

Analyzing the Frequency of Dental Anomalies in the Adult Population of Baghdad City by the Use of CBCT

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Abstract

Objective: This study aimed to investigate the prevalence of several dental anomalies in the Iraqi population and compare those variables using CBCT between genders and jaw locations.

Methods: A cohort of 152 Iraqi adults (84 females, 68 males) over the age of 18 referred to CBCT scans for various dental procedures used to investigate dental anomalies related to position, shape, number, and size.

Results: Out of the total sample size of 152 individuals, 55 had dental anomalies. Among these anomalies, females accounted for a larger percentage (50.8%) compared to males (49.2%). The maxilla was the most common location for jaw anomalies, accounting for 51.6% of cases. The study revealed that disturbances in tooth shape accounted for 48.1% of the specific anomalies discovered. Among these shape anomalies, dilaceration was the most prevalent subtype, accounting for 39.3% of the cases. The second most prevalent anomaly (24.6%) was impaction.

Conclusion: Dental abnormalities are quite widespread, with dilaceration being the most prevalent aberration that affects the morphology of teeth. Females exhibit a greater proportion of dental abnormalities. The investigation of dental anomalies is particularly important, especially before orthodontic and surgical procedures.

Keywords: Dental anomalies, Dilaceration, Impaction, CBCT.

Introduction

Traditional radiography renders a three-dimensional structure in two dimensions. The advent of cone-beam computed tomography (CBCT), which is designed specifically for imaging the maxillofacial region, has enabled three-dimensional visualization of a given area. On account of its capability to visualize three-dimensional tooth morphology, CBCT is recommended for the detection of all dental anomalies^(1,2).

Dental anomalies (DAs) encompass any variations in the morphology, dimensions, number, and positioning of the teeth⁽³⁾. Studies have indicated that the occurrence of DAs ranges

from 5.14% to 56.9% among different populations^(4,5). Tooth abnormalities may increase the patient's susceptibility to functional and aesthetic issues, or they may lead to malocclusion or other oral disorders that can complicate the patient's treatment⁽⁶⁾. While DAs are uncommon, they are more prevalent in the maxilla than in the mandible and the permanent dentition compared to the primary dentition. The same patient may exhibit it once or multiple times. Certain instances may go unnoticed by the patient, but DAs have the potential to induce significant complications and complicate the application of treatment⁽⁷⁻⁹⁾.



Dentists should therefore possess adequate knowledge regarding DAs^(10,11).

Aside from unique genetic variables, several environmental influences during the prenatal or postnatal period can contribute to the formation of certain abnormalities. During the initiation and morphogenetic stages of dental development, there can be variations in the number, form, and size of teeth. Furthermore, abnormalities in the eruption pattern of permanent teeth can lead to ectopic eruptions, as well as tooth rotation and impaction^(12,13). Early detection of developmental dental anomalies is very important for planning therapy, managing patients properly, and avoiding future clinical problems. This is shown by many studies from different populations that show different rates of occurrence^(9,14).

Researchers have conducted numerous investigations using panoramic radiographs (PR) to examine the prevalence of dental anomalies in various regions of Iraq. Najm et al.⁽¹⁵⁾ conducted a study in Baghdad where they observed a prevalence rate of 8.3% for DAs, ascertained via PR analysis. In a separate study in Erbil, Rahman et al.⁽¹⁶⁾ reported a prevalence rate of 15.06% for DAs using the same imaging technique. According to Abdalrahim, the prevalence of DAs identified through PR was 26.6% among the Kurdish subpopulation in Sulaimani⁽¹⁷⁾. To the best of our knowledge, this research represents the initial application of CBCT in Iraq to examine the frequency of dental anomalies. This study aimed to investigate the prevalence of several dental anomalies in the Iraqi population and compare those variables using CBCT between genders and jaw locations.

Methods

A total of 152 patients, 68 males and 84 females, who were at least 18 years old and referred to radiology departments at the "Specialized Center of Dentistry in Al-Sadar City from January 2024 to March 2024", for various dental procedures, had their CBCT images included in the study. The images were captured using "Kodak 9500, Care Stream, France; 10.8 s exposure time;

10 mA; 90 KV; voxel size of 300 μ m; FOV 8 \times 10 cm". They underwent an examination by an experienced radiologist. The inclusion criteria for this study encompassed adequate quality of radiographic images and a minimal age of 26 years for 3rd molar impaction and 18 years for other anomalies. I deemed all systemic conditions that could impact dental structures as exclusion criteria, and I exclusively incorporated radiographic data from patients who provided informed consent.

The CBCT images scanned and classified the anomalies based on their distribution, which included the jaw bone, gender, teeth, and anomaly type. Further classified the types of anomalies into four categories: (1) position, such as transposition, impaction, and ectopic (with and without rotation). (2) shape, like fusion, supernumerary root, hypercementosis, and dilaceration; (3) number, like hypodontia and hyperdontia; and (4) size, like macrodontia and microdontia (Figure 1).

