Hypodontia. Does the Prevalence and Distribution Pattern Differ in Orthodontic Patients?

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ABSTRACT

Objective: The aim of this study was to document the prevalence of hypodontia in the permanent dentition among a group of Turkish sample who sought orthodontic treatment and to compare present results with the specific findings of other populations. The occurrence was evaluated in relation to gender, specific missing teeth, the location and pattern of distribution in the maxillary and mandibular arches and right and left sides.

Materials And Methods: Orthodontic files of 2413 patients (1557 females-mean age: 17.78±5.41 years old and 856 males-mean age:17.02±5.47 years old) which included orthopantomograms, study models, and anamnestic data were examined for evidence of hypodontia.

Results: The prevalence of hypodontia was 7.54% (8.09% for female and 6.54% for male). Hypodontia was found considerably more frequently in the maxilla than in the mandible. Similarity in the distribution of missing teeth between the right and left sides was detected. The most frequently missing teeth were the maxillary lateral incisors, followed by the mandibular and maxillary second premolars. The majority of patients had one or two teeth missing, but seldom three or more.

Conclusions: Present data for hypodontia were within the wide range reported in the literature. The findings of patients with hypodontia involving the anterior teeth and others missing more than two teeth in the same quadrant were an indication of a great need for orthodontic treatment. By early detection of missing teeth, alternative treatment modalities can be planned and performed with a multidisciplinary team approach. (Eur J Dent 2007;1:167-173)

Key Words: Hypodontia; Patient; Panoramic radiograph; Turkish; Prevalence.

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INTRODUCTION

One of the main reasons for assessing a patient prior to orthodontic treatment is to determine the number of teeth present. The developmental absence of one or more teeth from the dentition is known as hypodontia.[1] Clinicians often claim that hypodontia has increased during recent decades. Possible explanations for this finding could be an improvement in imaging over the years, increasing dental awareness and unidentified environmental factor influencing the phenotype.[2]

Hypodontia is a subject that has been widely reported in different parts of the world (Table 1).[3-21] The studies have included case reports,[22]

missing teeth in populations of orthodontic cases,[4,15,19-21] and epidemiologic studies.[3,5-14,17,18,23] The data for hypodontia, excluding the third molars, in both genders combined varies from 0.3% in the Israeli population[3] to 11.3% in the Irish[13] and 11.3% in Slovenian populations.[20] The different findings could be explained by the variety in the samples examined in terms of age range, ethnicity and type of radiographs used for evaluation.

As a rule, if only one or a few teeth are missing, the absent tooth will be the most distal tooth of any given type[24] i.e. lateral incisors, second premolars and third molars. In many populations, it has been demonstrated that, except third molars, the most commonly missing teeth are the maxillary lateral incisor, mandibular and maxillary second premolar.[3,10,15,20] According to Jorgenson[24] the mandibular second premolar is the tooth most frequently absent after the third molar, followed by the maxillary lateral incisor and maxillary second premolar, for Europeans.

In the literature, hypodontia was found more frequently in females than males.[2,3,4,7,20] Most authors report a small but not significant predominance of hypodontia in females, but statistically significant differences have been found in some researches.[2,3,4,7]

Many studies have demonstrated that there is no consistent finding as to which jaw has more missing teeth. In the literature, few studies have compared the prevalence rates of tooth agenesis between the anterior and posterior regions and showed the distribution of missing teeth between the right and left sides.

Literature search in June 2006 revealed no previous studies about the prevalence of hypodontia in the permanent dentition in Turkish population and in Turkish orthodontic patients.

The aim of this study was to document the prevalence of hypodontia in the permanent dentition among a group of Turkish sample who sought orthodontic treatment and to compare present results with the specific findings of other populations. The occurrence was evaluated in relation to gender, specific missing teeth, the location and pattern of distribution in the maxillary and man-

Table 1. Comparison of findings of hypodontia in various populations.

