

## Article

# CBCT in Pediatric Dentistry: Awareness and Knowledge of Its Correct Use in Saudi Arabia

Smita Singh Bhardwaj <sup>1</sup> , Sara Alghamdi <sup>1</sup>, Basim Almulhim <sup>1</sup>, Abdullah Alassaf <sup>1</sup>, Abdullah Almalki <sup>1</sup> , Atul Bhardwaj <sup>2,\*</sup> and Ayoub Alzunaydi <sup>3</sup>

<sup>1</sup> Department of Preventive Dental Sciences, College of Dentistry, Majmaah University, Al Majmaah 11952, Saudi Arabia; s.bhardwaj@mu.edu.sa (S.S.B.); sa.mohammed@mu.edu.sa (S.A.); b.almulhim@mu.edu.sa (B.A.); am.assaf@mu.edu.sa (A.A.); ae.almalki@mu.edu.sa (A.A.)

<sup>2</sup> Department of Prosthodontics, College of Dentistry, Majmaah University, Al Majmaah 11952, Saudi Arabia

<sup>3</sup> Al Artawiyah General Hospital, Ministry of Health, Al Artawiyah 15719, Saudi Arabia; ayoubauz@gmail.com

\* Correspondence: a.bhardwaj@mu.edu.sa

**Abstract:** CBCT (Cone-beam computed tomography) is used for diagnosis, planning of treatment, and research. However, there are doubts and opinions regarding the use of CBCT for children and in pediatric dentistry. The knowledge about using this technique for pediatric patients is not clear to the dentists and some dental situations are still debated, therefore this study was done to understand the awareness and knowledge among dental practitioners and students across Saudi Arabia. A cross-sectional and descriptive survey was done on 464 dental practitioners and students, and 21 questions were put forward to assess the knowledge and awareness. All questions were then critically analyzed individually and descriptively concluded with appropriate references. Our study revealed that still very few dental practitioners are aware about the latest advances and use of this technique in pediatric dentistry, and more awareness needs to be created.

**Keywords:** CBCT (cone-bam computed tomography); DRI (digital radiological imaging); pediatric dentistry; SEDENTEXCT guidelines; 3D imaging; MSCT (multi slice computer tomography)



**Citation:** Bhardwaj, S.S.; Alghamdi, S.; Almulhim, B.; Alassaf, A.; Almalki, A.; Bhardwaj, A.; Alzunaydi, A. CBCT in Pediatric Dentistry: Awareness and Knowledge of Its Correct Use in Saudi Arabia. *Appl. Sci.* **2022**, *12*, 335. <https://doi.org/10.3390/app12010335>

Academic Editor: Cosimo Nardi

Received: 12 October 2021

Accepted: 17 November 2021

Published: 30 December 2021

**Publisher's Note:** MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



**Copyright:** © 2021 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

## 1. Introduction

With the implementation of a new technology, cost as well as risks are considered along with the benefits of change in the imaging technique. CT (Computed tomography) was developed in the 1900s, but it was expensive and exposed the subject to a lot of radiation, and thereby it was applied only in specific conditions such as severe anomalies. With CBCT (Cone-Beam Computed Tomography) came the advantages of low-cost and low radiation exposure, and it represents the best in 3-dimensional imaging for dental application. CBCT has a vast range of uses and applications; however, its use in pediatric dentistry is still questionable [1]. The most commonly used radiographic examination for pediatric patients is dental radiographs [2]. Dental radiology is of great help in the oral examination of infants and children along with adolescents and differentially abled children. They help in diagnosing oral disease and maxillofacial defects. The main reason for doing radiographic examination in children is detecting caries, injuries of the dental and maxillofacial region, developmental tooth anomalies and other pathological conditions of the oral region. However, the risks associated with it should never be neglected. Guidelines are present to avoid unnecessary radiation exposure. DRI (Digital radiological imaging) reduces the radiation dosage because less exposure time is required to obtain the image [3]. CBCT has also been used to analyze resorption related to an unerupted tooth and determine bony pathoses [4]. CBCT gives a very high diagnostic quality. It uses volumetric tomography and gives a 3-dimensional image. It gives a higher radiation exposure to patients than the traditional techniques, but the exposure is less than CT medical tomography. The advantage of CBCT is that it gives more information and more correct evaluation [5]. CBCT

