

# Assessment of hypodontia in the Turkish patients referring to the orthodontic clinic: A retrospective study

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## ABSTRACT

**Objective:** The aim of this retrospective study was to assess the prevalence and distribution of hypodontia in the permanent dentition in a sample of Turkish patients who referred to the Ankara Dental Hospital for orthodontic treatment. **Materials and Methods:** The pre-treatment orthodontic records of 2530 patients, 1382 girls (54.62%) and 1148 boys (45.38%) between the chronological ages of 7 and 16 years, were examined for evidence of hypodontia. The third molars were excluded in this study. **Results:** The prevalence of hypodontia in the inspected population was 5% (3.05% for girls, 1.95% for boys). The average number of the congenitally missing teeth per patient was 2.03 (1.08 for girls, 0.95 for boys). The prevalence of the congenitally missing permanent teeth was 34% for the upper laterals, 30% for the lower second premolars, 12.5% for the upper second premolars and 23.5% for the other teeth. Most patients with hypodontia (84.9%) (57.13% for girls, 27.77% for boys) had got missing either one tooth (45.23%) or two teeth (39.67%). **Conclusions:** The prevalence of hypodontia in girls was higher than in boys in this sample of the Turkish patients. The upper laterals and lower second premolars were consecutively the most symmetrically absent teeth. The prevalence of advanced hypodontia was lower than single and symmetrical hypodontia.

**Key words:** Congenital agenesis, hypodontia, missing teeth, orthopantomograms

## INTRODUCTION

Missing teeth are the most commonly observed developmental dental anomaly and many orthodontists can frequently encounter to manage this condition in a routine clinical practice.<sup>[1,2]</sup> It was reported that although distinct genetic and syndromic conditions elevated risk of hypodontia,<sup>[3]</sup> it was frequently experienced in normal healthy person.<sup>[4]</sup> This anomaly may also exist as a non-syndromic, familial type, which was found as an isolated phenomenon.<sup>[5,6]</sup>

Hypodontia is often used as a collective term for congenitally absence of primary or secondary teeth, but

specifically it describes the missing of one to six teeth except third molars.<sup>[7]</sup> While advanced hypodontia was defined as five or more congenital absence of teeth excluding the third molars, some authors have used the term of oligodontia referring to the absence of more than six teeth excluding third molars.<sup>[8]</sup> Treatment of these agenesis is very important since they can generate inadequacies in upper and lower dental arch lengths and occlusions; these problems might complicate orthodontic treatment planning.

The prevalence of dental anomalies has been investigated in many studies.<sup>[2,9]</sup> The differences in the prevalence of congenitally missing teeth (CMT) among

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different ethnic populations were well-documented by numerous researches.<sup>[10-14]</sup> However, few studies were found in the literature regarding the prevalence of hypodontia in the Turkish people.<sup>[15-17]</sup> Therefore, the aim of this study was to examine the prevalence and distribution of hypodontia in the permanent dentition in a sample of the Turkish patients who referred to orthodontic clinic of the Ankara Dental Hospital for orthodontic treatment.

## MATERIALS AND METHODS

The data were collected from the files of orthodontic patients who referred to the orthodontic clinic of the Ankara Dental Hospital, a governmental hospital in Ankara. Pre-treatment orthodontic records of 2530 patients (range of chronological age: 7-16 years), 1382 girls (54.62%) and 1148 boys (45.38%), were searched. Diagnosis of permanent teeth missing was made using both anamnestic data and radiographs. Pre-treatment orthopantomograms were examined by one operator using a standard light box to determine all permanent forming tooth germs radiologically except third molars. Then, the findings were compared with the anamnestic records.

Medical and dental documentations provided the necessary information, such as birth weight, teeth eruption schedule, illnesses and previous dental treatments including extractions or avulsions. These data were used as a supplement to decide the CMT and to ensure the accurate diagnosis of hypodontia. Absent teeth were basically identified after this evaluation. The location and number of CMT were recorded for each individual. If there was an incompatibility between anamnestic data and radiographs, the patient was not accepted into the study. Individuals who previously treated orthodontically and patients associated with craniofacial malformations and recognizable syndromes, such as ectodermal dysplasia, cleft lip and palate or mongolism (trisomy 21) were also excluded.

For error estimation, randomly selected 250 orthopantomograms of children with or without hypodontia were re-examined under the same viewing conditions 4 weeks later from the initial survey and the number and location of CMT were recorded for a second time by another investigator. Nearly 100% reproducibility was obtained in the identification of tooth agenesis.

Statistical analyses were performed using the Statistical Package for Social Sciences for Windows,

version 20.0 (SPSS Inc., Chicago, IL, USA). The Chi-square test was used to determine the significance of differences in prevalence. The level of significance was set at 5%.

