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Teeth Number Anomalies in Permanent Dentition among Non-Syndromic Dental Patients

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A B S T R A C T

The aim of this study was to establish teeth number anomalies in relation to gender, tooth type, location, distribution pattern and the association between frequently missing teeth among a group of dental patients in Turkey. A total of 378 non-syndromic patients (240 females and 138 males) with an age range of 7–45 ($\overline{X}$±SD=22.07±3.6) having evidence of absent or excess teeth were evaluated in the study. Pearson Chi-square, Fisher's exact, McNemar and Kappa coefficients were used for statistical analysis. 237 patients had a total of 546 congenitally missing teeth and 141 had 185 excess teeth. Congenitally missing teeth were more commonly seen rather than the presence of supernumerary teeth. Difference was determined in the frequent locations of congenital missing and supernumerary teeth. The most frequent missing tooth type was found to be the mandibular second premolar (26.6%), while the majority of supernumerary teeth were located in the anterior region of the maxillary arch (37.9%). Both teeth number anomalies were more commonly seen among females. In hypodontia cases the occurrence of symmetrical agenesis of laterals and second premolars in maxilla; centrals and second premolars in mandible was notable. Agenesis of mandibular centrals was found to be associated with maxillary lateral agenesis in males. Also higher prevalence of molar teeth agenesis was determined in the occurrence of at least 4 teeth agenesis. These findings will serve as information about the contemporary demographic pattern of teeth number anomalies among non-syndromic Turkish dental patients and can provide evidence that agenesis of some teeth symmetrically or together are the products of the same genetic mechanisms.

Key words: *tooth, anodontia, supernumerary*

Introduction

Teeth number anomalies in the dentition could be present as hypodontia and hyperdontia. Hypodontia occurs in the case of agenesis of teeth. The etiology of hypodontia remains unclear but it has been suggested that evolutive[1], enviromental[2] and genetic factors[3,4] could be responsible for this anomaly. Hypodontia could be associated with other dental abnormalities, such as a cleft lip and palate (CLP) as well as with more than 50 syndromes[5,6]. Depending on the examination method, patient age and ethnicity, the prevalence of hypodontia vary widely, ranging from 0.5 to 2.4 per cent for the primary and from 2.6 to 11.3 per cent for the permanent dentition when the third molars are excluded[5]. The most frequently absent teeth are reported to be the lateral incisors and the premolars[7].

Some clinicians claim that hypodontia cases have been increased during the latest decades[8]. During the evolution period decrease in the surface area required for mastication led to reduction in teeth dimensions and number. Consequently, the occasional congenital absence of teeth in modern human beings is not a surprising event[9]. On the other hand, some report similarity in the frequency of hypodontia between past and present[10]. Assessment of masticatory function is a basis of clinical work in dentistry. Bite forces are the expression and measure of masticatory function[11]. The effect of bite forces on teeth number anomalies may or may not have such effect and needs to be investigated.

Hyperdontia occurs in the presence of single or multiple supernumerary teeth. Similar to hypodontia the etiologic factors remain unclear but several theories, such as a dichotomy of the tooth bud[12], hyperactivity of the dental lamina[13], DNA mutations and maxillofacial anomalies[14] are suggested to be responsible for the anomaly. Su-

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pernumerary teeth, particularly when multiple, can be associated with a CLP and with a small number of systemic syndromes[13]. The frequency of hyperdontia among human beings is lower than from hypodontia. The prevalence of supernumerary teeth range from 0.3% to 0.8% in the primary dentition[15] and from 0.5% to 3.8% in the permanent dentition[16]. The most frequent locations are reported to be the maxillary anterior and mandibular premolar regions depending on the examination method, patient age and ethnicity[17]. A mesiodens is the most frequent type of supernumerary tooth[18]. In certain cases, supernumerary teeth can cause malocclusion. They are frequently the etiology of crowding, diestema, disturbed eruption or uneruption of teeth, delayed or abnormal root formation in permanent teeth, cysts and resorption of the adjacent teeth. The treatment of supernumerer teeth is to remove them[19].

As tooth number anomalies could show difference between ethnic groups and the past decades, the evaluation of the contemporary demographic pattern is important. And also there is a lack of knowledge about the relationship between congenitally missing teeth in literature. Therefore, the aim of this study was to assess the hypodontia and hyperdontia cases according to gender and tooth type among a group of dental patients in Turkey. In addition, any association between frequently seen missing teeth was also assessed.

