

Original Article

Is There Any Relationship between Hypodontia and Hyperdontia with Taurodontism, Microdontia and Macrodonia? A Retrospective Study

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INTRODUCTION

Tooth agenesis results in congenital absence of one or more teeth (hypodontia). It has been reported to be more common in the permanent dentition, with prevalence rates ranging from 0.03 to 10.1%.^[1,2] Hyperdontia is the presence of additional teeth compared to the normal,^[3] with a prevalence rate varying from 0.1 to 3.8% in permanent dentition.^[3,4]

Hypodontia and hyperdontia may occur with other dental anomalies such as microdontia, taurodontism, talon cusp, macrodonia, and germination.^[5,6]

ABSTRACT

Background: Hypodontia and hyperdontia may occur with other dental anomalies such as microdontia, taurodontism, talon cusp, macrodonia and germination. **Aims:** The aim of this study to evaluate the relationship between hypodontia and hyperdontia with taurodontism, macrodonia and microdontia.

Subjects and Methods: In this retrospective study, 2,348 Turkish patients aged 7 to 12 years and treated between 01.01.2017 and 01.01.2018 in Bahcelievler Oral and Dental Health Hospital were evaluated. Data were collected and differences in the distribution of hypodontia and hyperdontia including other dental anomalies were analysed. **Results:** Of the total sample of 2,348 patients, 1,126 (48%) were girls, 1,222 (52%) were boys. Hypodontia was found in 177 children (93 girls (53%), 84 boys (47%)). The prevalence of hypodontia and hyperdontia were 7.5% and 0.9%. Taurodontism is the most common dental anomalies in hypodontia patients (39%) followed by microdontia (10%). Taurodontism was more prevalent in girls (42%) than in boys (36.5%). Microdontia was found in 10 patients and macrodonia was observed in 9 hypodontia patients. Hyperdontia was found in 21 children [8 girls (38%), 13 boys (62%)]. The most common supernumerary tooth found was mesiodens (85%) and it's more prevalent in boys (67%) than in girls (33%). Taurodontism is the most common dental anomaly (48%) following macrodonia (19%) and were found to be much more prevalent in boys (53%) (23%) than in girls (37.5%) (12.5%). Microdontia was found in only 1 boy (%7.7) in hyperdontia patients. **Conclusion:** Hypodontia and hyperdontia with taurodontism, microdontia, and macrodonia need much more complex treatment plan. All cases should be evaluated using interdisciplinary approach for appropriate treatment choice. This helps in longterm and effective treatment planning according to a child's individual requirements.

KEYWORDS: Hyperdontia, hypodontia, macrodonia, microdontia, taurodontism

The purpose of this study was to evaluate prevalence and characteristics of non-syndromic hypodontia and hyperdontia in relation with other dental anomalies. Dental anomalies result in orthodontic, aesthetic and psychological challenges and treatment is with huge financial implications.

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METHODS

Study population

In this retrospective study, the dental records of 2,348 Turkish patients aged 7 to 12 years and treated between 01.01.2017 and 01.01.2018 in the Bahcelievler Oral and Dental Health Hospital, Istanbul, Turkey were reviewed by screening the files for the presence of panoramic images. The study was approved by Sadi Konuk Education and Research Hospital's Medical Ethics Committee (2019-43). Data were evaluated using panoramic radiographs and dental history records by two examiners who crosschecked records.

The assessment of hypodontia

One experienced examiner ascertained hypodontia from panoramic radiographs. The assessment of the panoramic radiographs was carried out under standardized conditions. Data were collected and differences in the distribution of hypodontia and hyperdontia including other dental anomalies were analysed. Children were included in the hypodontic group if they have at least one tooth missing with no sign of formation or calcification shown in panoramic radiographs. Children were excluded if they had any associated developmental anomalies (ectodermal dysplasia, cleft lip or palate, and Down syndrome) and had previous loss of teeth due to trauma, caries, periodontal disease or orthodontic extraction or a history of orthodontic treatment. Children whose radiographs were not of diagnostic clarity were excluded.

Statistical analysis

Data were collected and entered into the SPSS 20.0 programme for statistical analysis (Statistical Package for Social Sciences, SPSS Inc., Chicago, IL, USA). The Chi-square test was used to analyze differences in the distribution of hypodontia, sex, and malocclusion type. The level of significance was set at 5%.

RESULTS

Inter-examiner agreement for the study population

Intra-class correlation coefficient showed (ICC = 0.97) excellent agreement between two examiners who are a paediatric dentist and an oral and maxillofacial radiologist.