typically has a radiation exposure of greater than that used for conventional radiographs. This is of concern in children. This has increased efforts on dose adjustment and justifying the use of CBCT in the pediatric field [6,7]. CBCT needs only a single scan for capturing the data, thus the time required is less (less than 30 sec) when compared to the conventional CT [8]. There has been a rapid increase in the number of children getting dental treatment in the past decade. Up until a few years back, IOPAR (periapical radiographs) and OPG (panoramic radiographs) were generally used for the diagnosis of dental problems. These techniques created a 2D representation that was difficult to use for diagnoses as well as treatment planning. Thus, 3D modalities were introduced which have been used popularly in dentistry, but many skeptics of its application in children remain [9]. This study was done with the assumption that dental practitioners as well as students still have a lot of doubts on the use of CBCT for children, as very few pediatric cases are being referred for CBCT.

## 2. Materials and Methods

This observational, cross-sectional study was done in Saudi Arabia by using a questionnaire along with a consent form attached to it. This study has been done in accordance with the World Medical Association Declaration of Helsinki. At a 95 percent confidence interval, 5 percent margin of error, and taking a prevalence of 50 percent and finite population of 100,000, the sample size was estimated to be 383. Taking a 20 percent dropout rate, the total sample size was increased to 464. A pilot study that included 50 questionnaires was distributed to dental practitioners via WhatsApp before the main study to assess the validity of the questions. Moreover, after testing the questionnaire for its validity and applicability, it was then sent to the dental practitioners and dental students within the age group of 18 to 60 years by WhatsApp and e-mail after obtaining ethical approval from the Institutional Review Board of Majmaah University for Research Ethics committee (MUREC) (HA-01-R-088) MUREC-Nov.11/COM-2021/11-3. After the participants gave consent, they responded to a set of 21 questions. The data collection was done from 464 dentists of Saudi Arabia from May 2021 to August 2021. The data for the present study were analyzed using the SPSS statistical software Version 19.0. The descriptive statistics included mean, standard deviation and frequency. The level of significance for the present study was fixed at 5%. Chi Square test was used for the inferential statistics.

## 3. Results

The knowledge regarding CBCT was assessed by a set of questions (Q1 to Q16) with options No, Yes and Don't know (Table 1).

**Table 1.** Knowledge regarding CBCT.

|     | Questions                                                           | No          | Yes         | Don't Know/Maybe | p Value | Significance |
|-----|---------------------------------------------------------------------|-------------|-------------|------------------|---------|--------------|
| (1) | Do you have knowledge about the use of CBCT                         | 271 (58.4%) | 193 (41.6%) |                  | 0.001   | Significant  |
| (2) | Do you believe CBCT is safe to be used in children                  | 237 (51.1%) | 117 (25.2%) | 110 (23.7%)      | 0.001   | Significant  |
| (3) | Should we use CBCT on all the children visiting a pediatric clinic? | 356 (76.8%) | 74 (15.9%)  | 34 (7.3%)        | 0.001   | Significant  |
| (4) | Have you referred pediatric patients in the last 1 year for CBCT ?  | 310 (66.8%) | 154 (33.2%) |                  | 0.001   | Significant  |

Table 1. Cont.