## RESULTS

Table 1 shows the distribution of patients and missing teeth by category and sex. After a detailed survey of 2530 orthodontic patients' files, a total of 126 children, 77 girls (61.11%) and 49 boys (38.89%), were found to have hypodontia in the permanent dentition, excluding the third molars. Thus, the prevalence of hypodontia in the inspected population was 5% (3.05% for girls, 1.95% for boys). The effect of gender on prevalence was not statistically significant.

The distribution of different missing teeth by sex and the percentage is presented in Table 2. Maxillary right central incisors, maxillary left second molars, mandibular right canines and first molars in both arches showed no congenital absence in this sample of the Turkish patients. There was a total 255 CMT, 136 in girls (53.33%) and 119 in boys (46.67%), in these evaluated population. The average number of CMT per child with hypodontia was 2.03 (1.08 for girls, 0.95 for boys). The difference in the number of missing teeth per child between the sexes was not significant.

Despite some differences are found between both sexes in the order of prevalence, the upper lateral incisors (more than twice as many in girls as in boys) were the most commonly missing teeth, followed by the lower second premolars and the upper second premolars. The prevalence of missing teeth was 34% for the upper laterals (23.5% for girls, 10.5% for boys), 30% for the lower second premolars (15.5% for girls 14.5% for boys), 12.5% for the upper second premolars (4.7% for girls 7.8% for boys) and 23.5% for the other teeth (9.6% for girls, 13.9% for boys).

Congenital absence of the permanent canines, generally seen in Eastern countries, was found

**Table 1: Distribution of patients and missing teeth**

Parameters	Girls	Percentage	Boys	Percentage	Total
Number of patients	1382	54.62	1148	45.38	2530
Number of patients with missing teeth	77	61.11	49	38.89	126
Number of missing teeth	136	53.33	119	46.67	255

in only five Turkish patients with advanced hypodontia (0.2%). The prevalence of CMT was higher in the maxilla (54.1%) than in the mandible (45.9%). Slightly higher prevalence of CMT was determined on the right side (51.8%) than on the left side (48.2%). However, there was almost equal prevalence between the anterior segment (incisors and canines) (49.8%) and the posterior segment (premolars and molars) (50.2%). No statistically significant associations between sex and number of teeth agenesis in the maxilla and mandible, on the right and left sides and in the anterior and posterior segments were found.

Table 3 shows the distribution of symmetrical hypodontia by sex and percentage. There was a greatly predominant appearance of symmetrical hypodontia and the most commonly symmetrical hypodontia was the maxillary lateral incisors (37.08%), two-fold more in girls than in boys (24.72% for girls, 12.36% for boys). The mandibular second premolar agenesis (28.09%) was second order in prevalence almost equal in both

sexes (14.6% for girls, 13.48% for boys), followed by maxillary second premolar agenesis (11.24%), interestingly much more in boys than in girls (4.49% for girls, 6.75% for boys).

The distribution of the number of CMT by sex and the percentage is shown in Table 4. Out of total 126 patients with missing teeth, 107 patients (84.9%), 72 girls (57.13%) and 35 boys (27.77%), had got missing either one tooth (45.23%) or two teeth (39.67%). The prevalence of advanced hypodontia was identified at 0.43% (0.16% for girls, 0.27% for boys).

## DISCUSSION

Diagnosis of a patient with hypodontia was of great importance for early orthodontic treatment. If the indication of CMT was established before the occlusion settled, alternative treatment possibilities could be arranged and executed with multidisciplinary team strategies.<sup>[15,18]</sup> Since congenitally missing tooth is a common developmental defect,<sup>[1]</sup> dental practitioners

**Table 2: Distribution of missing teeth by sex and percentage**

Tooth number	Girls		Boys		Total	
	n	Percentage	n	Percentage	n	Percentage
17	0	0.00	1	0.39	1	0.39
16	0	0.00	0	0.00	0	0.00
15	6	2.34	9	3.52	15	5.86
14	2	0.78	3	1.17	5	1.95
13	1	0.39	2	0.78	3	1.17
12	31	12.10	15	5.86	46	17.97
11	0	0.00	0	0.00	0	0.00
21	1	0.39	0	0.00	1	0.39
22	29	11.33	12	4.69	41	16.01
23	1	0.39	3	1.17	4	1.56
24	3	1.17	2	0.78	5	1.95
25	6	2.34	11	4.30	17	6.64
26	0	0.00	0	0.00	0	0.00
27	0	0.00	0	0.00	0	0.00
37	1	0.39	1	0.39	2	0.78
36	0	0.00	0	0.00	0	0.00
35	18	7.03	22	8.59	40	15.63
34	1	0.39	2	0.78	3	1.17
33	0	0.00	1	0.39	1	0.39
32	2	0.78	7	2.73	9	3.52
31	4	1.56	3	1.17	7	2.73
41	6	2.34	3	1.17	9	3.52
42	2	0.78	4	1.56	6	2.34
43	0	0.00	0	0.00	0	0.00
44	0	0.00	2	0.78	2	0.78
45	22	8.59	15	5.86	37	14.45
46	0	0.00	0	0.00	0	0.00
47	0	0.00	1	0.39	1	0.39
Total	136	53.33	119	46.67	255	100

