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Araştırma/ Research Article

CONGENITAL DENTAL ANOMALIES IN THE PRIMARY DENTITION

SÜT DİŞİ DENTİSYONUNDA GÖRÜLEN DİŞ ANOMALİLER

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ABSTRACT
Aim: The purpose of this study was to investigate the prevalence of congenital anomalies in the primary dentition in preschool children populations.
Material and Methods: Data pertaining to a total of 935 children (487 boys and 448 girls) in the 2–5 year age-group who visited the Department of Pedodontics Clinic at the Dokuz Eylul Univeristy Hospital, Izmir, Turkey between january 01, 2016, and december 31, 2017 were all panoramic radiographs and photograph restrospectively analyzed. The presence of hypodontia, hyperdontia (supplemental and mesiodens), and double teeth (fusion and gemination) were recorded. Statistical analysis was performed using Fisher's exact test and chi-square test.
Results: Dental anomalies were found in 2.7% of children. Double teeth were the most frequently observed anomaly (1.4%), followed by hyperdontia (0.9%) and hypodontia (0.5%). Unilateral missing teeth were more frequently observed than bilateral missing teeth. All supernumerary teeth were located in the primary maxillary incisor area. Dental anomalies were significantly more frequent (p=0.001) in boys (1.6%, n=15) as compared to that in girls (1.1%, n=10). Radiographic examination showed 36.0% of the patients (9 children) had anomalies in the permanent dentition.
Conclusions: Identification of primary dental anomalies at an early age is of great importance as it may help prevent malocclusions as well as functional and psychological problems. Anomalies in primary dentition exhibited a correlation with anomalies in permanent dentition.
Keywords: *Hyperdontia, hypodontia, primary tooth, tooth abnormalities.*

ÖZ
Amaç: Bu çalışmanın amacı, okul öncesi çocukların süt dişinde görülen konjenital dental anomali prevalansını saptamaktır.
Gereç ve Yöntem: İzmir Dokuz Eylül Üniversitesi Tıp Fakültesi Çocuk diş kliniğine 01.01.2016-31.12.2017 tarihleri arasında gelen ve 2-5 yaş aralığında olan 935(487 erkek ve 448 kız) hastanın panoromik filmleri ve fotoğrafları retrospektif olarak değerlendirilmiştir. Hipodonti, hiperdonti (supplemental, meziodens), ve ikiz diş (füzyon, geminasyon) varlığı tespit edilmiştir. Verilerin istatistik analizinde Fisher's exact test ve ki-kare testi kullanılmıştır.
Bulgular: Dental anomali oranı %2.7 olarak saptanmıştır. En yaygın görülen diş anomalisi ikiz diş(%1.4), olarak bulunmuş olup, bunu hiperdonti(%0.9) ve hipodonti (%0.5) izlemiştir. Tek taraflı hipodonti çift taraflıdan daha fazla görülmüştür. Süt dişi dentisyonunda de görülen tüm supernumerer dişler üst çene keser dişler bölgesindedir. Diş anomalileri erkeklerde(%1.6, n=15), kızlardan(1.1%, n=10) daha fazla görülmüş olup, fark istatistiksel olarak anlamlı bulunmuştur(p=0.001). Radyolojik inceleme sonucunda süt dişinde diş anomalisi görülen hastaların %36.0"sının(9 hasta) daimi dişlerinde de görülmüştür.
Sonuç: Süt dişi diş anomalilerin erken yaşta tespit edilmesi hastanın okluzyon bozukluklarının önlenmesinin yanı sıra, psikolojik ve fonksiyonel problemlerinin önlenmesinde de oldukça önemlidir. Ayrıca süt dişi dentisyonunda görülen diş anomalileri daimi dentisyonu da etkilemektedir.
Anahtar kelimeler: *Diş anomalileri, hiperdonti, hipodonti, süt dişi.*

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INTRODUCTION

As in permanent dentition, dental anomalies in size, form, and number variances can be observed in primary dentititon. [1-4] Dental anomalies are usually detected during routine dental controls owing to an obvious deviation of the midline, malocclusion, rampant caries or due to the associated esthetic problems.[3] The prevalence of dental anomalies is also an important data in the genetical studies.[1,3] Dental anomalies in primary dentition may be a cause of either an isolated abnormality or a part of various syndromes. In epidemiological studies, it is important to differentiate dental anomalies that occur as part of syndromes. [2]