Materials and Methods

A sample of 378 Turkish patients consisted of 240 females and 138 males having either congenital missing or supernumerary teeth were selected from the patients attending the department of radiology and from the archive of department of orthodontics. The subjects ranged in age from 7 to 45 years ($\overline{X}\pm SD=22.07\pm3.6$). Clinical information and panoramic and/or periapical radiographs were used to investigate the presence of hypo or hyperdontia according a standard form including age, gender, missing or supernumerary tooth/teeth number, type and location. The third molars were excluded in hypodontia cases.

Statistical analysis

Data analysis was performed by using SPSS for Windows, version 11.5 (SPSS Inc., Chicago, IL, United States). Data were shown as number of cases and percentages. Pearson χ^2 or Fisher's exact test was applied for determining the difference between gender groups regarding for ratios of absent or supernumerary teeth. Whether the differences in prevalence of teeth number anomalies were statistically significant or not was evaluated by McNemar test. Kappa coefficient was calculated for determining the agreement levels regarding for ratios in absence of teeth. Kappa <0 as indicating no agreement and 0–0.20 as slight, 0.21–0.40 as fair, 0.41–0.60 as moderate, 0.61–0.80 as substantial, and 0.81–1 as almost perfect agreement. A p value less than 0.05 was considered statistically significant.

Results

Congenitally missing teeth

According to the results, 159 (67.1%) females and 78 (32.9%) males (total 237 patients) had a total of 546 congenitally missing teeth. 17 of these patients (9 females, 8 males) were in mixed dentition with an age range of 8–11.

TABLE 1
NUMBERS AND PERCENTAGES OF CONGENITALLY ABSENT TEETH IN THE MAXILLARY AND MANDIBULAR ARCH AND THE DIFFERENCE BETWEEN GENDERS

Absent tooth no. maxilla	Female N (%)	Male N (%)	p-Value	Absent tooth no. mandible	Female N (%)	Male N (%)	p-Value
11	0	2 (0.4)	0.107	31	19 (3.5)	7 (1.3)	0.659
12	50 (9.1)	20 (3.7)	0.357	32	4 (0.7)	2 (0.4)	1.000
13	2 (0.4)	4 (0.7)	0.093	33	1 (0.2)	3 (0.6)	0.106
14	12 (2.2)	3 (0.6)	0.397	34	2 (0.4)	4 (0.7)	0.093
15	36 (6.6)	16 (2.9)	0.710	35	67 (12.3)	18 (3.3)	0.004**
16	1 (0.2)	1 (0.2)	0.551	36	2 (0.4)	0	1.000
17	2 (0.4)	4 (0.7)	0.093	37	5 (0.9)	1 (0.2)	0.667
21	1 (0.2)	1 (0.2)	0.551	41	14 (2.6)	6 (1.1)	1.000
22	48 (8.8)	16 (2.9)	0.115	42	5 (0.9)	6 (1.1)	0.185
23	1 (0.2)	4 (0.7)	0.042	43	1 (0.2)	1 (0.2)	0.551
24	4 (0.7)	12 (2.2)	0.000**	44	3 (0.6)	2 (0.4)	0.665
25	37 (6.8)	19 (3.5)	0.853	45	32 (5.9)	28 (5.1)	0.010**
26	2 (0.4)	1 (0.2)	1.000	46	3 (0.6)	1 (0.2)	1.000
27	2 (0.4)	4 (0.7)	0.093	47	4 (0.7)	0	0.306

*p<0.05, **p<0.01, no. – number

Three hundred and five (55.9%) of the congenitally missing teeth were in the maxillary and 241 (44.1%) were in the mandibular arch. The number of missing teeth ranged from 1 to 7. A majority of the patients (95) had two, following (84) had one missing tooth. The absence of 5 teeth and over was seen rarely. In both genders missing of two teeth were seen more frequently. The distribution of congenitally missing teeth is shown in Figure 1.

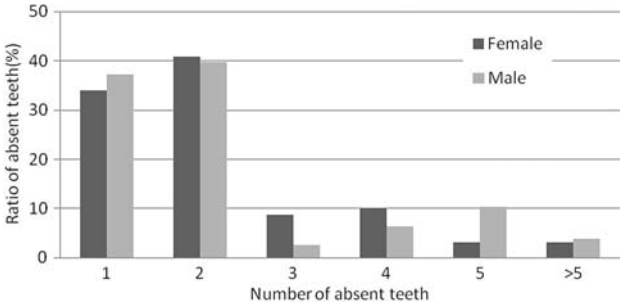

Fig. 1. Distribution of congenitally absent teeth among females and males.