|      | Questions                                                                                                                                                      | No           | Yes          | Don't Know/Maybe | p Value | Significance |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------------|------------------|---------|--------------|
| (5)  | Are you aware that the time required for CBCT scanning is less than conventional CT ?                                                                          | 152 (32.80%) | 302 (65.10%) | 10 (2.20%)       | 0.001   | Significant  |
| (6)  | Are you aware that CBCT can be used to detect dental infections or abscesses at an earlier stage as compared to the periapical radiographs                     | 97 (20.9%)   | 178 (38.4%)  | 189 (40.7%)      | 0.001   | Significant  |
| (7)  | Is CBCT a better diagnostic aid than radiographs and RVG for detecting supernumerary teeth in children?                                                        | 87 (18.8%)   | 186 (40.1%)  | 191 (41.2%)      | 0.001   | Significant  |
| (8)  | Are you aware that CBCT can be used in pediatric patients having malocclusions and craniofacial anomalies?                                                     | 28 (6%)      | 192 (41.4%)  | 244 (52.6%)      | 0.001   | Significant  |
| (9)  | Are you aware that CBCT can be used for detecting salivary stones?                                                                                             | 13 (2.8%)    | 227 (48.9%)  | 224 (48.3%)      | 0.001   | Significant  |
| (10) | Are you aware that CBCT can be used in pediatric patients having cleft lip and palate?                                                                         | 81 (17.5%)   | 196 (42.2%)  | 187 (40.3%)      | 0.001   | Significant  |
| (11) | Are you aware that CBCT can be used in pediatric patients for correct determination of the position of the un erupted teeth, especially for maxillary canines? | 63 (13.6)    | 168 (36.2%)  | 233 (50.2%)      | 0.001   | Significant  |
| (12) | Do you know about SEDENTEXCT international guidelines used for CBCT?                                                                                           | 355 (76.5)   | 109 (23.5%)  |                  | 0.001   | Significant  |
| (13) | Do you believe that CBCT should be preferred for 3D imaging in dentistry?                                                                                      | 107 (23.1%)  | 206 (44.4%)  | 151 (32.5%)      | 0.001   | Significant  |
| (14) | Should CBCT be used before planning to give dental implant in our young patients?                                                                              | 21 (4.5%)    | 218 (47.0%)  | 225 (48.5%)      | 0.001   | Significant  |
| (15) | Do you know about MSCT (multislice computer tomography)?                                                                                                       | 348 (75.0%)  | 116 (25.0%)  |                  | 0.001   | Significant  |
| (16) | Do you believe that you should get a CBCT machine in your clinic/hospital?                                                                                     | 33 (7.1%)    | 203 (43.8%)  | 228 (49.1%)      | 0.001   | Significant  |

The choice of diagnostic method by the dentists was analyzed by (Q17–21; Table 2).

**Table 2.** Choice of diagnostic methods.

| Questions                                                                                              | IOPAR/Lat Ceph | OPG         | CT          | CBCT        | All        | p Value     |
|--------------------------------------------------------------------------------------------------------|----------------|-------------|-------------|-------------|------------|-------------|
| (17) Which of the following technique will you prefer for analyzing root resorption and root fracture? | 143 (30.8%)    | 86 (18.5%)  | 47(10.10%)  | 121 (26.1%) | 67(14.40%) | 0.001 (Sig) |
| (18) Which of the following technique is best for analyzing dental trauma                              | 155 (33.4%)    | 107 (23.1%) | 30 (6.5%)   | 141 (30.4%) | 31 (6.7%)  | 0.001 (Sig) |
| (19) Which technique is the best for analyzing the Periodontal status                                  | 147 (31.7%)    | 51(11.0%)   | 68 (14.7%)  | 131 (28.2%) | 67 (14.4%) | 0.001 (Sig) |
| Question                                                                                               | Lateral Ceph   | OPG         | CT          | CBCT        |            |             |
| (20) Which technique should be used for analyzing the airway space                                     | 142 (30.6%)    | 127 (27.4%) | 34 (7.3%)   | 132 (28.4%) | 29 (6.2%)  | 0.001 (Sig) |
| Question                                                                                               | MSCT           | CT          | CBCT        | All         |            |             |
| (21) Which technique has the least radiation exposure?                                                 | 110 (23.7%)    | 81 (17.5%)  | 179 (38.6%) | 94 (20.3%)  |            | 0.001 (Sig) |

Mean Knowledge score regarding CBCT was calibrated (Table 3).