Dental anomalies in form and in number observed in primary dentition may also affect permanent dentition.[5] Early diagnosis is particularly important for long-term treatment planning. Various studies have reported higher prevalence of anomalies of permanent dentition as compared to those of primary dentition.[3,6] Reported prevalence rates of anomalies of primary dentition have ranged between 1.3%–7.2%.[1-4,7] Although the etiology of dental anomalies is not known, factors like gender, race, and environmental conditions are considered to have a significant influence.[1-4] Dental anomalies of primary dentition include hyperdontia (supernumerary teeth), double teeth (fusion, gemination), and hypodontia. [5]

Hyperdontia or supernumerary refers to the presence of one or more extra teeth is present than expected number of teeth. A supernumerary tooth with a normal form is called supplemental tooth, that with an atypical form (conical, tuberculate, or molariform shaped crown) is called mesiodens tooth. [4,8] Although the etiology of supernumerary teeth is not exactly known, a split in the tooth germ or extra budding of the dental lamina is thought to be the pathogenetic mechanism.[9,10]

The prevalence of supernumerary teeth tends to vary in different populations; prevalence rates of 1%–3.6% for permanent dentition and 0.05%–0.8% for primary dentition have been reported.[11-14] Various studies demonstrated that supernumerary teeth found by 2:1 at boys than girls and also more at maxillary region than mandibulary.[5,11]

Supernumerary teeth in primary dentition are generally found in premaxillary region. However, irrespective of the involved region, supernumerary teeth affect facial esthetics, and may cause unerupted incisiors, positional defects, rotation, midline diastema, delay in permanent teeth eruption, dentigerous or primordial cyst formation, root resorption of adjacent teeth, and orthodontic problems. Hence, it is essential to detect them at an early stage of development.[13]

The term "double teeth" is used for adjacent or twin teeth formations. Despite their similar clinical presentation, fusion and gemination are two different dental anomalies. While gemination is caused by the division of a single tooth bud, fusion is recognized as a developmental anomaly caused by the union of two separate tooth buds.[6]

In case of gemination, two teeth are formed from one single bud. Although no supernumerary tooth is observed in this case, the tooth crown tends to be larger. Fusion is recognized by the missing teeth. Both fusion and gemination may affect primary and permanent dentition.[6]

The etiology of fusion is not completely understood.[15] It is thought to result from fusion of two teeth prior to their calcification due to some physical trauma or pressure that brings this in close apposition to each other. In this case two teeth become a very large single tooth. If they fuse after the completion of the teeth crown, only one large root is observed. In either case dentine is always affected. Teeth may also have one single or two separate root canals. The fusion may happen either between two normal teeth or one single normal and one surnumerary tooth.[6] The reported prevalence of double teeth in primary and permanent dentition is 0.5%, 1.5%, and 0.1%, respectively.[15,16] Studies have shown that the prevalence of double teeth in Asian countries is significantly higher than that in European and North American countries.[15,16]

The absence of one or more teeth is called as hypodontia.[1,3] Hypodontia in primary teeth is typically followed by hypodontia in the permanent teeth. Early diagnosis of hypodontia will help to plan adequate dental treatment. It is also essential to inform the families accordingly.[1,2] The prevalence of hypodontia in primary dentition ranges from 0.2%–2.3%. [1-4]

The objective of this study was to evaluate the prevalence of dental anomalies (supernumerary teeth, double teeth, hypodontia) of primary dentition in children aged 2–5 years.

Subjects and Methods

The study was approved by the Dokuz Eylul University Noninvasive Clinical Research Ethics committee (protocol number: 2325-GOA and decision number: 2015/24-10).

Sample

The present study was conducted among children in the age-group of 2–5 years who visited child dental clinic at the Dokuz Eylül university hospital between January 01.2016 and December 31, 2017 Out of a total of 935 children, those who had supernumerary teeth (mesiodens, suplemental), double teeth (fusion and gemination) and hypodontia were eligible for this study. Dental anomalies were examined in all primary teeth in the mouth. All children photographs and radiographs were examined by a pedodontist. The same criteria were used to diagnose dental anomalies in the permanent dentition analyzed on the panoramic radiographs. Healthy children with primary dentition, who had no history of tooth loss due to trauma or extraction, were enrolled in this study. Children with systemic disease, chronic use of medication and those with cleft lip and/or cleft palate were excluded.

