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Research Article

INVESTIGATION OF THE PREVALENCE OF HYPODONTIA IN THE PERMANENT DENTITION OF CHILDREN

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ABSTRACT

The aim of this study was to investigate the prevalence and distribution of congenital tooth deficiency in the pediatric patient population in Erzincan region. In this study, digital panoramic radiographs of 1421 children (714 girls, 707 boys) aged 6-12 years who applied to the Oral and Maxillofacial Radiology Clinic of Erzincan Oral and Dental Health Education and Research Hospital were examined. Descriptive statistics were used to calculate the number and rates of missing teeth, and the chi-square test ($p<0.05$) was used to evaluate whether there was a significant difference between the groups. The prevalence of congenital tooth deficiency was found to be 6.22% in males, 5.18% in females and 5.70% in total. No statistically significant difference was found between gender and tooth deficiency ($p>0.05$). It was determined that mandibular second premolars were the most frequently missing teeth, followed by maxillary lateral teeth and maxillary second premolars. Hypodontia frequency was observed as 5.70% in patients living in Erzincan region. Accordingly, digital panoramic radiographs taken in children over 6 years of age who apply for dental examination are of great importance for the diagnosis and detection of possible hypodontia. Early diagnosis of congenitally missing teeth plays a crucial role in treatment planning that provides patients with lower costs and more accurate occlusion in the future.

INTRODUCTION

Hypodontia, or congenital tooth agenesis, is one of the most common dentofacial malformations that affects individuals both aesthetically and functionally. Although the etiology of hypodontia remains unclear, it is thought to be associated with heredity (such as Down syndrome, ectodermal dysplasia, etc.), local inflammation, trauma, radiation, and diseases such as rickets and syphilis (Aras & Dogan, 2020). In the literature, different terms are used depending on the number of congenitally missing teeth: the absence of 1 to 6 teeth is referred to as “hypodontia,” more than 6 missing teeth is termed “oligodontia,” and the complete absence of all teeth, a rare condition, is called “anodontia” (Dzemidzic, Nakas, Gagula, Kozadra & Tiro, 2020; Gracco et al., 2017; Meistere, Kronina, Karkle & Neimane, 2024). Studies have shown that the prevalence and location of hypodontia vary among different ethnic groups, ranging from 0.3% to 34.3% (Aras & Dogan, 2020; Mahjoub et al., 2024).

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Depending on the number and region of the affected teeth, this anomaly may lead to varying degrees of dental malposition, reduced alveolar bone height, and consequently to functional impairments such as difficulties in chewing and speaking, as well as aesthetic problems and associated self- confidence issues (Rakhshan, 2015). Early diagnosis of hypodontia is important for preventing potential future complications and for developing more effective treatment options (Ayrancı, 2019).

The aim of this study is to examine the prevalence and distribution of hypodontia in the permanent dentition of children in the Erzincan region.

MATERIAL AND METHOD

Study Type

This is a retrospective study conducted to examine the prevalence and distribution of hypodontia in the permanent dentition of children in the Erzincan region.

Study Population and Sample

In this study, digital panoramic radiographs of a total of 1,421 patients, 707 boys and 714 girls, were evaluated. These patients had presented to Erzincan Oral and Dental Health Training and Research Hospital between May 2022 and October 2022 and were between the ages of 6 and 12 at the time the radiographs were taken. Only high-quality, artifact-free digital panoramic radiographs were included in the study, while those with insufficient clarity or image quality were excluded. Based on a previous similar study (Aras & Dogan, 2020), the prevalence of hypodontia in the Erzincan region was assumed to be 6.6% for the purpose of estimating the sample size. With a 5% margin of error and 90% statistical power, the 1,421 panoramic radiographs collected from randomly selected patients over a six-month period were determined to meet the required minimum sample size.

Data Collection and Analysis

Digital panoramic radiographs (Planmeca ProOne® orthopantomographic imaging unit) obtained from patients who presented to Erzincan Oral and Dental Health Training and Research Hospital were used as the data collection tool in this study. Panoramic images with low resolution, artifacts, or unclear visualization of erupted teeth and tooth germs, as well as those belonging to patients with extracted teeth, cleft palate, or craniofacial syndromes, were excluded. All panoramic radiographs were examined using a digital viewer by an Oral and maxillofacial radiologist with 10 years of experience. Teeth, excluding third molars, were diagnosed as congenitally missing if crown mineralization could not be detected.

