# Prevalence Of Dental Anomalies: A Cone-Beam Computed Tomography Study

Dental Anomalilerin Prevelansı: Koni Işınlı Bilgisayarlı Tomografi Çalışması

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**ABSTRACT**

**Objective:** Dental anomalies are usually detected incidentally on panoramic radiographs taken during routine dental examinations. Incidentally seen anomalies could be seen more clearly in cone-beam computed tomography (CBCT) due to the limitations of two-dimensional radiographs. The aim of this study is to evaluate the localization of dental anomalies in the jaws and gender distribution in patients living in the Western Black Sea region by evaluating the CBCT images previously taken for different reasons retrospectively.

**Materials and Method:** Radiographic data of 207 patients out of 1230 patients who applied to Zonguldak Bülent Ecevit University, Faculty of Dentistry Oral and Maxillofacial Radiology Department and who were requested to have CBCT imaging due to any reasons were included in the research. The distribution of anomalies in CBCT images were scanned retrospectively and classified as maxillary - mandibular, unilateral - bilateral, and female-male.

**Results:** In our study, 105 of 207 patients with dental anomalies were female and 102 were male. An overall of 239 anomalies were detected in 207 patients. The most prevalent dental anomaly in both sexes was determined to be impacted teeth (%46). Considering the localization distribution of the anomalies, the most prevalent anomaly in both the maxilla and mandible was the impacted tooth. Considering the location of the anomalies in the jaws, and the anomalies were mostly observed unilaterally (%80).

**Conclusion:** Impacted teeth anomalies were the most prevalent type of dental anomalies in the Turkish subpopulation. CBCT is a very useful method for the detection of dental anomalies, especially root and canal anomalies.

**Key Words:** Cone Beam Computed Tomography, Impacted, Maxilla, Mandible, Teeth Anomalies.

**ÖZ**

**Amaç:** Dental anomaliler genellikle rutin dental muayeneler sırasında alınan panoramik radyografilerde tesadüfen fark edilmektedir. Tesadüfi görülen anomaliler iki boyutlu radyografilerin limitasyonları nedeni ile konik ışınlı bilgisayarlı tomografide (KIBT) daha net izlenebilmektedir. Bu çalışmanın amacı, farklı nedenlerle daha önceden alınan KIBT görüntülerinin retrospektif olarak değerlendirilmesiyle Batı Karadeniz Bölgesinde yaşayan hastalarda dental anomalilerin çenelerdeki lokalizasyonlarının ve cinsiyet dağılımının incelenmesidir.

**Gereç ve Yöntemler:** Zonguldak Bülent Ecevit Üniversitesi Diş Hekimliği Fakültesi Ağız, Diş ve Çene Radyolojisi Anabilim Dalı Kliniğine başvuran ve herhangi bir nedenden dolayı KIBT görüntülemesi istenmiş olan 1230 hastadan 207 hastanın radyografik verileri çalışmaya dahil edilmiştir. Retrospektif olarak taranan KIBT görüntülerinde anomalilerin dağılımı maksilla-mandibula, unilateral-bilateral ve kadın-erkek olarak sınıflandırılmıştır.

**Bulgular:** Çalışmamızda dental anomali tespit edilen 207 hastanın 105'i kadın 102'si erkektir. 207 hastada toplam 239 anomali tespit edilmiştir. Her iki cinsiyette de en sık görülen dental anomali gömülü diş (%46) olarak tespit edilmiştir. Anomalilerin lokalizasyon dağılımına bakıldığında hem maksilla hem mandibulada en sık gözlenen anomali gömülü diş olmuştur. Anomalilerin çenelerdeki yerleşimine bakıldığında en sık unilateral (%80) olduğu gözlenmiştir.

**Sonuç:** Gömülü diş anomalileri, seçilen bu Türk subpopülasyonunda en sık görülen dental anomali olarak belirlenmiştir. KIBT, diş anomalilerinin, özellikle de kök ve kanal anomalilerinin tespiti için oldukça faydalı bir yöntemdir.