Dental anomalies

The entire maxillary and mandibular arches were examined. Three anomalies, supernumerary teeth, hypodontia and double teeth were recorded in primary dentition. Dental anomalies including variations in tooth size, morphology, and number were recorded according to the criteria described by Kreiborg et al.[17] (Table 1). The anomalies in number of teeth (supernumerary teeth and hypodontia) were determined by counting the number of teeth on dental arch, while morphological anomalies (double teeth) were determined by the number and appearance of the teeth. Additionally, data on sex and the specific affected site on the dental arc was examined.

Table 1. Dental anomalies representing variations in tooth size, morphology, and number
were recorded according to the criteria described by Kreiborg et al.[17]

Hypodontia		**Absence of one or only a few teeth**
Hyperdontia (Supernumerar)	Mesiodens	Supernumerary tooth present in the pre-maxilla between the two central incisors
	Supplemental	An additional tooth to the normal series which resembles the tooth with which it is associated
Double teeth	Fusion	Union in dentin and/or enamel between two or more separately developed normal teeth
	Gemination	Incomplete division of a tooth germ

Statistical analysis

All data analyses were performed with Statistical Package for Social Sciences (SPSS) for Windows 20.0 software program (SPSS Inc., Chicago, IL, USA). Descriptive analysis was performed to evaluate the frequency of dental anomalies. Chi-squared and Fisher exact test were used to assess the association of age, sex and geographical religion with prevalence of dental anomalies in study subjects. A significance level of $p<0.05$ was adopted.

RESULTS

Out of 935 children in the 2–5 years age-group with primary dentition, 487 (52.1%) were boys and 448 (47.9%) were girls. Anomalies were observed in 25 children, which corresponded to an overall prevalence of 2.7% (Table 2). Radiographic examination showed 36.0% of the patients (9 children) had anomalies in the permanent dentition. Twenty three children had unilateral, while two children had bilateral primary teeth anomalies. A fusion on the right and a hypondia on the left of the mandubular was found in one child with bilateral primary teeth anomaly (Table 3). Left and right hypondia were found in maxillary lateral incisors of the second child. Pictures of inner mouth, intra-oral radiograph and panoramic radiograph of the patients who had clinical primary dentititon anomalies were evaluated (Fig.1,2). Dental anomalies were significantly more frequent ($p<0.001$) in boys (1.6%, n=15) than in girls (1.1%, n=10). While dental anomaly is not seen at the age of 2, this rate increased to 0.3% at the age of 3 years, 1.2% at the age of 4 years and 1.3% at the age of 5 years.

Table 2. Distribution of dental anomalies by sex and age (Unit of analysis: Children and Teeth)

		N (%)	**Children N (%)**	**Teeth n (%)**
Sex	Female	448(47.9)	10(1.1)	10(1.1)
	Male	487(52.1)	15(1.6)*	17(1.8)*
	Total	935	25(2.7)	27(2.9)
Age	2	46(4.9)	-	-
	3	135(14.4)	3(0.3)	4(0.4)
	4	348(37.2)	10(1.1)	11(1.2)
	5	406(43.4)	12(1.3)	12(1.3)

N, number of children examined n, number of children with dental anomalies.
****p value: chi-squared test. (p<0.05)***

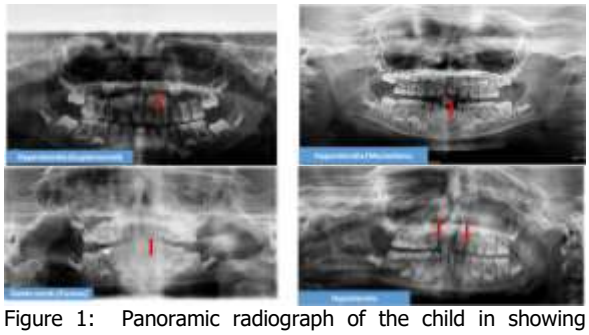

Figure 1: Panoramic radiograph of the child in showing hyperdontia (supplemental) primary maxillary left lateral incisor. Panoramic radiograph of the child in showing hyperdontia (meziodens) primary maxillary incisors. Panoramic radiograph of the child in Double teeth (fusion) involving primary maxillary incisor region and showing agenesis of the permanent maxillary lateral incisors. Panoramic radiograph of the child in showing bilateral tooth agenesis of the primary maxillary lateral incisors and permanent maxillary lateral incisors.