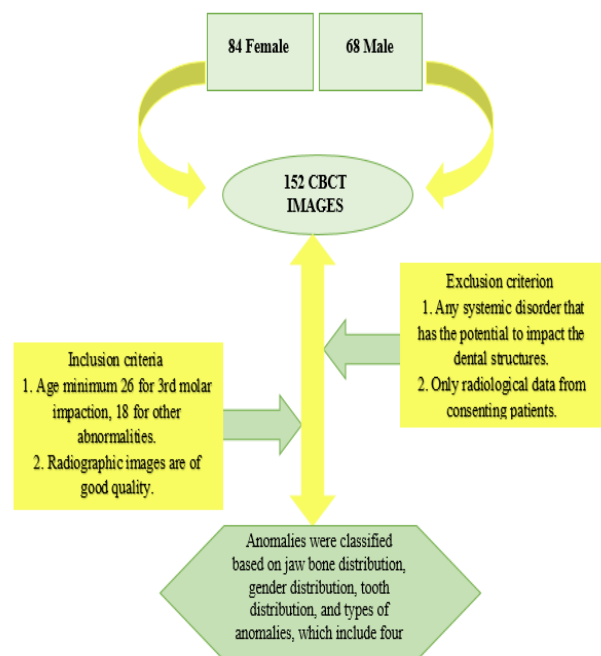


Figure 1. The flow chart demonstrates how to distribute the data.

All of the data collected were analyzed using the chi-square test at a significance threshold of $p <$

0.05. An analysis of descriptive statistics was conducted. The data analyzed using SPSS software (version 22). “The Oral Medicine Department's Scientific Committee approved this study in accordance with the Helsinki Declaration (PROTOCOL 3 JANUARY 2024)”.

Results

Out of 152 patients, 55 patients (23 females and 32 males) had 122 anomalies. The prevalence of DAs in females was 50.8%, while in males it was 49.2%. Dilaceration teeth were identified as the most prevalent dental anomaly in both genders, accounting for 39.3% of cases. Impaction was the second most prevalent abnormality, accounting for 24.6% of cases. A statistically significant association was seen between ectopic and dilaceration anomalies and gender in the distribution of dental anomalies ($p < 0.05$).

The maxilla was the most common location for jaw anomalies, accounting for 51.6% of cases. When looking at the most common abnormality in both jaws, it is dilaceration. The second most common dental abnormality observed was ectopic eruption in the upper jaw, while impaction was more widespread in the lower jaw. A strong association was identified between dilaceration anomalies and their distribution in the jaws ($p < 0.05$). Shape was the most common type of abnormality, accounting for 48.3% in both genders, followed by position. However, the size category indicated a minor incidence rate of 2.5%. Based on the distribution of anomalies in the jaw teeth, the canine tooth was determined to be the most prevalent in the maxilla, whereas the second premolar was the most common in the mandible. The most common tooth abnormality observed was the dilacerated tooth.

The distribution of anomalies by gender revealed that one anomaly was most prevalent among females, two anomalies were found among males, and three anomalies were observed in both genders (Tables 1, 2, and 3), Figure 2.

Table 1: The frequency and classification of dental anomalies impact the number, position, shape, and size of teeth in relation to gender and jaw location.

P-value	Chi-square	Lower	Upper	P-value	Chi-square	Total (152)	Male (68)	Female (84)	Gender	
									Position	Shape
0.184	2.004	0	15 (12.2%)	0.044	3.464	15 (12.2%)	5 (4%)	10 (8.2%)	Ectopic	10
0.184	2.464	0	3 (2.4%)	0.074	3.464	3 (2.4%)	1 (0.8%)	2 (1.6%)	Transposition	2
0.063	3.78	18 (14.7%)	12 (9.8%)	0.063	3.78	30 (24.6%)	18 (14.7%)	12 (9.8%)	Impaction	12
0.044*	3.464	32 (26.2%)	16 (13.1)	0.048	3.671	48 (39.3%)	18 (14.7%)	30 (24.6%)	Dilaceration	30
0.109	2.774	1 (0.8%)	4 (3.3%)	0.063	3.78	5 (4%)	3 (2.4%)	2 (1.6%)	Root fusion	2
0.184	2.002	3 (2.4%)	0	0.074	3.464	3 (2.4%)	2 (1.6%)	1 (0.8%)	Supernumery roots	1
0.184	2.001	3 (2.4%)	0	0.057	4.01	3 (2.4%)	2 (1.6%)	1 (0.8%)	Hvnerementosis	1
0.074	3.464	1 (0.8%)	2 (1.6%)	0.074	3.464	3 (2.4%)	2 (1.6%)	1 (0.8%)	Hypodontia	1
0.14	2.384	1 (0.8%)	8 (6.5%)	0.102	2.882	9 (7.3%)	7 (5.7%)	2 (1.6%)	Hvnerdontia	2
0.184	2.12	0	3 (2.4%)	0.057	4.01	3 (2.4%)	2 (1.6%)	1 (0.8%)	Macrodonia	1
0.135	2.645	59 (48.2%)	63 (51.6%)	0.065	3.598	122	60 (49.2%)	62 (50.8%)	Total	122

* Significant.