Author	Ref. No	Year of Publication	Population	Sample Size	Females [%]	Males [%]	Preva-lence [%]
Rosenzweig KA, Garbarski D.	3	1965	Israel	_	_	_	0.30
Rose JS.	4	1966	UK	6000	5.1	3.53	4.30
Haavikko K.	5	1971	Finland	1041	_	_	8.00
Bot PL and Salmon D.	6	1977	France	5738	_	_	1.90
Magnusson TE.	7	1977	Iceland	1116	8.9	6.70	7.90
Rolling S.	8	1980	Denmark	1529	7.80	7.70	7.80
Davis PJ.	9	1986	China	1093	7.70	6.1	6.90
Nik-Hussein NN.	10	1989	Malaysia	1583	3.5	2.2	2.80
Al Emran S.	11	1990	Saudi Arabia	500	_	_	4.00
Lynham A.	12	1990	Australia	662	_	_	6.30
O'Dowling IB and McNamara TG.	13	1990	Ireland	3056	12.54	10.43	11.30
Sterzik G et al.	14	1994	Germany	3238	_	_	8.10
Cuairan RV et al.	16	1996	Mexica	593	_	_	6.30
Ng'ang'a RN and Ng'ang'a PM.	17	2001	Kenya	615	5.30	7.20	6.30
Nordgarden et al.	18	2002	Norway	430	5.10	4.00	4.50
Tavajohi-Kermani H et al.	19	2002	USA	1016	6.00	3.00	8.80
Fekonja A.	20	2005	Slovenia	212	7.10	4.20	11.30
Endo T et al.	21	2006	Japanese	3358	9.30	7.50	8.50

dibular arches and right and left sides.

MATERIALS AND METHODS

A total of 4000 orthodontic patient files from the Department of Orthodontics of Erciyes University, Kayseri and Kırıkkale University, Kırıkkale were reviewed. The patient files (panoramic radiographs, specific periapical radiographs, dental casts, anamnestic data), were the only sources of information used to diagnose hypodontia.[21] If an accurate diagnosis of hypodontia could not be made, the files were excluded. Moreover, radiographs of patients with any syndrome or cleft lip/palate were excluded from the study. The patients had no previous loss of teeth due to trauma, caries, periodontal disease, or orthodontic extraction.

A total of 2413 patients' records of sufficient quality were selected. All files were from Turkish patients ranging from nine to 36 years of age, 1557 of which were females with an average of 17.78±5.41 years old, and 856 of which were males with an average of 17.02±5.47 years old.

All radiographs were evaluated on the dental viewer by one author (Y.S.). A tooth was registered as congenitally missing when no trace could be found on the radiograph and the treatment records confirmed that the tooth had not been extracted. Third molars were not included to the investigation. In all cases, the radiographic findings were checked and consistent with the previously recorded information in the notes.

All descriptive and comparative statistical analyses were performed using the SPSS software package (Statistical Package for Social Sciences, Windows 98, version 10.0, SPSS Inc., Chicago, IL, USA). To compare the differences between male and female patients, maxillary and mandibular jaw and right and left side, chi-square or the t-test was performed. The level of significance tested was $P<.05$.

RESULTS

Of 2413 cases examined, 182 demonstrated a congenital absence of one or more teeth (Table 2). The prevalence of hypodontia was 7.54 percent for a Turkish orthodontic patient population. One or more congenitally missing teeth were found in 126 (8.09%) female and 56 male (6.54%) patients.

The number of missing teeth per child ranged from one to 15 in the present study. Of all the 182 patients with hypodontia, 83% had one or two missing teeth, 15% had three to five missing teeth and 2% had six or more missing teeth (Table 3). Distribution of hypodontia (Figure 1) and statistical comparisons by tooth type in different genders are shown in Table 4. Female hypodontia prevalence was higher than males nearly in all tooth types. The differences in reported prevalence between the genders were found statistically significant for the tooth number "14", "12" and "11" ($P<.05$).

Distribution and statistical comparisons of missing teeth according to site in the jaws are shown in Table 5. Statistically significant differences were found for five of the 14 investigated teeth.

Frequency of absence and test results in relation to right and left side, in maxillary, and mandibular arches are shown in Table 6. Hypodontia was found more often on the left side than on the right side (8.50 and 7.13 percent, respectively), but no statistically significant differences were detected.

DISCUSSION

Tooth agenesis (currently the most common anomaly in the development of the human den-

Table 2. Distribution of subjects and prevalence of hypodontia.

Gender	Number of Patients		Prevalence (%)
	Affected	Examined	
Female	126	1557	8.09
Male	56	856	6.54
Total	182	2413	7.54
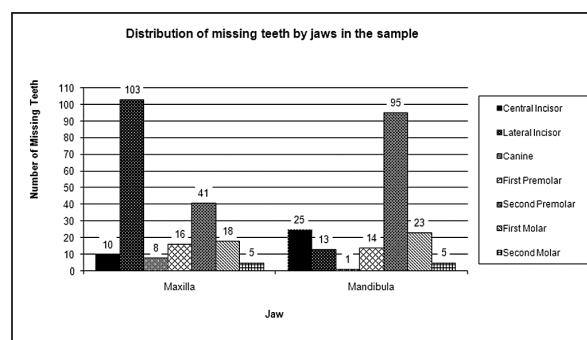
Figure 1. Distribution of missing teeth by jaws in the sample.