Of the total sample of 2,348 patients [1,126 (48%) were girls, 1,222 (52%) were boys]. The prevalence of Hypodontia was found in 7.5% (N = 177) in children including 93 girls (53%) and 84 boys (47%) with mean age of 8.95 (SD = 1.51). Hyperdontia was found in 0.9% in children, including 8 girls (38%) and 13 boys (62%) with mean age of 8.95 (SD = 1.28).

The incidence of hypodontia was higher in girls than boys, although hyperdontia was more common in boys than in girls. On the other hand, according to Chi-square statistic, it was found that there was no relationship between number of patients with hypodontia or hyperdontia and gender. (Chi-square = 1.56; df: 1; P = 0.21).

Hypodontia group

Mandibular second premolars were the most common symmetrical missing teeth in girls (20%) and in boys (28.5%) [Table 1] and maxillary laterals were more symmetrical missing teeth in girls (19%) than in boys (11%). Besides, the maxillary central incisor and mandibular canine showed no symmetrical congenital absence in the sample of Turkish girls and boys.

Taurodontism was the most common dental anomalies in hypodontia patients (39%) followed by microdontia (5.6%) [Figure 1]. Taurodontism in girls (42%) was more prevalent dental anomalies than in boys (36.5%). Microdontia was found in 10 hypodontia patients (5.6%) (7 girls and 3 boys). Macrodonia was observed in 9 patients (5%) (4 girls and 5 boys).

Hypotaurodontism was the most common taurodontism type in hypodontia patients (51%) [Figure 2].

Table 1: Distribution of symmetrical hypodontia according to gender

Contralateral missing teeth	Girl n (%)	Boy n (%)	TOTAL n (%)
11-21	0	0	0
12-22	18 (19%)	9 (11%)	27 (15%)
13-23	1 (1%)	2 (2%)	3 (2%)
14-24	1 (1%)	3 (3%)	4 (2%)
15-25	11 (12%)	10 (12%)	21 (12%)
31-41	1 (1%)	3 (3%)	4 (2%)
32-42	3 (3%)	2 (2%)	5 (3%)
33-43	0	0	0
34-44	0	2 (2%)	2 (1%)
35-45	19 (20%)	24 (28.5%)	43 (24%)

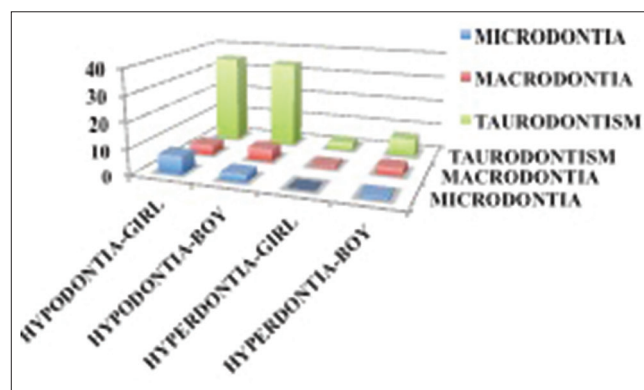


Figure 1: Distribution of taurodontism, microdontia, and macrodontia in hypodontia and hyperdontia patients according to gender

Table 2: Distribution of taurodontism with respect to the affected jaws in hypodontia patients

TAURODONTISM in HYPODONTIA	MANDIBULAR TAURODONTISM	MAXILLARY TAURODONTISM	MAX. AND MAND. TAURODONTISM	TOTAL
GIRLS	8 (24%)	13 (38%)	13 (38%)	34
BOYS	5 (14%)	12 (34%)	18 (51%)	35
TOTAL	13 (19%)	25 (36%)	31 (45%)	69
Chi-square		1.52		
Degrees of freedom (df)		2		
<i>p</i>		0.47		

Table 3: Distrubition hyperdontia type according to gender

	GIRLS	BOYS	TOTAL
Mesiodens	6 (33%)	12 (67%)	18 (85%)
Maxillar paramolar	1	0	1 (5%)
Maxillar lateral	0	1	1 (5%)
Mandibular lateral	1	0	1 (5%)
TOTAL	8 (38%)	13 (62%)	21

Table 4: Distrubition of taurodontism with respect to the affected jaws in hyperdontia patients

TAURODONTISM in HYPERDONTIA	MANDIBULAR TAURODONTISM	MAXILLARY TAURODONTISM	MAX. and MAND. TAURODONTISM	TOTAL
GIRLS	0	2 (67%)	1 (33%)	3
BOYS	2 (29%)	0	5 (71%)	7
TOTAL	2 (20%)	2 (20%)	6 (60%)	10