IBM SPSS Statistics 27 (SPSS Inc., Armonk, NY, USA) was used for statistical analysis. The data were analyzed using frequency, descriptive statistics, and the Chi-square test. The level of statistical significance was set at $p < 0.05$.

Limitations of the Study

This study is limited by the sample size obtained. The panoramic radiographs included in the study were collected from children who presented with dental problems during the specified period. A more homogeneous and larger sample is required to improve the generalizability of the results.

Ethical Considerations

This study was approved by the Non-Interventional Clinical Research Ethics Committee of Erzincan Binali Yıldırım University Faculty of Medicine (approval number: 2024-13/03) and was conducted in accordance with the Declaration of Helsinki.

RESULTS

A total of 137 congenitally missing permanent teeth were identified in 81 of the 1,421 patients included in the study (Figure 1). The prevalence of permanent tooth agenesis was found to be 6.22% in males, 5.18% in females, and 5.70% overall. No statistically significant difference was observed between gender and tooth agenesis ($p > 0.05$). The mean age was 8.65 ± 1.82 years for boys, 8.67 ± 1.79 years for girls, and 8.66 ± 1.81 years overall.

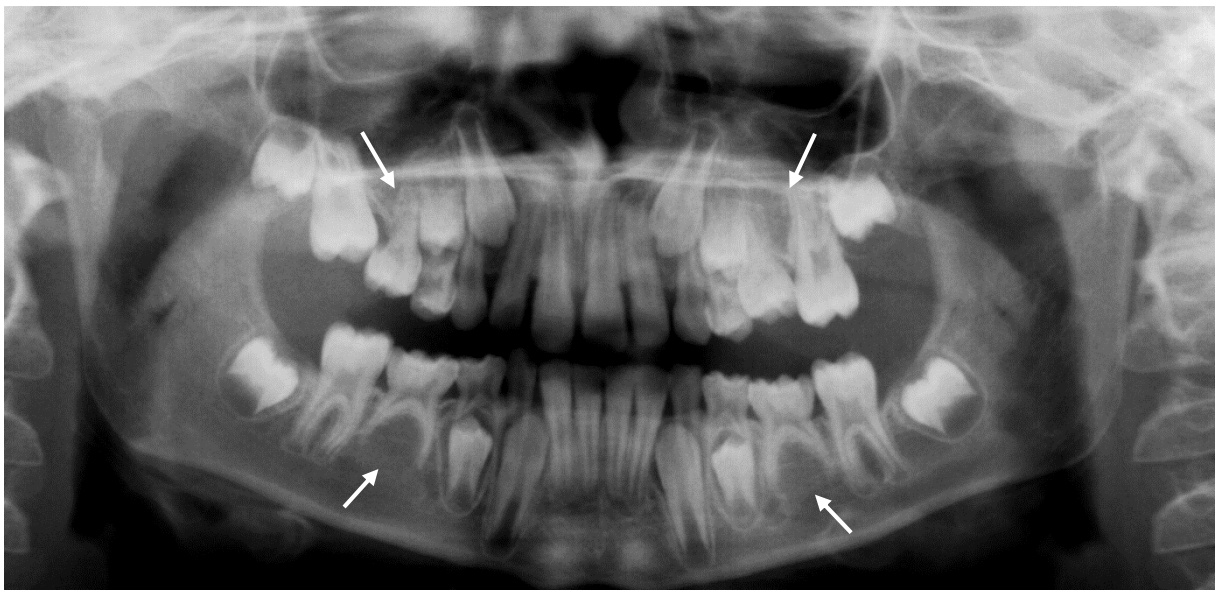

Figure 1. A case of hypodontia showing the absence of all second premolar tooth germs in both the maxilla and mandible (indicated by arrows).