In the present study, knowledge and attitude of the subjects regarding the use of CBCT was assessed. Over two-fifths (41.6%) of the study's subjects had knowledge about the use of CBCT. Only 25.2% believed CBCT to be safe for use in children, 76.8% did not recommend the use of CBCT for all the children visiting pediatric clinic and 66.8% had recommended no pediatric patients for CBCT in the last year. However, 65.10% were aware that the time required for CBCT scanning is less than conventional CT, 38.4% were aware that CBCT can be used to detect dental infections or abscesses at an earlier stage as compared to the periapical radiographs, 40.1% were of view that CBCT a better diagnostic aid than radiographs and RVG for detecting supernumerary teeth in children, 41.4% were aware that CBCT can be used in pediatric patients having malocclusions and craniofacial anomalies, 48.9% were aware that CBCT can be used for detecting salivary stones, 42.20% were aware that CBCT can be used in pediatric patients having cleft lip and palate, 48.9% were aware that CBCT can be used in pediatric patients for correct determination of the position of the un erupted teeth, especially for maxillary canines, 76.5% did not know about the about SEDENTEXCT international guidelines used for CBCT and 44.4% believed that CBCT should be preferred for 3D imaging in dentistry.

Only 26.1% preferred CBCT for analyzing root resorption and root fracture, whereas 30.8% still believed in the use of IOPAR. Only 30.4% believed that the CBCT technique is best for analyzing dental trauma, and 30.6% believed lateral CEPH to be best for analyzing airway space. Only 28.2% believed CBCT to be best for analyzing the periodontal status, whereas 31.7% still believed in the use of IOPAR

**Table 3.** Mean Knowledge score regarding CBCT.

|                                                                                                                                                                     | Minimum | Maximum | Mean   | Std. Deviation |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|---------|--------|----------------|
| (1) Do you have knowledge about the use of CBCT                                                                                                                     | 0.00    | 1.00    | 0.4159 | 0.493          |
| (2) Do you believe CBCT is safe to be used in children                                                                                                              | 0.00    | 1.00    | 0.3305 | 0.471          |
| (3) Should we use CBCT on all the children visiting a pediatric clinic?                                                                                             | 0.00    | 1.00    | 0.1721 | 0.377          |
| (4) Have you referred pediatric patients in the last 1 year for CBCT?                                                                                               | 0.00    | 1.00    | 0.3319 | 0.471          |
| (5) Are you aware that the time required for CBCT scanning is less than conventional CT?                                                                            | 0.00    | 1.00    | 0.6652 | 0.472          |
| (6) Are you aware that CBCT can be used to detect dental infections or abscesses at an earlier stage as compared to the periapical radiographs                      | 0.00    | 1.00    | 0.6473 | 0.478          |
| (7) Is CBCT a better diagnostic aid than radiographs and RVG for detecting supernumerary teeth in children?                                                         | 0.00    | 1.00    | 0.6813 | 0.466          |
| (8) Are you aware that CBCT can be used in pediatric patients having malocclusions and craniofacial anomalies?                                                      | 0.00    | 1.00    | 0.8727 | 0.334          |
| (9) Are you aware that CBCT can be used for detecting salivary stones?                                                                                              | 0.00    | 1.00    | 0.9458 | 0.226          |
| (10) Are you aware that CBCT can be used in pediatric patients having cleft lip and palate?                                                                         | 0.00    | 1.00    | 0.7076 | 0.455          |
| (11) Are you aware that CBCT can be used in pediatric patients for correct determination of the position of the un erupted teeth, especially for maxillary canines? | 0.00    | 1.00    | 0.7273 | 0.446          |
| (12) Do you know about SEDENTEXCT international guidelines used for CBCT?                                                                                           | 0.00    | 1.00    | 0.2349 | 0.424          |
| (13) Do you believe that CBCT should be preferred for 3D imaging in dentistry?                                                                                      | 0.00    | 1.00    | 0.6581 | 0.475          |
| (14) Should CBCT be used before planning to give dental implant in our young patients?                                                                              | 0.00    | 1.00    | 0.9121 | 0.283          |
| (15) Do you know about MSCT (multislice computer tomography)?                                                                                                       | 0.00    | 1.00    | 0.2500 | 0.433          |
| (16) Do you believe that you should get a CBCT machine in your clinic/hospital?                                                                                     | 0.00    | 1.00    | 0.8602 | 0.347          |