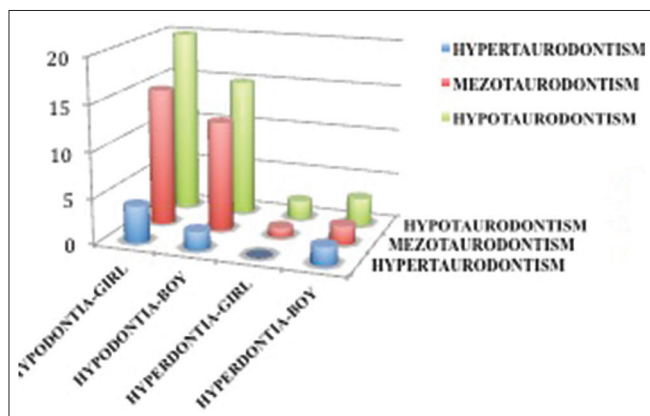


Figure 2: Distribution of type of taurodontism according to gender

On the other hand, hypotauodontism was more prevalent type in boys (59%) than in girls (43%); but mezotauodontism and hypertauodontism type were more prevalent in girls (43%) (14%) than in boys (35%) (6%). There were no statistically significant differences between taurodontism type and gender in hypodontia patients (Chi-square = 1.72; *P* = 0.42) [Figure 2].

Maxillary taurodontism (34%) was found more prevalent than mandibular taurodontism (14%) in boys in hypodontia patients [Table 2]. Moreover, there was no statistically significant differences between

taurodontism with respect to the effected jaws and gender (Chi-square = 1.52; *P* = 0.47).

Hyperdontia group

The most common supernumerary tooth found in hyperdontia patients was mesiodens (85%). Mesiodens was found more prevalent in boys (67%) than in girls (33%) [Table 3].

Taurodontism is the most common dental anomaly in hyperdontia patients (48%) followed by macrodontia (19%). Besides, taurodontism and macrodontia was found much more prevalent in boys (53%) (23%) than in girls (37.5%) (12.5%), respectively [Figure 1].

Distribution of taurodontism according to gender showed that there was a slightly higher prevalence in boys 13 (62%) than in girls 8 (32%) [Figure 2]. In addition hypotauodontism was the most common taurodontism type in hyperdontia patients. Hypertauodontism wasn't found in girls in hyperdontia patients.

Although there was no mandibular taurodontism in girls and maxillary taurodontism in boys in hyperdontia patients [Table 4], maxillary and mandibular taurodontism was more prevalent in boys (71%) than in girls (33%).

DISCUSSION

The prevalence of hypodontia in this overall sample was 7.5%. Fekonja^[7] and Goya^[8] found that the prevalence of hypodontia was 11.3% and 9.4%. In contrast, Meza^[9] found that the prevalence was 2.7%. There is great variation in the prevalence of hypodontia in different populations. The differences may be due to the source of information for each study genetic factor, sample size, and presence or absence of radiographs during the examination.

In this study females presented a higher prevalence of hypodontia; however, no statistically significant difference was observed and this is in accordance with reports by Fekonja,^[7] Endo^[10] and Meza.^[9]

The prevalence reported in the literature varied between 0.2% and 0.8% in the primary dentition, and between 0.5% and 5.6% in the permanent dentition of the general population.^[11] In the present study, we found that prevalence of hyperdontia was 0.9. In the general Caucasian population, the prevalence of supernumerary teeth is 1–3%,^[12] and in Asian populations, the estimated prevalence is relatively higher (2.7–3.4%).^[13]

Hypodontia group

In the present study, of the individuals identified with hypodontia, 83% had one or two missing teeth. Fekonja,^[7] Gomes^[14] and Goya^[8] reported similar results but, Peker^[15] reported a lower incidence of one or two missing teeth.

The most common bilaterally missing teeth were the mandibular second premolars and the maxillary laterals. Goya *et al.*^[8] found that symmetry of congenitally missing teeth was predominant (74.6%).

Hypodontia can occur with other conditions such as taurodontism, microdontia and decreases in the size of the incisors and canines as well as conical or tapered teeth such as peg-shaped laterals.^[16-18]

We found that taurodontism was the most common dental anomalies among hypodontia patients. Puttalingaiah *et al.*^[19] support our findings but their study population were adults. Lai and Seow^[17] studied a sample of 66 hypodontia patients and found the prevalence of taurodontism to be 34.8%. On the other hand, two Brazilian pediatric population studies^[20,21] did not find such association between taurodontism and tooth agenesis. Kuchler *et al.*^[21] reported that they didn't find association between tooth agenesis and taurodontism, but found seven missing teeth and was associated with taurodontism. In the present study, only 4 patients with oligohypodontia had taurodontism. Sampling variation,

i.e. size, local factors, and preselection of the individuals, can be responsible for these discrepancies.