In general, the mandibular second premolar (26.6%), following the maxillary lateral incisor (24.5%) was missing in most of the cases while the absence of the maxillary central incisor was rare (0.8%). In the maxillary arch, lateral incisor was the most frequent missing tooth in both quadrants among females (17.9%); while in males lateral incisor in the right quadrant (3.7%), second premolar in the left quadrant (3.5%) were the most frequently seen missing teeth. The absence of the central incisor (0.8%) and the first molar (1%) was rare among females and males, respectively. The absence of maxillary left first premolar and canine was seen more frequently in males than females ($p<0.05$). Details about frequency of missing tooth type in the right and left quadrants in the maxillary arch are given in Table 1.

In the mandibular arch, the second premolar was the most frequent missing tooth among both females (18.2%) and males (8.4%), while the absence of the canine (1.2%) and the first molar (1.2%) was rare among females and males, respectively. The frequency of missing mandibular second premolars were determined significantly more in females ($p<0.05$). Details of frequency of absence of tooth type in the right and left quadrants in the mandibular arch are shown in Table 1.

Agreement levels regarding for proportions in lack of teeth is shown in Table 2. Substantial agreement between the absence of maxillary right and left lateral incisors, maxillary right and left second premolars (Kappa 0.61–0.80); moderate agreement between missing mandibular right and left second premolars was found both in males and females (Kappa 0.41–0.60). The agreement level between missing lower right and left incisors was almost perfect in females (Kappa 0.81–1.00) where as substantial in males (Kappa 0.61–0.80). Moderate agreement was determined between the bilateral missing maxillary second premolars (15&25) and bilateral mandibular second premolars (35&45) both in males and females (Kappa 0.41–0.60). The agreement between the absence of bilateral maxillary laterals (12&22) and bilateral mandibular centrals (31&41) was found moderate only in males (Kappa 0.41–0.60). No agreement was found between laterals and premolars (Kappa <0). Besides the absence of at least one maxillary or mandibular first or second molar teeth were more frequently determined in cases having at least 4 missing teeth both in males and females ($p<0.001$).

TABLE 2
PROPORTIONS OF AGREEMENT LEVELS BETWEEN FREQUENTLY ABSENT TEETH

Teeth number	Prevalence of absent teeth N (%)/N (%)	p Value (McNemar test)	Kappa
Female			
12/22	50 (31.4)/48 (30.2)	0.824	0.705*
15/25	36 (22.6)/37 (23.3)	1.000	0.804*
35/45	67 (42.1)/32 (20.1)	0.000**	0.375*
15–25/35–45	31 (19.5)/27 (17.0)	0.585	0.368*
31/41	19 (11.9)/14 (8.8)	0.063	0.831*
12–22/31–41	39 (24.5)/14 (8.8)	0.000**	0.025
12/35	50 (31.4)/67 (42.1)	0.125	<0
12/45	50 (31.4)/32 (20.1)	0.054	<0
22/35	48 (30.2)/67 (42.1)	0.084	<0
22/45	48 (30.2)/32 (20.1)	0.085	<0
15–25–35–45/12–22	82 (51.6)/59 (37.1)	0.050*	<0
Male			
12/22	20 (25.6)/16 (20.5)	0.219	0.784*
15/25	16 (20.5)/19 (24.4)	0.453	0.743*
35/45	18 (23.1)/28 (35.9)	0.052	0.335*
15–25/35–45	14 (17.9)/12 (15.4)	0.804	0.262*
31/41	7 (9.0)/6 (%7.7)	1.000	0.748*
12–22/31–41	15 (19.2)/5 (6.4)	0.006**	0.336*
12/35	20 (25.6)/18 (23.1)	0.860	<0
12/45	20 (25.6)/28 (35.9)	0.302	<0
22/35	16 (20.5)/18 (23.1)	0.851	<0
22/45	16 (20.5)/28 (35.9)	0.088	<0
15–25–35–45/12–22	48 (61.5)/21 (26.9)	0.000**	<0

**p<0.01, *p<0.05, Degree of agreement found statistically significant.

Supernumerary teeth

According to the results, 81 (57.5%) females and 60 (42.6%) males, (141 patients) had a total of 185 supernumerary teeth. 8 of these patients (6 females, 2 males) were in mixed dentition with an age range of 7–11.

One hundred and thirty four (72.4%) of the supernumerary teeth were present in the maxillary and 51 (27.6%) were present in the mandibular arch. Supernu-

merary teeth were presented more commonly among females rather than males. The number of these teeth ranged from 1 to 4. One tooth was present in both females (74.1%) and males (81.7%) in the majority of the cases. The distribution of supernumerary teeth is shown in Figure 2.