#### 4. Discussion

Studies have measured radiation doses of CBCT for patients. It was observed that by changing the field of view (FOV), tube voltage (kV) and tube current (mA) that the radiation dose that is delivered can be changed. [5] The main advantage of the use of CBCT in children is that it has less scanning time, reduced dosage and is less complicated, decreasing anxiety. Images obtained are highly magnified along with less distortion. CBCT has higher radiation exposure compared to IOPAR, however the dose reduction is less and in between 96% and 51% as compared with conventional CT [10]. Excess radiation exposure is not good in children due to the rapid growth of tissues and the associated higher chance of DNA (deoxyribonucleic acid) damage [11]. CBCT has better diagnostic

value than CT [12]. In our study, the majority of dentists were aware that the time required for CBCT scanning is less than conventional CT.

For children, a dentist should not expose them to unwanted radiation. Earning money should never be the reason for exposing children to radiation. They should follow three principles: Number one is the “justification principle”, and according to it, radiographs should be indicated only when there is no way left of getting the relevant information. If the patient is unable to cooperate, radiographs should not be taken. Second is the “limitation principle”, which states that the dentists’ should follow the ALARA principle and keep the radiation dose as low as reasonably achievable. The third principle is “optimization principle”, and according to it, the dentist should try to achieve the best radiographic images using the above two principles [13,14]. Reduction in the radiation dose for CBCT can be obtained while taking a good quality image. The reduction in the FOV (Field of view) is the most effective way for dose reduction and is a significant way of optimization [15]. According to SEDENTEXCT guidelines, it is difficult to differentiate between the harmful and safe radiation exposure due to the various uncertainties which are related to stochastic effects [16]. Various studies have been done in this field, e.g., Van Acker JWG et al. observed that majority of patients were referred for CBCT for trauma in children of 12 years. 14% of CBCT were done for dento-alveolar trauma, while 18% were done for other reasons, 40% for developing dentition related reasons, 10% related to endodontics, 1% for periodontic reason, 16% for surgical reasons and 1% for TMJ [17]. Fifty patients at a London hospital in a Pediatric Dentistry department were assessed and 94% compliance was seen with SEDENTEXCT guidelines. After training its staff for CBCT, the compliance increased up to 100%. Forty-four percent of the treatment plans were modified due to the new information given by CBCT [18]. In our study, most of the dentists did not know about the about SEDENTEXCT international guidelines used for CBCT. Therefore, we need to conduct seminars, workshops and discuss this in conferences to make dentists aware of it. Abdelgawad F et al. determined the accuracy of low-dose CBCT in localization of impacted supernumerary teeth and observed that there was an improvement in the surgery while removing supernumerary teeth [19]. Gümrü B et al. evaluated 149 CBCT scans that were taken from children below 14 years, representing 5% of all scans. Most of the referrals were from the Department of Paediatric Dentistry. The most common region of interest for CBCT was the maxillary canine region (85.55%). The most common indication of CBCT was impacted teeth (41.4%) and by bone pathology (31%) along with dental anomalies (29.6%) as well as 11.6% of the patients for orofacial clefts and syndromes [20]. De Grauwe A et al. did a systematic review and stated that CBCT is a good choice for diagnosis in cleft lip/palate due to its on its lower exposure of radiation and shorter duration [16]. In our study, only a few dentists were aware that CBCT can be used to detect dental infections or abscesses at an earlier stage, for detecting supernumerary teeth and cleft lip and palate in children. Gallichan N et al. conducted a retrospective analysis of CBCTs done over 4 years in three dental hospitals in England; 335 CBCT examinations were done and the mean age was 11 years. The main reason for doing CBCT examinations was to analyze the developing dentition. The use of CBCT was justified in 100% of cases [21]. In the present study, fewer dentists knew that CBCT can be used in pediatric patients having malocclusions and craniofacial anomalies. ISMAN O et al. investigated the CBCT indications and dento-maxillofacial pathologies in children. CBCT was most commonly done for malocclusion and dentofacial anomalies in the primary as well as in permanent dentition, while impacted teeth in the mixed dentition [22]. In our study, dentists did not have sufficient knowledge about the use of CBCT in pediatric dentistry, and only few believed that it is safe to be used in children. Therefore, more awareness needs to be spread among the dentists regarding its use in pediatric dentistry. Henein C et al. observed 52 CBCTs and said that they were mostly done for the localization of impacted teeth (27%), supernumerary teeth (23%), and to analyze root resorption (17%). CBCTs helped in treatment planning, diagnosis, and management, and 31% of treatment plans were modified based on the findings [23]. Jianru Yi et al. observed that CBCT has a good diagnostic value for identifying root resorption