tition) is one of the most intriguing phenomena, because it is frequently associated with other oral anomalies, structural variations and malformations of other teeth, late eruption, transposition and crowding.[25,26] Dental practitioners have claimed that they have seen more and more patients with hypodontia in the latest decades, thus when a patient is assessed for orthodontic purposes, the possibility that one or more teeth may be congenitally missing from the permanent dentition must be kept in mind.[10]

Calcification of the crown starts at the age of 3 years and is generally complete at 6 years.[18] In some individuals, there may be delayed development of premolars,[27] hence nobody can be absolutely certain that these teeth are missing below the age of about nine years, especially among males.[17] Wisth et al[28] proved that the prevalence of missing teeth is higher when examined at the

age of 7 years compared with 9 years of age. At 7 years, 7.1 percent of the children had missing teeth, while 2 years later hypodontia was diagnosed in only 6.6 percent of the same sample. For that reason, patients older than 9 years were included into the present sample.

The present study revealed a hypodontia prevalence of 7.54 percent in this sample of orthodontically treated patients, excluding third molars. This frequency is consistent with the 1.6-9.6 percent reported for a normal population and 8.1 percent reported for orthodontically treated patients in Magdeburg.[14] However, Fekonja[20] reported considerably higher (11.3 percent) and Silva Meza[15] reported lower (2.7 percent) hypodontia prevalence in orthodontic patients. The findings of patients with hypodontia involving the anterior teeth and others missing more than two teeth in the same quadrant were an indication of a great need for

Table 3. Distribution of numbers of missing teeth among orthodontic patients with hypodontia (n: 182).

Number of missing teeth	Females	%	Males	%	Total	%
1	47	25.82	18	9.89	65	35.71
2	59	32.42	27	14.84	86	47.25
3	10	5.49	2	1.1	12	6.59
4	6	3.3	6	3.3	12	6.59
5	1	0.55	2	1.1	3	1.65
6 ≤	3	1.65	1	0.55	4	2.2
Total	126	69.23	56	30.77	182	100

Table 4. Distribution of hypodontia and statistical comparisons by tooth type in different genders.

Tooth Number≠	Male		Female		Total		Sig	Tooth Number≠	Male		Female		Total		Sig
	No.	%	No.	%	No.	%			No.	%	No.	%	No.	%	
17	0	0	2	0.13	2	0.13	NS	37	1	0.12	1	0.06	2	0.18	NS
16	2	0.23	6	0.39	8	0.62	NS	36	3	0.35	9	0.58	12	0.93	NS
15	9	1.05	10	0.64	19	1.69	NS	35	18	2.1	35	2.25	53	4.35	NS
14	0	0	8	0.51	8	0.51	*	34	1	0.12	6	0.39	7	0.5	NS
13	1	0.12	1	0.06	2	0.18	NS	33	0	0	0	0	0	0	NS
12	9	1.05	38	2.44	47	3.49	*	32	3	0.35	3	0.19	6	0.54	NS
11	3	0.35	0	0	3	0.35	*	31	4	0.47	9	0.58	13	1.05	NS
21	2	0.23	5	0.32	7	0.55	NS	41	5	0.58	7	0.45	12	1.03	NS
22	16	1.87	40	2.57	56	4.44	NS	42	4	0.47	3	0.19	7	0.66	NS
23	3	0.35	3	0.19	6	0.54	NS	43	0	0	1	0.06	1	0.06	NS
24	2	0.23	6	0.39	8	0.62	NS	44	2	0.23	5	0.32	7	0.55	NS
25	8	0.93	14	0.9	22	1.83	NS	45	16	1.87	26	1.67	42	3.54	NS
26	3	0.35	7	0.45	10	0.8	NS	46	4	0.47	7	0.45	11	0.92	NS
27	1	0.12	2	0.13	3	0.25	NS	47	2	0.23	1	0.06	3	0.3	NS

NS indicates: not significant; *: P<.05, ≠ Federation Dentaire International Notation

orthodontic treatment. By early detection of missing teeth, alternative treatment modalities can be planned and performed with a multidisciplinary team approach.

Four individuals (0.17 percent) in this sample were found to have agenesis of six or more teeth, consistent with oligodontia. This value is similar with the other Scandinavian studies[8] but higher than the findings of Nordgarden et al[18] (0.0084 percent). According to the WHO, a condition is regarded as rare when existing in less than 1:10,000 people, whereas the European Union defined a low prevalence as less than five per 10,000 persons (Decision No: 1295/1999/EC of the European Parliament and the Council of 29 April 1999). Thus, oligodontia in the study group (16:10,000) cannot be presented as a rare condition.