Fig. 2 a) Double teeth (gemination) involving primary maxillary incisors region. b) Double teeth (fusion) involving primary maxillary incisors region and tooth agenesis of the lateral incisor. c) Hyperdontia (supplemental) involving primary maxillary central incisors region. d) Hyperdontia (meziodens) involving primary maxillary central incisors region. e) Unilateral tooth agenesis of the primary maxillary lateral incisor region. f) Double teeth involving primary mandibular right incisor/canine region and tooth agenesis of the contralateral incisor.

Double teeth were the most frequently observed anomaly (1.4%), followed by hyperdontia (1.0%), and hypodontia (0.5%). Unilateral missing teeth were more frequently observed than bilateral missing teeth. Dental anomalies in maxilla (2.0%) were significantly more frequent than those in mandile (0.9%) ($p<0.001$). All supernumeray teeth were found in maxilla (1.0%) ($p<0.001$), and mesiodens (0.6%) were more frequently observed than suplementals (0.3%). Hyperdontia were significantly more frequent ($p<0.001$) in boys than in girls. Mesiodens cases (0.6%), early loss of the primary maxillary central incisor or its luxation was observed. The suplemental teeth in primary dentition were single and located in the lateral incisor region in maxilla. The mesiodens teeth in primary dentition were located in the central incisor region in maxilla. No anomaly was observed in the permanent dentition following the case of maxillar suplemental and mesiodens teeth (Table 4). All children with tooth agenesis in the primary dentition also showed agenesis of the permanent dentition. Patients with hypodontia in the primary dentition, in our study, displayed hypodontia in the permanent dentition in 100% (3 children) of the cases. In all cases of tooth agenesis in the primary dentition, the missing tooth was the lateral incisor.

Double teeth and hypodontia were detected in both maxilla and mandible with no significant between-group difference. Double primary teeth were found mostly in the maxilla (61.5%). In all three patients, while fusion on maxilla is formed involving cental and lateral incisors, on mandible it is formed involving the lateral incisors and canines. Approximately 46.2% of cases experienced further problems in the permanent successors.

Table 3. Distribution of dental anomalies by sex and dental arch

Unit of analysis (%)	N (%)	n (%)	Hyperdontia		Double teeth		Hypodontia
			Meziodens	Suplemental	Fusyon	Gemination	
Children(N) Teeth(n)	25(2.7)	27(2.9)	6(0.6)	3(0.4)	6(0.6)	7(0.8)	**5(0.5)**
Sex							
Female	10(1.1)	10(1.1)	1(0.1)	-	1(0.1)	5(0.6)	**3(0.3)**
Male	15(1.6)*	17(1.8)*	5(0.5)	3(0.4)	5(0.5)	2(0.2)	**2(0.2)**
Arch							
Upper	18(1.9)*	19(2.0)*	6(0.6)*	3(0.3)*	3(0.3)	5(0.5)	**2(0.2)**
Lower	7(0.8)	8(0.9)	-	-	3(0.3)	2(0.2)	**3(0.3)**
Unilateral	23(2.5)*	23(2.5)*	6(0.6)	3(0.3)	5(0.5)	7(0.8)	**2(0.2)**
Bilateral	**2(0.2)**	**4(0.4)**	**-**	**-**	**1(0.1)**	**-**	**3(0.3)**

N: The number of children with dental anomalies n: The number of teeth with dental anomalies *Fisher exact test: p<0.001.