**Anahtar Kelimeler:** Konik Işınlı Bilgisayarlı Tomografi, Gömülü Kalma, Maksilla, Mandibula, Dental Anomali.

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## INTRODUCTION

Dental anomalies occur due to genetic, developmental, or metabolic disorders. It is generally classified as congenital, developmental, or acquired (1-3).

Congenital anomalies occur as genetic inheritance, while developmental anomalies are disorders that occur during the formation period of teeth. These anomalies can affect the primary and permanent teeth and may appear as number, size, shape, structure, and eruption anomalies in the teeth. Acquired anomalies occur after the normal formation of the teeth is completed (2-5). Although dental anomalies are rare, they are more common in the permanent dentition than in the primary dentition and in the maxilla than in the mandible. They can be seen solitary in the same patient more than single. In some cases dental anomalies are not noticed by the patient, but they can cause serious problems and make the treatment to be applied difficult (4-6). Therefore, dentists should have sufficient knowledge about dental anomalies.

Dental anomalies are usually noticed incidentally on panoramic radiographs taken during routine dental examinations. Panoramic radiographs are an imaging method that can be obtained in a short time, allows to evaluate a larger area at once, and the radiation dose received by the patient is lower than intraoral radiographic techniques (7). However, the superimposition of the anatomical structures in panoramic radiographs sometimes prevents the evaluation of the radiograph adequately. Therefore, Conical Beam Computed Tomography CBCT) may be needed.CBCT became available in dentistry in the late 1990s and its usege is becoming widespread day by day; frequently used in maxillofacial surgery, implant applications, and endodontics. It is necessary to know the internal morphology of the tooth root, especially for successful endodontic treatment of teeth with dental anomalies. 2D radiographs have possibility to hide the true nature of these anomalies. In spite of these advantages, the high radiation dose compared to 2-dimensional radiographs limits the usege of CBCT (8,9,10). The aim of this the study is to investigate the distribution of dental anomalies by gender and jaw localization in patients living in the Western Black Sea region, by retrospectively evaluating the CBCT images previously taken for different reasons.

## MATERIAL AND METHODS

Of 1230 patients who applied to the Oral and Maxillofacial Radiology Department of Zonguldak Bülent Ecevit University Faculty of Dentistry between January 2019 - June 2020; CBCT images were obtained for pre- and post-operative dental implant surgery, for orthodontic treatment planning, for evaluating the relationships of the teeth and the pathologies to the neighboring anatomical structures such as paranasal sinuses or inferior alveolar canal.

Radiographic data of a total of 207 patients, including 105 female and 102 male were included in the study. Medical and dental anamnesis of patients are recorded in the patient information management system of our faculty. Only patients' radiographic data who have consent, were included for the study.

All CBCT images were obtained in the Department of Oral and Maxillofacial Radiology of our faculty using Veraviewpocs 3D R100 (J Morita Mfg. Corp., Kyoto, Japan) using 80x100 mm FOV dimensions at 90kVp and 5 mA. In the positioning of the patient, chin rest and head stabilizer were used in relevance with the manufacturer's instructions and patient movement was averted. CBCT images were evaluated with the i-Dixel 2.0 (J. Morita Corporation, Osaka, Japan) software program by two experienced Oral, Dental and Maxillofacial Radiologists for 7 years.

The distribution of anomalies in CBCT images were scanned retrospectively (Figure 1-Figure 2) and classified as maxillary-mandibular, unilateral-bilateral, and female-male.
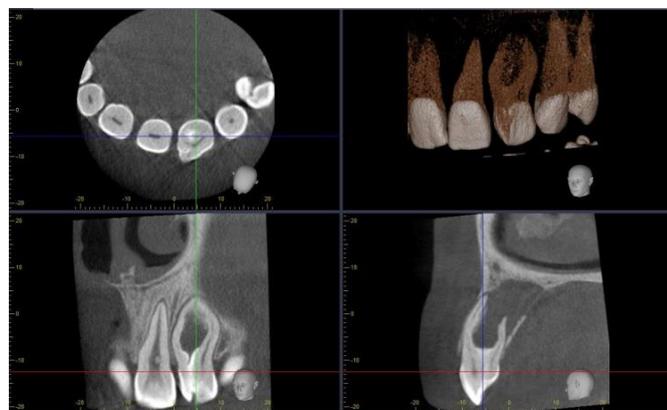