**Table 3: Distribution of symmetrical hypodontia by sex and percentage**

Combination of missing teeth	Girls		Boys		Total	
	n	Percentage	n	Percentage	n	Percentage
11-21	0	0.00	0	0.00	0	0.00
12-22	22	24.72	11	12.36	33	37.08
13-23	0	0.00	3	3.37	3	3.37
14-24	1	1.12	3	3.37	4	4.49
15-25	4	4.49	6	6.74	10	11.24
16-26	0	0.00	0	0.00	0	0.00
17-27	0	0.00	0	0.00	0	0.00
31-41	4	4.49	2	2.25	6	6.74
32-42	2	2.25	3	3.37	5	5.62
33-43	0	0.00	0	0.00	0	0.00
34-44	0	0.00	2	2.25	2	2.25
35-45	13	14.60	12	13.48	25	28.09
36-46	0	0.00	0	0.00	0	0.00
37-47	0	0.00	1	1.12	1	1.12
Total	43	48.33	46	51.67	89	100

**Table 4: Distribution of the number of missing teeth by sex**

Number	Girls		Boys		Total	
	n	Percentage	n	Percentage	n	Percentage
1 tooth	42	33.33	15	11.90	57	45.23
2 teeth	26	20.63	24	19.04	50	39.67
3 teeth	3	2.38	3	2.38	6	4.76
4 teeth	2	1.59	0	0.00	2	1.59
5 teeth or more	4	3.17	7	5.55	11	8.72
Total	77	61.11	49	38.89	126	100

should aware of its deleterious effects to the occlusion. For this reason, this study explored hypodontia in the pre-treatment files of orthodontic patients in terms of the number and location of permanent missing teeth. We found that the prevalence of hypodontia in the inspected Turkish population was 5%. Sisman *et al.*<sup>[15]</sup> investigated another Turkish orthodontic patient group for evidence of CMT and indicated that the prevalence of hypodontia in their sample was 7.54%, higher than that of ours. However, other Turkish researchers found lower prevalence values, 4.6%,<sup>[16]</sup> 4.30%<sup>[17]</sup> and 2.63%.<sup>[2]</sup> These findings may be different each other due to the variety in the examined districts of Turkey, age range, ethnicity and sample size.

Substantial variations in the prevalence of CMT among different ethnic populations were observed with the exception of the third molars. The higher prevalence of hypodontia than that of the Turkish populations were reported as 6.3% in the Brazilian population;<sup>[19]</sup> 8.5% in the Japanese population;<sup>[11]</sup> 10.1% in the Norwegian population;<sup>[14]</sup> 11.3% in the Irish<sup>[20]</sup> and in the Slovenian populations.<sup>[12]</sup> The Israeli and the Malaysian populations showed lower prevalence (0.3%<sup>[13]</sup> and 2.8%<sup>[10]</sup>). Rølling and Poulsen<sup>[21]</sup> conducted an investigation to observe the period prevalence rates of agenesis of permanent teeth in the Danish students. The authors stated that the period prevalence rates appeared to be constant over time (1972-1979: 7.8%; 1992-2002: 7.1%).

In our study, we found an average of 2.03 teeth per child with hypodontia. In other Turkish populations, Sisman *et al.*<sup>[15]</sup> and Celikoglu *et al.*<sup>[16]</sup> declared an average of 2.07 and 2.13 teeth per child with hypodontia, respectively. These averages were nearly equal (2.4 teeth) to the finding of Endo *et al.*<sup>[11]</sup> in the Japanese population. The similarity was interesting because of having demonstrated more hypodontia in the eastern countries.

The present study showed higher prevalence of CMT in girls than boys in this sample of the Turkish population. The present finding was the same as Sisman's finding.<sup>[15]</sup> Appearance of teeth agenesis intraorally was advocated to show gender-specific pattern.<sup>[21]</sup> However, in several reports, significant differences were not found between girls and boys relating to the total prevalence of hypodontia,<sup>[22]</sup> although other investigators stated a higher incidence in females.<sup>[10,12,21]</sup> This difference may be resulted from the reality in connection with awareness of esthetics

in females and the gender distribution of various populations.