Table 4. Anomalous primary teeth and its effect on permanent teeth

Anomaly	No of childrens with anomalies in	No of children with anomalies in the	Degree of effect (%)
Hyperdontia	9	-	-
Double teeth	13	6	46.2
Hypodontia	3	3	100.0
Total	25	9	36.0

DISCUSSION

Hyperdontia, hypodontia and double teeth seen in primary dentition may also be present in permanent dentition.[3,5,13,18,19] Studies performed on primary dentition show a dental anomaly rate of 1.3%–7.2% (Table 5).[1-3,5,7,17,20]

Table 5. Prevalence of dental anomalies of primary dentition in different geodemographic regions

Reference N(%)	Country (n)	Hyperdonti	Double	Hypodontia	Overall
Chen et al.(1)	Taiwan(2611)	1.0	3.0	2.0	**5.0**
Deolia et al.(2)	India (1300)	0.3	2.3	0.6	**4.0**
Gomes et al.(3)	Brazil (1718)	0.3	1.0	0.3	**1.8**
Kapdan et al.(4)	Turkey(1140)	0.3	1.3	0.2	**2.0**
Mukhopadhyay et al.(5)	Bengali (2757)	0.4	0.4	0.5	**1.8**
Kramer et al.(7)	Brazil(1260)	0.3	1.3	0.6	**2.5**
Carvalho et al.(18)	Belgian (750)	0.8	0.7	0.4	**1.8**
Yonezu et al.(19)	Japanese(3722)	0.007	4.1	2.4	**7.2**
Magnusson(20)	Iceland(937)	0.5	0.7	0.5	**1.7**
Whittington et al.(21)	New Zealand(1037)	0.2	0.8	0.3	**1.4**
King et al.(22)	Chines (936)	2.8	4.1	4.1	**6.3**
Järvinen et al.(25)	Finland (1111)	0.4	0.7	0.9	**1.3**
Jones et. al.(26)	USA (493)	0.2	0.4	-	**-**
Present study	**Turkey (935)**	**1.0**	**1.4**	**0.5**	**2.7**

In this study, a total of 27 (2.9%) dental anomalies in 25 (2.7%) children pertained to primary dentition. The prevalence of dental anomalies observed was higher than that reported in some studies,[3-5,18,20,21] and lower than that reported in some of the others; [1,2,22] however, it was very close to that reported by Kramer et al.[7] (2.5%). This difference in prevalence of primary dentition dental anomalies may be attributable to differences in sample size, ethical and genetical differences. Moreover, the clinical studies have reported higher prevalence rates than those reported by studies perfomed in schools and other places.[4]

We found a higher prevalence of dental anomalies among boys (1.6%) as compared to that in girls (1.1%). While some earlier studies found no statistically significant difference between boys and girls,[1,3,5] some others have reported a higher prevalence of dental anomalies among girls.[6] Kapdan et al.[4] and Whittington et al.[21] reported a higher prevalance of dental anomalies in primary dentition in boys as compared to that in girls, which is consistent with our findings.

While Delio et al.[11] found most dental anomalies in children at the age of 3 year, we found that most anomalies in children at the age of 5. This may be attributed to the high rate of mesiodens seen in this age group.

Hyperdontia teeth in primary dentition are rarer than that in permanent dentition.[1,3,5,22] The prevalence in primary dentition varies between 0.07%–2.8%.[1,3,4,19,22] In the present study, the prevalence of hyperdontia was 1.0%. Kapdan et al.[4] found a lower hyperdontia prevalence (0.3%) in their study on Turkish children aged 2–5 years. The fact that this study was performed in a clinical setting, which included children showing mesiodens brought by their parents to the clinics likely contributed to the higher prevalence of dental anomalies.

As in the study of Mukhopadhyay et al.[5] mesiodens tooth was the most frequently seen hyperdontia in this study. However, in a study conducted on Japanese children with primary dentition by Miyoski et al.[23] suplemental teeth between maxillary lateral incisors were the most frequent hyperdontia.

Permanent maxillary central incisors erupt between six and seven years of age.[18] Before this period, in the absence of trauma, if a luxation occurs on left and/or right primary maxillary central incisor and if these teeth are lost earlier, the possibility of mesiodens might be checked by a dental radiographic of this location. In most of the mesiodens cases (0.6%), early loss of the primary maxillary central incisor or its luxation was observed.