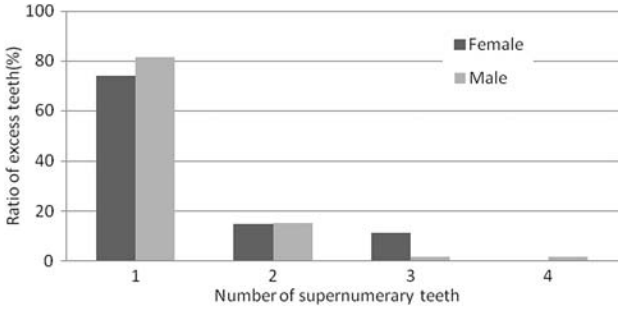

Fig. 2. Distribution of supernumerary teeth among females and males.

In general, the most frequent location of supernumerary teeth was found to be the maxillary anterior region (37.9%) following the mandibular premolar region (21.6%). The mandibular molar region was a rare location (1.6%). In the maxillary arch, the most frequent location of supernumerary teeth was found in the anterior and behind the third molar regions among females (15.7%) and in the anterior region among males (22.2%). Supernumerary teeth were rarely found in the molar region both among females (3.2%) and males (2.7%). Details of the frequency of supernumerary teeth region in the right and left quadrants in the maxillary arch are given in Table 3.

In the mandibular arch, supernumerary teeth were most frequently located in the premolar region both among females (15.7%) and males (5.9%), while they were rarely found behind the third molar region among females (0.5%). No supernumerary tooth was found in the mandibular anterior region among males (0%). Details of the frequency of supernumerary teeth region in the right and left quadrants in the mandibular arch are shown in Table 3.

Discussion

When gender, frequent localization, tooth type and number were compared between hypodontia and hyperdontia cases, it was seen that gender showed similarity, but tooth type, number and frequent localization site showed difference among the examined patients. Both hypodontia and hyperdontia were more commonly seen in females compared to males. The result for hypodontia coincides with the majority of the previous studies indicating a female predominance[8,20–22]. On the other hand, the results for hyperdontia show difference from most of the studies indicating a male predominance[13,19,21–24]. Nonetheless, possible variation in gender ratios may be seen and could be related to ethnic factors or sample differences.

Difference was observed in the number of congenitally missing and supernumerary teeth. The majority of missing teeth number was two following one, while one supernumerary tooth was present in the most of the hyperdontia cases. Supporting our results, in previous studies, it is reported that in non-syndromic cases supernumerary teeth are more frequently present as a single tooth[12,13,21]. Multiple hyperodontia rarely occur without being associated with complex syndromes and are seen as two teeth in most cases[12,13,23].

Many studies have demonstrated no consistent finding about difference in the total number of congenitally missing and supernumerary teeth in the maxillary and mandibular arches[25,26]. While Sisman et al.[8] and Peker et al.[21] reported that the hypodontia occurred more frequently in the maxillary arch, Kirzioğlu et al.[27] reported it to be the mandibular arch. The missing teeth number was nearly similar for both arches according to our results. On the other hand, approximately a three-fold predominance was recorded for the presence of supernumerary teeth in the maxillary arch compared to the mandibular arch. In accordance with present finding, the majority of the supernumerary teeth are reported to be located in the maxillary arch in previous studies[13,16,19,21,23,24].

Missing tooth type and supernumerary tooth location has been reported to differ among different populations. In the American[2] and Japanese[20] populations the mandibular second premolar was reported to be the most fre-

TABLE 3
NUMBERS AND PERCENTAGES OF SUPERNUMERARY TEETH PRESENT IN THE MAXILLARY AND MANDIBULAR ARCH AND THE DIFFERENCE BETWEEN GENDERS

Teeth no. maxilla	Female N %	Male N %	p-Value	Teeth no. mandible	Female N %	Male N %	p-Value
13–23	29 (15.7)	41 (22.2)	0.041*	33–43	4 (2.1)	0	0.136
14–15	6 (3.2)	1 (0.5)	0.394	34–35	14 (7.6)	5 (2.7)	0.142
16–17	4 (2.1)	5 (2.7)	0.495	36–37	0	1 (0.5)	0.426
18	19 (10.3)	1 (0.5)	0.000**	38	1 (0.5)	0	1.000
24–25	5 (2.7)	6 (3.2)	0.528	44–45	15 (8.1)	6 (3.2)	0.232
26–27	2 (1.1)	0	0.508	46–47	2 (1.1)	0	0.508
28	10 (5.4)	5 (2.7)	0.584	48	0	3 (1.6)	0.075