**Figure 1:** Dens invaginatus in the left maxillary lateral tooth and its appearance in CBCT, a periapical lesion in the relevant tooth in sagittal section.
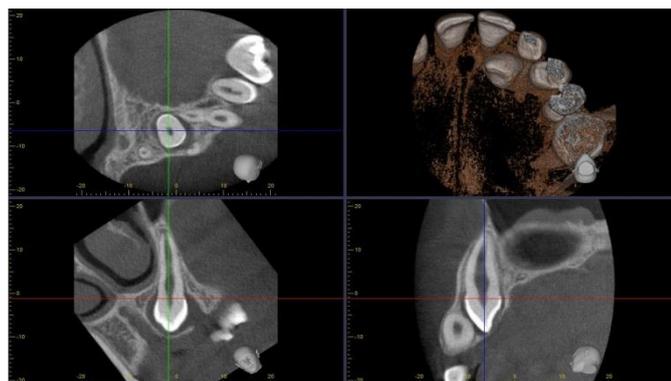


**Figure 2:** Displacement anomaly and CBCT view in the left maxillary canine tooth.

The all of data obtained were analyzed with the chi-square test at p <0.05 significance level. Descriptive statistics were made and the Kolmogorov Smirnov test was applied to evaluate the normality of the data set.

This study was confirmed by the Zonguldak Bülent Ecevit University Clinical Research Ethics Committee with the protocol number 2013-43-12 / 03.

## RESULTS

In our study, 105 of 207 patients with dental anomalies were females and 102 were males. A total of 239 anomalies were detected in 207 patients. The incidence of dental anomalies in female was %52.7, and %47.2 in male.

The most common dental anomaly in both females and males was found to be impacted teeth (%46). The second most common anomaly in women was dilaceration, while in men it was the supernumerary tooth anomaly (9.6%)

A significant relationship was found between rotation anomaly and gender, in the distribution of dental anomalies by gender (p <0.05). Rotation anomaly was detected only in male patients in this study (Table 1).

In terms of localization in the jaws, anomalies were most frequently observed in the maxilla (%43.5).

Considering the distribution of anomalies in terms of localization, the most prevalent anomaly in both maxilla and mandible was the impacted tooth. The second most prevalent dental anomaly was supernumerary teeth in the upper jaw, while was the dilaceration in the lower jaw, a significant correlation was found between the supernumerary tooth, impacted tooth, displacement and rotation anomalies, and the distribution in the jaws (p <0.05) (Table 2).

Considering the distribution of the anomalies in the jaws, unilateral (%80) was found to be the most common. The most prevelant bilateral and unilateral anomaly was the impacted tooth.

In the statistical distribution of dental anomalies in the jaws was analyzed and a significant correlation was found between the teeth agenesis, impacted teeth and supernumerary teeth anomaly and the location (unilateral/bilateral) in the jaws (p <0.05) (Table 3).

| GENDER | Supernumarary teeth | Dilaceration | Teeth agenesis | Dens invaginatus | Fusion | Hypersementosis | Displacement | Ectopi | Impacted teeth | Inversion | Rotation | Transposition | Talon cusp | Microdontia | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| females (n=105) | 14 %5,8 | 23 %9,6 | 7 %2,9 | 2 %0,8 | 1 %0,4 | 2 %0,83 | 13 %5,4 | 1 %0,4 | 62 %25,9 | 1 %0,4 | - | - | 1 %0,4 | - | 126 %52,7 |
| males (n=102) | 23 %9,6 | 16 %6,7 | 5 %2 | 1 %0,4 | - | 1 %0,4 | 6 %2,5 | - | 48 %20 | - | 8 %3.3 | 3 %1,2 | - | 1 %0,4 | 113 %47,2 |
| total (n=207) | 37 %15.4 | 39 %16 | 12 %5 | 3 %1,2 | 1 %0,4 | 3 %1,2 | 19 %7.9 | 1 %0,4 | 110 %46 | 1 %0,4 | 8 %3.3 | 3 %1,2 | 1 %0,4 | 1 %0,4 | 239 |
| P value | 0,084 | 0,253 | 0,587 | 1.000 | 0,323 | 0,578 | 0,105 | 0,323 | 0,084 | 0,323 | 0,003 | 0,077 | 0,323 | 0,309 | |
| pearson chi square value | 2,99 | 1,3 | 0,29 | 0,31 | 0,97 | 0,31 | 0,97 | 0,31 | 2,62 | 0,97 | 2,98 | 0,97 | 8,56 | 1,03 | |

