endodontic practice. With growing technology collecting all necessary records from a single low radiation CBCT scan instead of subjecting the patients to different modalities should be considered. Proper knowledge combined with appropriate use and easy cost efficient access to CBCT would benefit endodontic diagnosis and treatment planning efficiency. It is recom-

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mended that CDE programs can be conducted for dentists to increase their awareness to gain more knowledge about the indications and contraindications regarding usage of CBCT in endodontics.

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Conflict of Interest

The authors declare that they have no conflict of interest for this study.

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