The general prevalence of hypodontia was higher in females than males according to present findings. In the literature, no differences were found when comparing the total prevalence of hypodontia between males and females,[7,8,12,16,17] although others report a higher incidence in females than in males,[9,10,15,18,20,21] even though we determined significant differences for some teeth (Table 4).

Table 5. Distribution and statistical comparisons of missing teeth according to site in the jaws.

Tooth Number#	Maxilla		Tooth Number#	Mandible		Sig	Tooth Number#	Maxilla		Tooth Number#	Mandible		Sig
	No.	%		No.	%			No.	%		No.	%	
11	3	0.12	41	12	0.5	*	21	7	0.29	31	13	0.54	NS
12	47	1.95	42	7	0.29	***	22	56	2.32	32	6	0.25	***
13	2	0.08	43	1	0.04	NS	23	6	0.25	33	0	0	NS
14	8	0.33	44	7	0.29	NS	24	8	0.33	34	7	0.29	NS
15	19	0.79	45	42	1.74	***	25	22	0.91	35	53	2.2	*
16	8	0.33	46	11	0.46	NS	26	10	0.41	36	12	0.5	NS
17	2	0.08	47	3	0.12	NS	27	3	0.12	37	2	0.08	NS

NS indicates; not significant, *: P<.05; ***: P<.001; # Federation Dentaire International Notation

Table 6. Frequency of absence and test results in relation to right and left side, in maxilla and mandibula

Maxilla							Mandibula						
Right Side			Left Side				Right Side			Left Side			
Tooth Number #	No.	%	Tooth Number#	No.	%	Sig	Tooth Number#	No.	%	Tooth Number#	No.	%	Sig
11	3	0.12	21	7	0.29	NS	41	12	0.5	31	13	0.54	NS
12	47	1.95	22	56	2.32	NS	42	7	0.29	32	6	0.25	NS
13	2	0.08	23	6	0.25	NS	43	1	0.04	33	0	0	NS
14	8	0.33	24	8	0.33	NS	44	7	0.29	34	7	0.29	NS
15	19	0.79	25	22	0.91	NS	45	42	1.74	35	53	2.2	NS
16	8	0.33	26	10	0.41	NS	46	11	0.46	36	12	0.5	NS
17	2	0.08	27	3	0.12	NS	47	3	0.12	37	2	0.08	NS

NS indicates; not significant; # Federation Dentaire International Notation

The maxillary lateral incisor is clearly the most frequently missing tooth, followed by the mandibular second premolar, maxillary second premolar and mandibular incisor. Agenesis of maxillary and mandibular canines and second molars are very rare. These findings are consistent with most of the previous data.[3,10,15,20,29] In some studies, a different sequence from most to least affected teeth was found. In contrast with our findings, some of them indicate that the most frequently absent teeth are: the mandibular second premolar, followed by the maxillary second premolar, the maxillary lateral incisor and the mandibular central incisor.[7,8,17,18,21] Nevertheless, almost all of these findings were taken from whole population studies. In a sample of orthodontically treated patients, Silva Meza[15] found the same sequence as the present one. Interestingly, mandibular lateral incisor agenesis has a higher prevalence rate in Japanese orthodontic patients.[21] Higher incidence of lateral incisor prevalence in samples of orthodontic patients could be explained by missing tooth's localization. Dental awareness and aesthetic anxiety of patients might be high in patients with missing anterior teeth.

Many studies have demonstrated that there is no consistent finding as to which jaw has more missing teeth.[3-5,7-13,15,21,23,27,28,30,31] Present study supports the finding that more teeth were missing from the maxilla (maxilla: 201 teeth; mandible: 176 teeth) than from the mandible and differ from those reported by Silverman,[23] Dolder,[30] and Kırzıoglu et al[31] who found more absences in the mandibular arch.

There was a remarkable similarity in the distribution of missing teeth between the right and left sides in our subjects, this agrees with the results of most previous studies.[3,4,7,8,15,21,27,28,30]

CONCLUSIONS

The hypodontia prevalence of 7.54 percent found in the current sample of orthodontically treated patients was generally similar with the researches for Caucasoid populations. Hypodontia was found considerably more frequently in the maxilla than in the mandible and similarity was detected in the distribution of missing teeth between the right and left sides. The most frequently missing teeth were the maxillary lateral incisors, followed by the maxillary and mandibular second premolars. The majority of patients had one or two teeth missing, but seldom three or more.

By early detection of missing teeth, alternative treatment modalities can be planned and performed with a multidisciplinary team approach in order to establish an aesthetic and functional dentition in the future and to minimize the complications of hypodontia.

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