*p<0.05, **p<0.01, no.-number

quently missing tooth type, while this was the maxillary lateral among Brasilian children and adolescents[28]. In present study, the most frequent missing tooth type was found to be the mandibular second premolar, following the maxillary lateral incisor. Our frequent congenitally absent tooth type shows similarity with the reports from American and Japanese populations. De Oliveira Gomes et al.[14] reported the most frequent location of supernumerary teeth as the premaxilla and the anterior region of the mandible as a rare region for the occurrence of supernumerary teeth among Brazilian children and adolescents. Rajab and Hamdan[13] reported the most frequent location of supernumerary teeth as the premaxilla following the premolar region in Jordan. Similarly rare occurrence was reported in the canine, mandibular central and maxillary molar regions. The most frequent location was the maxillary anterior region following the mandibular premolar region and the maxillary fourth molars in our study. Montenegro et al.'s[16] results show similarity with the present findings. In American blacks fourth molars are the most seen supernumerary teeth followed by extra premolars[29]. Ferres-Padro et al.[19] reported that in the cases of multiple supernumeraries, often appear in the premolar zone.

In this study, the relationship between frequently seen missing teeth was also investigated. The present findings suggested that there was a symmetry between missing laterals and second premolars in the maxillary arch where as a symmetry was found between the absence of centrals and second premolars in the mandibular arch. Prskalo et al.[30] reported bilaterally missing lateral incisor in 42.86% of their hypodontia cases. A relationship was established between the agenesis of bilateral mandibular second premolars and bilateral maxillary second premolars. An association was also determined between the bilateral missing maxillary lateral teeth and mandibular bilateral missing centrals but only in males. Supporting our results, previous studies suggested that subjects with advanced hypodontia had various types of symmetrical tooth agenesis[31-33]. In this study, no association was found between the agenesis of upper laterals and upper or lower second premolars which are the most frequently missing tooth types. In constrast with our findings, Garib et al.[34] stated that there were strong associations between agenesis of second premolars and other permanent teeth excluding third molars. We have also determined that higher prevalance of molar teeth agenesis was determined in the occurrence of at least other 4 teeth agenesis. In accordance with our findings Abe et al.[35] stated that maxillary first molar agenesis occurred in individuals with advanced tooth agenesis. In this study, present results can provide evidence that agenesis of some teeth symmetrically or together are the products of the same genetic mechanisms.

Conclusion

Gender has an impact on the localization, tooth type and number in hypodontia and hyperdontia cases. The most frequently affected areas in the dental arch differ in hypodontia and hyperdontia cases. Assessment of hypodontia and hyperdontia among a group of non-syndromic patients attending a dental school in Turkey would be helpful for understanding the current demographic pattern, and making comparisons between different populations. Also agenesis of some of the teeth together or symmetrically will influence orthodontic treatment planning.

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ANOMALIJE BROJA ZUBIJU U PERMANENTNOJ DENTICIJI NESINDROMIČKIH PACIJENATA

S A Ž E T A K

Cilj ovog istraživanja je utvrditi anomalije u broju zubi u odnosu na rod, tip zubiju, lokaciju, distribucijski obrazac te u odnosu na povezanost sa grupom pacijenata u Turskoj s učestalim nedostatkom zuba. U istraživanje je uključeno ukupno 378 nesindromičkih slučajeva pacijenata (240 žena i 138 muškaraca) u dobnom rasponu od 7–45 (X±SD= 22.07±3.6) godina. U statističkoj analizi korišteni su: Pearsonov χ-kvadrat, Fisherov exact test te McNemar i Kappa koeficijenti. U 237 pacijenata ustanovljeno je ukupno 546 kongenitalni izostanaka zuba, dok je kod 141 ustanovljeno ukupno 185 viška zubiju. Drugi mandibulardni predmolar je tip zubiju koji najviše izostaje (26.6%). Višak je zubiju uglavnom bio smješten u prednjoj regiji maksilarnog luka (37.9%). Obje anomalije u broju zuba više su primjećene kod žena. U slučajeva hipodoncije primjećene su simetrične ageneze lateralnih i drugih predmolara maksile te centralnih i drugih predmolara mandibule. Primjećeno je da je ageneza centralnih mandibularnih zubiju povezana sa maksilarnom lateralnom agenezom u muškaraca. Također, kod barem četiri ageneze zubiju, ustanovljena je veća prevalencija ageneze molara. Ovi rezultati nadopunjuju podatke o demografskom obrascu anomalija u broju zuba među zubnim pacijentima u Turskoj, te pružaju dokaz kako je simetrična ili zajednička ageneza nekih zubiju produkt istih genetskih mehanizama.