as compared to periapical radiographs [24]. In the present study, few dentists preferred CBCT for analyzing root resorption and root fracture and a lesser percentage only believed that CBCT technique is best for analyzing dental trauma and for analyzing the Periodontal status. CBCT is very good in identifying periapical disease [25]. In the present study, not many dentists were aware that CBCT can be used to detect dental infections or abscesses at an earlier stage as compared to the periapical radiographs. Furthermore, CBCT is good in upper airway evaluation [26]. However, few dental practitioners had the knowledge of its application in this field. CBCT has an excellent role in diagnosing periodontal defects [27]. In our study, few dentists had this knowledge.

Just like all radiographic techniques, CBCT should also be used by dentists after reviewing the child's medical condition and previous history of radiographic exposure as well as a thorough examination. Dentists should consider CBCT application only when it benefits the patient or improve the clinical outcome [28]. It is essential to have a thorough understanding of the principles of CBCT imaging to get the complete benefit of the technique as it has multiple applications in pediatric dentistry along with minimizing the risk related to the radiation exposure [29].

The limitation of this study is that the study sample for the present study was limited to dentists of Saudi Arabia. In future studies, a study comparing two different countries with a larger sample size can be done. Furthermore, the identity of the participants was kept confidential in the present study. For future studies, a comparison can be done with the same concept among the pediatric dentists and the general dental practitioners.

## 5. Conclusions

In the present study, it was found that only 41.6% of the study's subjects had complete knowledge about the use of CBCT. The majority of the subjects did not recommend the use of the CBCT for their pediatric patients. Less than 50 percent of the dentist believed the use of the CBCT is best for analyzing salivary stones, periapical infections, malocclusions, supernumerary teeth, cleft lip, and cleft palate or for the correct determination of the position of the unerupted teeth, especially for maxillary canines. A greater percentage dentists believed in the use of IOPAR for analyzing root resorption, root fracture, dental trauma, and periodontal infection.

**Author Contributions:** Conceptualization, methodology—S.S.B.; software validation, formal analysis, investigation—A.B.; resources, data curation—A.A. (Abdullah Allassaf); writing—original draft preparation—A.A. (Abdullah Almalki); writing—review and editing—A.A. (Ayoub Alzunaydi); visualization, supervision, project administration—B.A.; funding acquisition—S.A. All authors have read and agreed to the published version of the manuscript.

**Funding:** This research received no external funding.

**Institutional Review Board Statement:** The study was conducted according to the guidelines of the Declaration of Helsinki and approved by the Institutional Review Board of the Majmaah University for Research Ethics committee (MUREC) (HA-01-R-088) MUREC-Nov.11/COM-2021/11-3.

**Informed Consent Statement:** Informed consent was obtained from all subjects involved in the study.

**Data Availability Statement:** The data presented in this study is available on request from the corresponding author. The data is not publicly available due to ethical issues.

**Acknowledgments:** The authors would like to thank the Deanship of Scientific Research at Majmaah university for supporting this work under Project Number: R-2021-310.

**Conflicts of Interest:** The authors declare no conflict of interest.

## References

1. Sugumaran, S.; George, A.M.; Kumar, S.A.; Sundari, K.K.; Chandrasekar, S.; Rajagopal, R. Knowledge, awareness, and practice of cone-beam computed tomography among orthodontists: A survey. *J. Indian Orthod. Soc.* **2018**, *52*, 255–264. [[CrossRef](#)]
2. White, S.C. Radiation exposure in pediatric dentistry: Current standards in pedodontic radiology with suggestions for alternatives. *Pediatric Dent.* **1982**, *3*, 441–447.