**Table 1.** Dental anomaly-gender relationship and chi-square analysis results.

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| Localization | Supernumary teeth | Dilaceration | Teeth agenesis | Dens invaginatus | Fusion | Hypersementosis | Displacement | Ectopi | Impacted teeth | Inversion | Rotation | Transposition | Talon cusp | Microdontia | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Maxilla | 18 %7,5 | 14 %5,8 | 8 %3,3 | 1 %0,4 | 1 %0,4 | - | 13 %5,4 | 1 %0,04 | 37 %15,4 | - | 7 %2,9 | 3 %1,2 | - | 1 %0,4 | 104 %43.5 |
| Mandible | 5 %2 | 18 %7,5 | 1 %0,4 | 2 %0,83 | - | 3 %1,2 | - | - | 55 %23 | - | - | - | - | - | 84 %35 |
| Both jaws | 14 %5,8 | 7 %2,9 | 3 %1,2 | - | - | - | 6 %2,5 | - | 18 %7,5 | 1 %0,4 | 1 %0,4 | - | 1 %0,4 | - | 51 %21.3 |
| Total | 37 %15,4 | 39 %16,3 | 12 %5 | 3 %1,2 | 1 %0,4 | 3 %1,2 | 19 %7,9 | 1 %0,4 | 110 %46 | 1 %0,4 | 8 %3,3 | 3 %1,2 | 1 %0,4 | 1 %0,4 | 239 |
| P value | 0,001 | 0,390 | 0,103 | 0,492 | 0,520 | 0,073 | 0,002 | 0,520 | 0,001 | 0,131 | 0,03 | 0,138 | 0,131 | 0,520 | |
| pearson chi square value | 14,27 | 1,88 | 4,54 | 1,41 | 1,30 | 5,24 | 12,13 | 1,30 | 17,91 | 4,06 | 6,98 | 3,95 | 4,06 | 1,30 | |

**Table 2.** The relationship between dental anomalies and jaws and results of chi-square analysis.

| Distribution | Supernumarary teeth | Dilaceration | Teeth agenesis | Dens invaginatus | Fusion | Hypersementosis | Displacement | Ectopi | Impacted teeth | Inversion | Rotation | Transposition | Talon cusp | Microdontia | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bilateral | 13 %5,4 | 2 %0,83 | 6 %2,5 | - | 1 %0,4 | - | 6 %2,5 | - | 17 %7,1 | - | 2 %0,83 | - | - | - | 47 %19,6 |
| Unilateral | 24 %10 | 37 %15,4 | 6 %2,5 | 3 %1,2 | - | 3 %1,2 | 13 %5,4 | 1 %0,4 | 93 %38,9 | 1 %0,4 | 6 %2,5 | 3 %1,2 | 1 %0,4 | 1 %0,4 | 192 %80 |
| Total | 37 %13,7 | 39 %16,3 | 12 %5 | 3 %1,2 | 1 %0,4 | 3 %1,2 | 19 %7,9 | 1 %0,4 | 110 %46 | 1 %0,4 | 8 %3,3 | 3 %1,2 | 1 %0,4 | 1 %0,4 | 239 |
| P value | 0,017 | 0,08 | 0,01 | 0,372 | 0,05 | 0,372 | 0,223 | 0,608 | 0,045 | 0,608 | 0,764 | 0,372 | 0,608 | 0,608 | |
| pearson chi square value | 5,64 | 7,14 | 6,61 | 0,79 | 3,83 | 0,79 | 1,48 | 0,26 | 4,03 | 0,26 | 0,09 | 0,79 | 0,26 | 0,29 | |