In this study, the most common finding was the absence of a single tooth, observed in 49.4% of cases, followed by the absence of two teeth (39.5%), three teeth (6.2%), and four teeth (3.7%). The distribution of tooth agenesis by number and gender is presented in Table 1. The most frequently missing teeth were the mandibular second premolars (42.3%), followed by the maxillary lateral incisors (29.2%), maxillary second premolars (19%), mandibular lateral incisors (3.7%), and mandibular central incisors (5.8%) (Figure 2).

Table 1. Distribution of the Number of Missing Teeth by Gender

Number of Missing Teeth	Males with Tooth Agenesis (n)	Females with Tooth Agenesis (n)	Distribution (%)
1	22	18	49.4
2	16	16	39.5
3	4	1	6.2
4	1	2	3.7
5	0	0	0
6	1	0	1.2
Total	44	37	100

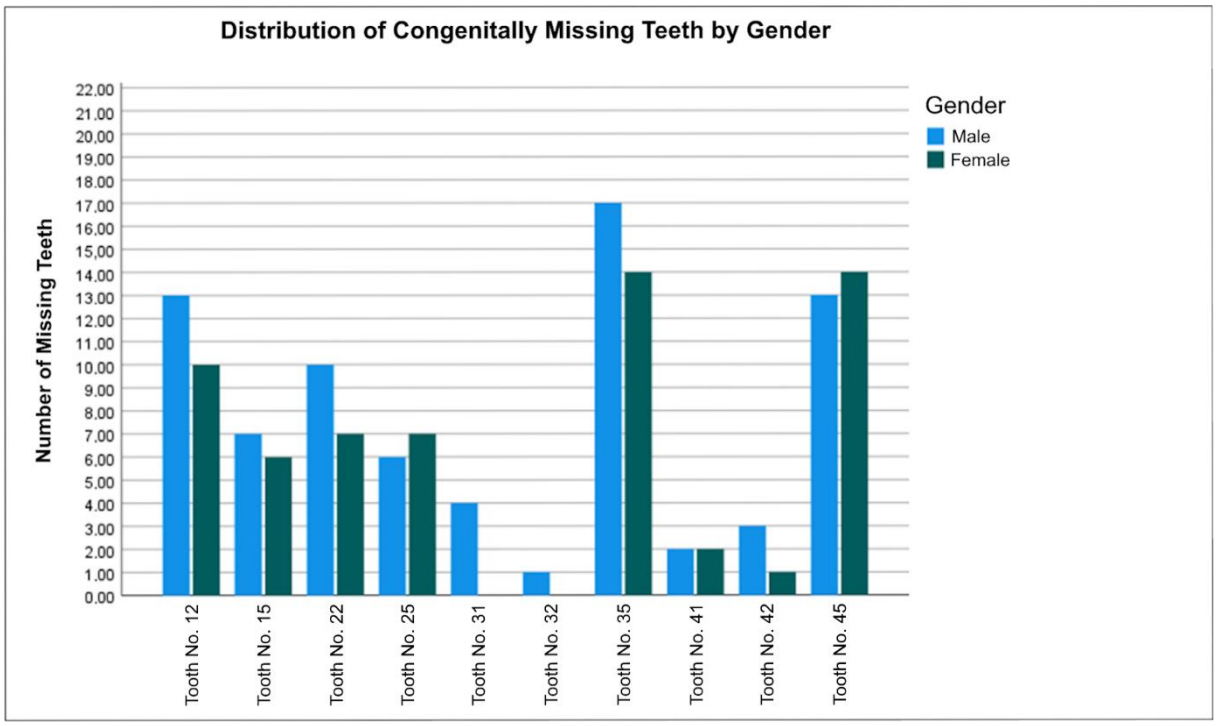

Figure 2. Distribution of Congenitally Missing Teeth by Gender

Of the 137 congenitally missing teeth, 76 were found in males and 61 in females. The distribution by quadrant showed 36 missing teeth in the first quadrant, 30 in the second quadrant, 36 in the third quadrant, and 35 in the fourth quadrant.