3. Giray, F.E.; Peker, S.; Yalcinkaya, S.E.; Kargul, B.; Aps, J. Attitudes and knowledge of paediatric dentists' on digital radiography and cone beam computed tomography. *J. Pak. Med. Assoc.* **2019**, *69*, 205–210.
4. Yepes, J.F.; Booe, M.R.; Sanders, B.J.; Jones, J.E.; Ehrlich, Y.; Ludlow, J.B.; Johnson, B. Pediatric Phantom Dosimetry of Kodak 9000 Cone-beam Computed Tomography. *Pediatric Dent.* **2017**, *39*, 229–232.
5. Hajem, S.; Brogårdh-Roth, S.; Nilsson, M.; Halme, K.H. CBCT of Swedish children and adolescents at an oral and maxillofacial radiology department. A survey of requests and indications. *Acta Odontol. Scand.* **2020**, *78*, 38–44. [\[CrossRef\]](#)
6. Horner, K.; Barry, S.; Dave, M.; Dixon, C.; Littlewood, A.; Pang, C.L.; Sengupta, A.; Srinivasan, V. Diagnostic efficacy of cone beam computed tomography in paediatric dentistry: A systematic review. *Eur. Arch. Paediatr. Dent.* **2020**, *21*, 407–426. [\[CrossRef\]](#)
7. Dief, S.; Veitz-Keenan, A.; Amintavakoli, N.; McGowan, R. A systematic review on incidental findings in cone beam computed tomography (CBCT) scans. *Dentomaxillofac. Radiol.* **2019**, *48*, 20180396. [\[CrossRef\]](#)
8. Ramakrishnan, M.; Sarbeen, I. Recent advances in dental radiography for pediatric patients: An unstructured review. *Drug Invent. Today* **2018**, *10*, 3502–3507.
9. Jayajanani, S.; Jeevanandan, G.; Jayashri, P. Cone beam computed tomography in pediatric dentistry. *Drug Invent. Today* **2019**, *12*, 5–8.
10. Padmanabhan, S.; Venkateswaran, S. Image gently: A three-dimensional view of cone-beam computed tomography. *J. Indian Orthod. Soc.* **2016**, *50*, 1–2. [\[CrossRef\]](#)
11. Dhillon, J.K.; Kalra, G. Applications of cone beam computed tomography in pediatric dentistry. *J. Pediatr. Dent.* **2013**, *1*, 27–31. [\[CrossRef\]](#)
12. Yang, T.W.; Lin, Y.Y.; Hsu, S.C.; Chu, K.C.W.; Hsiao, C.W.; Hsu, C.W.; Bai, C.H.; Chang, C.K.; Hsu, Y.P. Diagnostic performance of cone-beam computed tomography for scaphoid fractures: A systematic review and diagnostic meta-analysis. *Sci. Rep.* **2021**, *11*, 2587. [\[CrossRef\]](#)
13. Aps, J.K.M. Cone beam computed tomography in paediatric dentistry: Overview of recent literature. *Eur. Arch. Paediatr. Dent.* **2013**, *14*, 131–140. [\[CrossRef\]](#)
14. Hayashi, T.; Arai, Y.; Chikui, T.; Hayashi-Sakai, S.; Honda, K.; Indo, H.; Kawai, T.; Kobayashi, K.; Murakami, S.; Nagasawa, M.; et al. Clinical guidelines for dental cone-beam computed tomography. *Oral Radiol.* **2018**, *34*, 89–104. [\[CrossRef\]](#)
15. Oenning, A.C.; Pauwels, R.; Stratis, A.; Vasconcelos, K.D.F.; Tijssens, E.; De Grauwe, A.; Jacobs, R.; Salmon, B. Halve the dose while maintaining image quality in paediatric Cone Beam CT. *Sci. Rep.* **2019**, *9*, 5521. [\[CrossRef\]](#)
16. Grauwe, A.D.; Ayaz, I.; Shujaat, S.; Dimitrov, S.; Gbadegbegnon, L.; Vande Vannet, B.; Jacobs, R. CBCT in orthodontics: A systematic review on justification of CBCT in a paediatric population prior to orthodontic treatment. *Eur. J. Orthod.* **2019**, *41*, 381–389. [\[CrossRef\]](#)