**Table 3.** The relationship of dental anomalies according to distribution in jaws and chi-square analysis results.

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## DISCUSSION

Dental anomalies may consist of due to various etiologies and may lead to impairment of function and aesthetics. Clinicians should be able to recognize both clinical and radiological signs of anomalies and assist the patient in early diagnosis and appropriate treatment, especially when they occur in association with a syndrome (4). For example, multiple supernumerary teeth can be relevant with Cleidocranial dysplasia and Gardner's syndrome, while diseases such as Cleft lip-palate and Ectodermal dysplasia may present with oligodontia or anodontia (3,4). There is a risk of pulpal inflammation and necrosis in dens invaginatus due to the tooth decay caused by failure to clean and bacterial colonization, or the narrow canals extending between the invagination and pulp (4,11).

The most prevalent dental anomaly in this study was the impacted tooth anomaly (%46), and no significant difference was observed between genders in terms of the frequency of impacted teeth. This result is similar to other studies (12,13,14). However, in Koparal et al.'s study, the frequency of impacted teeth was found to be statistically significantly higher in males than in female (13). In the study of Aren et al. the frequency of dental anomalies in the Turkish population was examined retrospectively and the most prevalent anomaly was tooth agenesis (%1.7) (15).

Among the causes of the impacted teeth are trauma, the thickness of the bone and soft tissue on the tooth, systemic diseases and syndromes, as well as the incompatibility of the dental arch with the tooth size , and the obstacles in the eruption pathway of the tooth (tooth, cyst, angulation of the teeth). Surgical extraction of the impacted teeth may be required due to pathological conditions such as cysts, tumors, and infections occurring around the impacted teeth, resorption and caries in the teeth. Asymptomatic impacted teeth can be followed for a long time. Other treatment options are leading to erupt the impacted teeth with orthodontic movements or transplantation of the teeth (3,16).

In Saberi and Ebrahimipour's study, opposite to our study findings, the most prevalent dental anomaly was taurodontism (%5.38), the second most frequent was dilaceration (%5.29) (17). In a study performed by Haghanifar et al. the most frequent anomaly was dilaceration (%7.7) followed by dens invaginatus (%3.8) (18). In the study of Baron et al. taurodontism was the most common anomaly (%15.06), the second most common was ectopic eruption (%11.43) (19). In our study, rotation anomaly was detected only in male patients. Gupta et al. reported that there was no difference between genders in terms of rotation

anomaly in his prevalence study on 1123 patients (20). In the study conducted by Gürbüz et al. in a group of the Turkish population, dental anomalies were found in 1517 patients and teeth rotation anomaly was found in %58.4 of patients (21).

Sakulratchata et al. dedected that the tooth agenesis (%34.38 ) was the most frequent dental anomaly in their prevalence study on 385 pediatric patients. They reported that there was no significant relationship between dental anomaly and gender, systemic disease, or physiological/psychological disorder (p <0.05). In our study, tooth agenesis was observed at a low rate of %5. In both studies, tooth agenesis was observed more commonly in the maxilla than in the mandible (22).

Differences between studies may be due to the size and extent of the selected samples, the method of the study, and ethnic differences. In addition, different imaging techniques used in the studies may have caused differences in the distribution of anomalies. While panoramic radiographs are frequently used in routine dental examinations, CBCT is used more frequently for the evaluation of implants impacted teeth, lesions in the jaws, and fort he determination of root canal anomalies in endodontics (23,24).

## CONCLUSION

Impacted teeth were the most prevalent type of dental anomaly in a Turkish subpopulation. The results of this study resemblance to the results of other studies, although there are some differences in certain aspects, that may occur due to the the differences in the number of samples, method, and place where the study was conducted. CBCT is a very beneficial method for the detection of dental anomalies, especially root-canal anomalies.

In addition, by increasing the sample size and conducting it as a multi-center study, extensive data on the Turkish population can be obtained.

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