The primary cause associated with missing teeth has been reported as heredity or familial distribution.<sup>[23,24]</sup> The other possible factors may be localized inflammations or infections having damaged the tooth germs in the alveolar bone.<sup>[25]</sup> Several researches evaluated the prevalence of familial distribution in relatives of individuals with hypodontia and showed that it was considerably greater than that of the general population.<sup>[26]</sup> However, Brook<sup>[27]</sup> advocated a single multifactorial theory that heredity was not absolutely the transmission way of hypodontia. This model was dependent upon a constant distribution of tooth size and combines polygenic and external conditions. The study of Parkin *et al.*<sup>[26]</sup> supported the complex interaction of CMT. Furthermore, the multifactorial theory was verified by the inconsistent expression and substantial differences in the severity and location of missing teeth in monozygotic twins.<sup>[28]</sup> In addition, Harris and Clark<sup>[29]</sup> advocated that while hypodontia may include a single dental element, it affects several teeth. Thus, genotypic condition of someone regarding to liability to hypodontia is expressed as a systemic rather than an isolated occurrence.

The current study revealed that the upper lateral incisors, more than two-fold in girls than in boys, were the most commonly missing teeth, followed by the lower second premolars and the upper second premolars. This finding of the present study was in accordance with many reports.<sup>[10,12,19,29]</sup> Furthermore, other Turkish researchers supported our finding.<sup>[2,15]</sup> However, Jorgenson<sup>[30]</sup> stated that the mandibular second premolar was the most frequently absent tooth after the third molar, the next teeth were the maxillary lateral incisor and maxillary second premolar in Europe. This result was in agreement with the Endo *et al.*'s finding that the most commonly missing tooth was the mandibular second premolars in the Japanese population.<sup>[11]</sup> Furthermore, a prevalence study exhibited that congenitally missing of the second premolars was occurred more frequent unilaterally than bilaterally in Danish population.<sup>[21]</sup>

The most frequently observed symmetric hypodontia was mandibular second premolar agenesis, followed by either maxillary second premolar or maxillary lateral incisor agenesis.<sup>[11,31]</sup> However, in the present study, there was a great predominant appearance of symmetrical hypodontia and the most common symmetrical hypodontia was the maxillary lateral



incisors (37.08%), twofold more in girls than in boys (24.72% for girls, 12.36% for boys). The mandibular second premolar agenesis (28.09%) was second order in prevalence of symmetric hypodontia almost equal in both sexes.

For making the diagnosis of hypodontia, previous studies have confirmed the reliability of orthopantomograms.<sup>[10,29,32,33]</sup> In our study, orthopantomograms were mainly used not only for detecting tooth agenesis, but also for searching possible late development of premolars excluding third molars. The files of patients younger than 13 years were examined to detect the delayed teeth mineralization as congenitally missing in their intermediate or final records, based on the finding by Aasheim and Ogaard.<sup>[32]</sup> They pointed out that no tooth except third molars was discovered to mineralize in patients after the age of 12. Beginning of crown calcification is normally at 3 years of age. Although calcification mostly finishes at 6 years,<sup>[34]</sup> late development of premolars may be seen in some cases.<sup>[32]</sup> Following a careful archive search we did not find any late calcification of tooth.

From anamnestic data, we explored the possibilities of maternal effects, such as illnesses during pregnancy and birth weights of infants and found no prominent effects of these factors. Some studies suggested that the principle intra-uterine factor affecting tooth development was maternal health.<sup>[35]</sup> They reported tooth agenesis in cases of rubella, Rhesus-incompatibility and other metabolic diseases. Parkin *et al.*<sup>[26]</sup> conducted a familial study and concluded that there was no impact of maternal illnesses on the expression in the first degree relatives with hypodontia. This finding was in agreement with our findings. Moreover, poor evidence on the effects of birth weight was demonstrated for the hypodontia.<sup>[28]</sup> However, it was reported that there were no significant differences in birth weight between children with or without hypodontia.<sup>[26]</sup>

## CONCLUSIONS

- The prevalence of hypodontia in girls was higher than in boys in this sample of Turkish patients evaluated
- The upper lateral incisors were the most commonly missing teeth, followed by the lower second premolars and then the upper second premolars
- Congenital absence of the permanent canines was determined in only five Turkish patients with advanced hypodontia

- The prevalence of advanced hypodontia was lower than single and symmetrical hypodontia
- Symmetrical hypodontia was predominant and the upper lateral incisors were the most symmetrically absent teeth.

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