Table 2. Distribution of anomalies based on the frequency of single or multiple occurrences within gender.

Group	No. of anomaly				Total
	One	Two	Three	More	
Female	15	6	9	2	32
Male	3	11	5	4	23
Total	18 (32.7 %)	17 (30.9 %)	14 (25.5 %)	6 (10.9 %)	55
Test	3.467				
P-value	0.047*				
	P<0.05				

*Significant; No.: number.

Table 3: Distribution of tooth prevalence associated with the dental anomalies based on participant variables.

Teeth	Maxilla	Mandible	Male	Female
Central	3	1	3	1
Lateral	2	0	1	1
Canine	26	0	10	16
First Premolar	20	14	15	19
Second premolar	1	23	10	14
First molar	0	1	1	0
Second molar	4	1	3	2
Third molar	5	18	14	9
Total	61	58	57	62

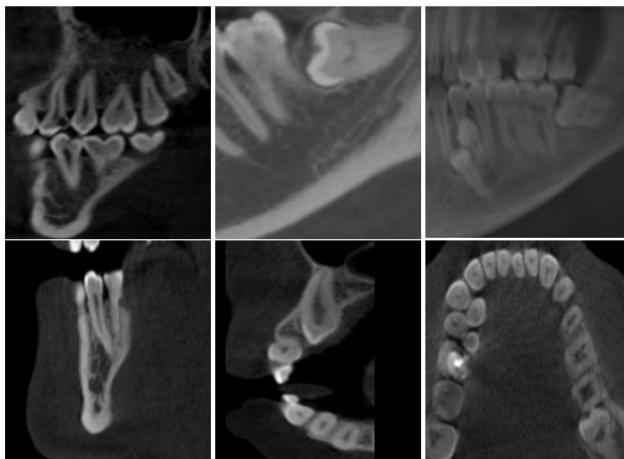


Figure 2: Examples of different dental anomalies by CBCT views.

Discussion

This study recorded dental anomalies in 36.2 % of individuals by CBCT. This study's findings are consistent with past research on Iraq^(18, 19) and Gupta et al.⁽¹¹⁾, which revealed considerably

higher percentages of issues (33.9, 32.8, and 34.28%, respectively).

Treatment becomes more complex when these dental anomalies are not identified in sufficient time, which can cause inappropriate occlusion, cosmetic and functional issues, and secondary complications⁽²⁰⁾.

CBCT is more commonly employed in endodontics to detect root canal anomalies, impactions and lesions in the jaw, and implants, whereas panoramic radiographs are commonly utilized in routine dental examinations^(20, 21).

In compatible with the current study, Şeker et al.⁽²²⁾ found that CBCT is a highly valuable technique for identifying DAs, particularly those related to the roots and canals. A total of 239 abnormalities were identified in 207 individuals (105 being female and 102 being male).

Dilaceration is a developmental abnormality that describes an abrupt change in tooth crown-root axial inclination. Trauma and tooth bud development disturbance can induce dilaceration. X-rays are the sole way to diagnose dilaceration⁽²³⁾.

As ascertained through this analysis, dilaceration was the most commonly occurring anomaly, comprising 39.3% of the total. Haghanifar et al.⁽²⁴⁾, dilaceration was the most commonly observed anomaly at a rate of 7.7%. Additional research was documented in 8.1% by Hassan et al.⁽²⁵⁾ and in 27.7% by Shayan et al.⁽²⁶⁾ According to Abdalrahim's findings, the predominant anomaly identified at a rate of 18.52% was dilacerations⁽¹⁷⁾.

An ectopic eruption occurs when a tooth arises or develops in an atypical position or path. When neighboring permanent teeth in the same quadrant change position, transposition occurs in the dental arch⁽²⁵⁾. In terms of ectopic and transposition, the study's results were higher than those of Hassan et al.⁽²⁵⁾ at 12.2% and 2.4%, respectively. The prevalence rates of these dental malformations are 2.6% ectopic and 0.2% transposition, respectively; Şeker et al.⁽²²⁾ found 0.4% ectopic and 1.2% transposition. Bakhrji et al.⁽²⁷⁾ discovered a higher percentage of 6%.

Ethnic differences could explain the discrepancy in study results.