17. Van Acker, J.W.; Martens, L.C.; Aps, J.K. Cone-beam computed tomography in pediatric dentistry, a retrospective observational study. *Clin. Oral Investig.* **2015**, *20*, 1003–1010. [\[CrossRef\]](#)
18. Mizban, L.; El-Belihy, M.; Vaidyanathan, M.; Brown, J. An audit and service evaluation of the use of cone beam computed tomography (CBCT) in a paediatric dentistry department. *Dentomaxillofac. Radiol.* **2019**, *48*, 20180393. [\[CrossRef\]](#)
19. Abdelgawad, F.; Wassef, N.M.; Abd Alsamad, A. Low-Dose cbct for localization of impacted supernumerary teeth in children. *Egypt. Dent. J.* **2020**, *66*, 51–56. [\[CrossRef\]](#)
20. Gümrü, B.; Guldali, M.; Tarcin, B.; Idman, E.; Peker, S. Evaluation of cone beam computed tomography referral profile: Retrospective study in a Turkish paediatric subpopulation. *Eur. J. Paediatr. Dent.* **2021**, *22*, 66–70.
21. Gallichan, N.; Albadri, S.; Dixon, C.; Jorgenson, K. Trends in CBCT current practice within three UK paediatric dental departments. *Eur. Arch. Paediatr. Dent.* **2020**, *21*, 537–542. [\[CrossRef\]](#)
22. İşman, Ö.; Yılmaz, H.H.; Aktan, A.M.; Yılmaz, B. Indications for cone beam computed tomography in children and young patients in a Turkish subpopulation. *Int. J. Paediatr. Dent.* **2017**, *27*, 183–190. [\[CrossRef\]](#)
23. Henein, C.; Bhatia, S.K.; Drage, N. The Use of Cone Beam Computed Tomographic Imaging in a Paediatric Dentistry Department. *Oral* **2021**, *1*, 45–55. [\[CrossRef\]](#)
24. Yi, J.; Sun, Y.; Li, Y.; Li, C.; Li, X.; Zhao, Z. Cone-beam computed tomography versus periapical radiograph for diagnosing external root resorption: A systematic review and meta-analysis. *Angle Orthod.* **2017**, *87*, 328–337. [\[CrossRef\]](#)
25. Li, J.Y.; Lim, A.J.Z.; Lum, S.H.B.; Saion, M.A.M.; Mei, L. Clinical Applications of Cone-Beam Computed Tomography in Endodontics: A Systematic Review. *J. Dent. App.* **2014**, *1*, 16–20.
26. Guijarro-Martinez, R.; Hernandez-Alfaro, F.; Swennen, G.; Mareque-Bueno, J. Upper airway evaluation using cone-beam computerized tomography (CBCT): Systematic review and results after mono and bimaxillary advancement. *Int. J. Oral Maxillofac. Surg.* **2011**, *40*, e12. [\[CrossRef\]](#)
27. Assiri, H.; Dawasaz, A.A.; Alahmari, A.; Asiri, Z. Cone beam computed tomography (CBCT) in periodontal diseases: A Systematic review based on the efficacy model. *BMC Oral Health* **2020**, *20*, 191. [\[CrossRef\]](#)
28. American Dental Association Council on Scientific Affairs. The use of cone-beam computed tomography in dentistry. An advisory statement from the American Dental Association Council on Scientific Affairs. *J. Am. Dent. Assoc.* **2012**, *143*, 899–902.
29. Mehta, V.; Ahmad, N. Cone beamed computed tomography in pediatric dentistry: Concepts revisited. *J. Oral Biol. Craniofac. Res.* **2020**, *10*, 210–211. [\[CrossRef\]](#)