DISCUSSION

A review of the literature reveals numerous studies on the prevalence of congenitally missing permanent teeth, apart from third molars, conducted in various populations (Aras & Dogan, 2020; Ayrancı, 2019; Sökücü, Ünal, Topcuoğlu & Öztaş, 2009). These studies indicate that the prevalence of hypodontia varies greatly among different ethnic groups, ranging from 0.3% to 34.3% (Aras & Dogan, 2020; Mahjoub et al., 2024; Meistere et al., 2024). Gelgör et al., reported the prevalence of tooth agenesis as 2% in females and 1.6% in males in a study covering the regions of Kırıkkale and Konya (Gelgör, Şişman & Malkoç, 2005). Altug-Atac et al. reported a prevalence of 2.76% for congenitally missing teeth in a study involving 3,043 individuals (Altug-Atac & Erdem, 2007). In their study conducted in the Central Black Sea region, Ayrancı observed a prevalence of 6.5% in females, 8% in males, and approximately 7.3% overall for permanent tooth agenesis (Ayrancı, 2019). Yıldız et al. found the prevalence of hypodontia to be 4% in males, 5.9% in females, and 5% overall in their study of 969 individuals (Yildiz, Ataş, Tekin & Ataş, 2022). Bağ reported a prevalence of 8.26% for congenitally missing teeth in a study conducted in the Kütahya region with 1,441 participants. (Bag, 2022). In the present study, the overall prevalence of permanent tooth agenesis was found to be relatively lower. The differences between the reported rates may be attributed to variations in sample size and ethnic background. Although there is no clear consensus in the literature, most studies have reported that mandibular second premolars are the most commonly missing teeth, followed by maxillary lateral incisors (Aras & Dogan, 2020; Ayala Sola, Ayala Sola, De La Cruz Pérez, Nieto Sánchez & Díaz Renovales, 2018; Gracco et al., 2017; Sökücü et al., 2009; Yildiz et al., 2022). In addition, the literature suggests that in order to avoid potential false-positive diagnoses of tooth agenesis, the radiological evaluation of mandibular second premolar calcification should be performed at age nine or older (Arandi & Rabi, 2024). The inclusion of panoramic radiographs from children aged 6 to 12 in this study may be considered a limitation; however, the most commonly missing teeth were the mandibular second premolars, followed by the maxillary lateral incisors, maxillary second premolars, mandibular lateral incisors, and mandibular central incisors, respectively. Meistere et al. reported that 41% of the missing teeth were located in the maxilla and 59% in the mandible (Meistere et al., 2024). Similarly, Kirzioglu et al. found that in the Isparta region, the prevalence of missing teeth was 50.3% in the mandible and 49.7% in the maxilla (Kirzioglu, Koseler Sentut, Ozay Erturk & Karayilmaz, 2005). In the present study, the distribution of congenitally missing teeth by jaw was found to be similar to previous findings, with 48.18% in the maxilla and 51.82% in the

mandible. No statistically significant difference was observed between the upper and lower jaws. Sökücü et al. reported that maxillary central incisor agenesis was observed in only one patient, whereas the prevalence of missing mandibular central and lateral incisors was 12.95% (Sökücü et al., 2009). Similarly, in the present study, no cases of maxillary central incisor agenesis were observed, while the prevalence of missing mandibular central and lateral incisors was found to be lower. When hypodontia was classified according to the number of missing teeth, Ayrancı (2019) reported that the most common was the absence of a single tooth (56.2%), followed by the absence of two teeth (31.5%) (Ayrancı, 2019). Cavare et al. reported that the most common finding in their study was the absence of a single tooth (50.8%), followed by the absence of two teeth (35.7%) (Cavare, Decaup, Boileau & Garot, 2024). Similarly, in the present study, single-tooth agenesis was the most frequently observed condition, while six missing teeth were identified in only one patient.

CONCLUSION

The prevalence of hypodontia among patients living in the Erzincan region was found to be 5.70%. Accordingly, digital panoramic radiographs obtained from children aged six and above who present for dental examination are of great importance for the diagnosis and detection of possible hypodontia. Early diagnosis of hypodontia and a multidisciplinary treatment approach are highly important for achieving better functional and aesthetic outcomes in the future.

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