Congenitally absent teeth, or hypodontia, is a prevalent dental anomaly that frequently manifests in the dentition. The result was 2.4%. In contrast, previous research across different populations has reported a prevalence of hypodontia ranging from 2.63% to 11.2%^(13, 28). Hypodontia was the most prevalent dental anomaly, according to numerous investigations^(6, 29). On a global scale, Saudi Arabia (6.7%) and India (4.19%) reported the lowest prevalence^(11, 25), while Thai orthodontic patients had the highest prevalence at 26.1%⁽³⁰⁾.

As a consequence of the development of tooth or teeth from a tooth germ, hyperdontia or supernumerary teeth occur when the number of teeth in the dental arch exceeds the average value. In terms of the condition of hyperdontia, this research yielded a result of 7.3%, which aligns with the findings of AlHudaithi et al. in Saudi Arabia (7.6%)⁽³¹⁾. In contrast, Fnaish et al.⁽³²⁾ identified a low prevalence of 4.5% among Jordanian individuals. Shokri et al.⁽³³⁾ and Şeker et al.⁽²²⁾ reported incidences of hypercementosis at 0.2% and 1.2%, respectively. However, the current investigation revealed a higher prevalence of 2.4%, possibly due to the use of various sample sizes.

The findings of previous research are consistent with the observation of an impaction in 24.6% of the cases. According to Aldhorae et al.⁽³⁴⁾, impaction prevalence ranges from 14% to 47%. In Saudi Arabia, Afify and Zawawi⁽⁶⁾ found a prevalence rate of 21.1%. Shayan et al.⁽²⁶⁾ analyzed 602 patients and found an impaction incidence of 21.8%.

Supernumerary roots were present at a prevalence of 2.4%, which is consistent with Guttal et al.⁽³⁵⁾ (2%) and Turkkahraman et al.⁽³⁶⁾ (1.2%).

The prevalence of root fusion was 4%, which was higher than the 0.4% identified by Şeker [22]. Ethnic disparities can be the reason for this difference.

Both Hassan et al.⁽²⁵⁾ and Şeker et al.⁽²²⁾ found no statistically significant difference in the prevalence of anomalies between the sexes. That is nearly identical to this research, with the exception of dilaceration and ectopics. Furthermore, Şeker et al.⁽²²⁾ discovered a significant distinction between the location of the jaw and both supernumerary teeth and impaction. This discovery contradicts the present outcome, which was only observed in the case of dilaceration. Variations in sample size cause the inconsistency.

In line with this result, Khaleel et al.⁽¹⁹⁾ concluded that DAs had a greater impact on the maxilla (55.48%) than the mandible (44.52%).

In terms of the number of DAs in each participant, 32.7% presented one anomaly, 30.9% two, 25.5% three, and 10.9% more than three. Another study recorded that 75.61% of patients had one DA, 22.76% had two, and 1.63% had three⁽¹⁹⁾. This study and Abdalrahim⁽¹⁷⁾ agree that one DA is more prevalent; however, Abdalrahim detected significant differences between genders in relation to the frequency of DAs for only one and two anomalies. In 24.5%, 3.3%, and 0.2% of cases, DAs were one, two, or more⁽²⁴⁾. Another comparable finding was that 91.79% of patients had one anomaly, 7.46% had two, and 0.75% had three⁽³⁷⁾.

DAs most affected the maxillary canine, followed by the mandible's second premolar. According to ALHumaida et al.⁽³⁸⁾, the maxillary molar had the greatest DAs (36.2%), followed by the mandibular molar, maxillary and mandibular premolars, maxillary anterior, and mandibular anterior. Other analyses showed that maxillary incisors had the highest anomalies⁽¹⁷⁾. Differences may be attributable to the diagnostic criteria and procedures employed to diagnose these DAs.

Mabrouk et al.⁽³⁷⁾ are utilizing CBCT to examine the prevalence and distribution of DAs in Tunisia. Furthermore, it was determined that clinical and radiographic interpretations are necessary when DAs are suspected. A CBCT is



sufficient for performing an additional radiographic examination to validate the suspicion of DAs.

Gokcek et al. (39) discovered that DAs are a common tooth disorder. While they may remain asymptomatic, they are capable of causing any type of practical complication. Due to the high incidence of DAs, early detection is crucial.

Variations among studies may arise from demographic differences, methodological approaches, sample size and scope, and ethnic disparities. Additionally, variations in the distribution of anomalies may have resulted from the use of distinct imaging techniques in the studies.

Conclusions

Dental abnormalities are quite widespread, with dilaceration being the most prevalent aberration that affects the morphology of teeth. There was no significant disparity in the occurrence of anomalies across genders, except for ectopics and dilacerations. Similarly, no notable variation was detected in jaw location, except for dilaceration.

High-quality CBCT examinations revealed a significant incidence of DAs, particularly those associated with the numbers, and also offered insights into ongoing population shifts and facilitated a thorough assessment.

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