In the present study, taurodontism in hypodontia patients was a more prevalent dental anomaly in girls than in boys. Kan *et al.*^[18] found that girls showed a significantly higher tendency for taurodontism compared to case controls.

Taurodontism may be classified as hypo, mezo and hyper, respectively based on the degree of apical displacement of the pulpal floor.^[22] We found that hypotaurodontism was the most common taurodontism type in hypodontia patients and more prevalent type in boys than in girls. Besides, maxillary taurodontism was more prevalent than mandibular taurodontism in hypodontia patients. There was no study on relationship between type of taurodontism and effected jaws in hypodontia patients in the literature. On the other hand, Topcuoglu *et al.*^[23] found that the most frequently affected teeth were maxillary molars. Besides they said that hypotaurodontism was the most common taurodontism type in a Turkish population. Colak *et al.*^[24] said that Taurodontism is not uncommon in Turkish population and the prevalence of taurodonts were significantly more common in the mandible compared with the maxilla. In contrast, Bilge *et al.*^[25] explained that taurodontism was more common in the age groups of 13–19 years and its prevalence was 11.2% in Turkish population.

However, some researches did not find a link between hypodontia and microdontia.^[18] The prevalence of microdontia ranges from 0.8% to 8.4% in various populations.^[26]

Some authors found links between hypodontia with size anomalies and taurodontism.^[23] Therefore, it is difficult to draw conclusions from the literature. Both hypodontia and taurodontism seem to be a part of syndromes characterized by decreased mitotic cellular activity which might also affect dental germ development.^[27] On the other hand, some other studies found clear associations between both mild and severe hypodontia and reduced tooth size,^[17,26,27] especially in the upper laterals (in the mesiodistal dimension) and the lower canines (the labiolingual dimension).^[18] The latter agrees with the synergism and allelism of major genes possibly affecting hypodontia.^[26]

Hyperdontia group

In this study, we observed that mesiodens is more prevalent in boys than in girls. Contrary to this, Peker *et al.*^[15] found that most supernumerary teeth were in mandibular premolar region, followed by maxillary third molar region and maxillary midline as mesiodens. Besides, the other studies reported that mesiodens is seen

commonly in pediatric populations and supernumerary teeth are seen frequently in maxillary posterior region for adult populations.^[28]

In the literature, there is limited study on relationship of hyperdontia with other developmental dental anomalies. In the present study, we found that taurodontism was the most common dental anomalies in hyperdontia patients (48%). Our results was found similar to that Sarr *et al.*'s^[29] normal population study. Topcuoglu *et al.*^[25] and Ardakani *et al.*^[30] found 22.5% and 7.5% prevalence of taurodontism in normal population study.

On the other hand, our previous study shows macrodontia as the second highest anomaly in hyperdontia patients following microdontia. Peker *et al.*^[15] observed 8.1% prevalence of microdontia and dilacerations of molar in hyperdontia patients. Ardakani *et al.*^[30] found microdontia prevalence of 2.5% and macrodontia prevalence 0.2% in normal population. Their study population included adults and not only hyperdontia patients. But the small size of the sample and study population do not allow for a specific conclusion to be reached.

Hypotaurodontism was found the most common taurodontism type in hyperdontia patients and our results is similar to that Topcuoglu *et al.*'s normal population study.^[23] Besides, they observed that incidence of maxillary taurodontism is higher than mandibular taurodontism in normal population. In contrast, we found that there was no differences in incidence of maxillary and mandibular taurodontism and both were high in hyperdontia patients.

CONCLUSION

The high prevalence of dental anomalies, especially taurodontism, in hypodontic and hyperdontic patients presents a clinical challenge for pediatric dentists and orthodontists. Treatment plan can be so complicated because of difficulty of endodontic treatment of taurodontic teeth. To successfully manage hypodontia and hyperdontia the dentist should be able to identify taurodontic, macrodontic, and microdontic teeth and correctly include them in the treatment plan. Both hypodontia and hyperdontia cases should be evaluated carefully by all clinicians in order to ensure early diagnosis and treatment planning for appropriate treatment modalities to minimize the complications of these dental anomalies.

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Conflicts of interest

There are no conflicts of interest.

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