Parents usually do not recognize suplemental teeth; therefore, such teeth are typically detected during the routine dental controls. In a study by King et al.[22] supplemental teeth were found mainly between the maxillary lateral incisors. In the present study, three children had supplemental teeth and all were located in maxillary between the laterals. In this study, hyperdontia was more commonly found in boys as compared to that in girls, although the difference was not statistically significant. Mukhopadhyay et al.[5] reported the same relation between hyperdontia and gender. Also, Kim et al.[24] found mesiodens twice more frequently in boys as compared to that in girls.

While some researchers reported more frequent hypodontia in maxillary lateral incisors,[5,21,25] others have found these more frequently in mandibular lateral incisors.[22] In this study, hypodontia was observed both in maxilla and mandible; there was no significant difference in this respect. While bilateral hypodontia was found in three children, only one child showed maxillary unilateral hypodontia. In this study, all children had missing primary lateral teeth. The reported prevalence of hypodontia in primary dentition has ranged between 0.2%–4.1% in various pediatric populations.[1,4,19,22] While the prevalence of hypodontia in the present study was 0.5%, Chen et al.[1] reported 2.0% prevalence in Taiwanese children, Yanezu et al.[18] reported a 2.4% prevalence in Japanese children, and King et al.[22] reported a 4.1% prevalence in Chinese children. In European populations, the

reported prevalence has varied between 0.2 and 0.9%,[1,18,20,25] which is closer to our findings. While many researchers, like in this study, found no significant relation between hypodontia and sex.[1,7,23,25] King et al.[22] reported higher prevalance in girls as compared to that in boys.

In the present study, all children (3 children) with hypodontia in the primary dentition demonstrated hypodontia in the permanent dentition. This was in agreement with the reports of Whittington et al.[21] and Mukhopadhyay et al**.** [5] who observed it in 100% of the cases.

Double tooth is observed more frequently in primary dentition (0.4%–4.9%) as compared to that in permenant dentition (0.1%).[5,15,16,19,21,26] It is also more frequently found in Asia1 (2.3%–4.1%),[2,17,20] than in Europe (0.7%–1.3%),[4,18,20,25] and USA (0.4%) (24). In this study the prevalence of double teeth was 1.4%, which is quite close to that reported in Turkish children (1.3%) by Kapdan et al. [4]

So far, the etiology of double teeth is not known. Environmental factors, genetics, premature birth, trauma, and vitamin deficiency are thought to be involved in its causation.[27-29]

In primary dentition, early diagnosis of fusion and gemination is essential as it helps to identify potential problems and their treatment in permanent dentition. In most of the cases where a fusion is identified in primary dentition, a congenital missing tooth is observed in permanent dentition.[21] However, in case of gemination, congenital missing teeth is not always present in permanent dentition.[3,21] In this study, while all 6 children who presented fusion in primary dentition had congenital missing teeth in permanent dentition, none of the cases with gemination had a congenital permanent missing teeth. Several studies have shown that double primary teeth have an influence on permanent successors, including hypodontia, supernumerary teeth.[3,5,13,29] Wu et al. [13] report, the influence of permanent successors was 55.9% when double primary teeth involved the lateral incisors and canines. In our study, the overall percentage of permanent tooth anomalies was 46.2%.

Aguiló et al. [30] in their study on primary dentition, reported double teeth both on left and right sides of maxilla and mandible without any statistically significant difference. Similarly in this study double teeth was found in both arches and no statistically significant difference was observed in the incidence of double teeth between maxilla and mandible. Association between gender and double teeth has not been reported.[3,30] In the present study, too, no such association was observed. However, Yonezu et al.[19] reported a higher prevalence of double teeth in mandible as compared to that in maxilla and a higher prevalence among girls than in boys.

This study was conducted in a university clinical setting, and the findings may not be representative of the prevalence of dental anomaly prevalence in the general population. Besides the retrospective study design does not allow for causal inferences.

CONCLUSION

Our findings are in line with most of the previous reports related to these dental anomalies in primary dentition and emphasize the encouragement of parents to bring their young children for regular dental examinations. Anomalies in the primary dentition are important because of their effect on the underlying permanent dentition. A careful and detailed examination by a specialist will certainly help to determine the problems at an early stage and allow for effective and long term treatment planning based on the child's age, gender and the location of the anomalies.

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