



Original articles

COMPARING THE FREQUENCY OF MANIFESTATION OF HYPERDONTIA AND HYPODONTIA

Greta Yordanova, Mario Grancharov.

Department of Orthodontics, Faculty of Dental Medicine, Medical University - Sofia, Bulgaria.

ABSTRACT

Introduction: Hypodontia and hyperdontia are two dental phenomena with deviations in the number of teeth - reduction and increase of tooth germs.

The aim of the study is to compare the frequency of manifestation of hyperdontia and hypodontia, their distribution by tooth groups among Bulgarian orthodontic patients.

Materials and methods: The prospective clinical-epidemiological study covered 2676 patients: 1705 (63.7%) female and 971 (36.3%) male. They were detected and diagnostically proven with supernumerary and missing teeth. The findings were distributed according to their localization to make a comparative analysis.

Results: The patients established with hypodontia were 5.79% with average age of 15.17 ± 5.34 years, and hyperdontia in 3.13% of patients with average age of 11.80 ± 4.65 years. Statistically credible, hyperdontia was more frequently observed in males, while hypodontia was significantly more frequently observed in females. The hypodontia was the most commonly observed in the mandibular distal segment - second premolars (46.5%), next affected was the maxillary lateral (37.4%), followed by the maxillary distal segment (32.3%), and the least was the mandibular frontal segment (12.9%). The supernumerary teeth found in the maxillary frontal segment were incisors and mesiodens (91%) compared to the maxillary distal segment (9%) was significant. In the mandible, the difference between the frontal (42.3%) and distal segment (57.7%) was without statistical significance.

Conclusions: Knowledge of the clinical characteristics of hypodontia and hyperdontia are important for targeted early diagnosis and treatment. Both of these specific problems have an effect on an individual's function and psychosocial well-being.

Keywords: Tooth agenesis, Hyperdontia, Hypodontia, Genetic disorders,

INTRODUCTION

Hypodontia and hyperdontia are deviations in the number of teeth, respectively, related to their reduction due to a congenital lack of tooth germs or an increase due to the hyperfunction of the dental lamina. The two dental phenomena are associated with a genetic predisposition and a change in the signaling precursors for the development of tooth germs. A series of genetically controlled, cascading molecular interactions influence tooth germ development. Changes in the mediators of this signaling pathway can affect the forming number of teeth [1-3]. The etiology of hypodontia and hyperdontia is complex and includes both genetic regulation and the action of factors from the external environment. There are also syndromic forms of hypodontia and hyperdontia, then their appearance is part of a complex of multiple congenital anomalies [4].

A reduced number of teeth is often accompanied by other dental abnormalities such as microdontia and altered tooth shape. The supernumerary teeth may be morphologically normal or abnormal in structure and features. The abnormalities of epithelial-mesenchymal interactions during tooth formation have been responsible for dental malformations [5]. Both forms of change in a number affect the normal development and formation of the dental arch and occlusal relationships. Therefore, from an orthodontic point of view, both problems are significant and require special and in-depth knowledge for the purpose of their early diagnosis and treatment plan. In hypodontia, we most often observe delayed exfoliation of primary teeth, impaction of adjacent teeth (the relationship of upper lateral hypodontia and canine retention), change in the tooth inclination, transposition, crowding, superposition of antagonists, ectopic eruption, shortened perimeter of the dental arch and various occlusal disorders [6, 7]. The frequency of hypodontia varies in different studies within wide limits between 1.5% to 12% [4, 8]. The highest rates of hypodontia are reported in Caucasian patients [9]. A frequency of about 5-6% are described in Europeans [10], 8.87% in Bulgarians [6], 4.6% in the Turkish population [11]. In 80% of cases, 1 or 2 missing teeth are observed, most often mandibular second premolars and maxillary lateral incisors [6, 10]. More often, hypodontia is registered in women.

For the manifestation of hyperdontia, values from 0.1% to 4% have been reported, depending on the analyzed group of people [8, 12,13]. Males are more often affected

by supernumerary teeth. They are most commonly found in the maxilla and less in the mandible, with the area of the premaxilla being most affected by the typical representative of the supernumerary teeth - mesiodens. In the posterior segments, the supernumerary teeth can be parapremolar, paramolar and distomolar [14]. The research data on the prevalence of anomaly hypodontia and hyperdontia show that the former is significantly more widespread.

The aim of the study is to compare the frequency of manifestation of hyperdontia and hypodontia, their distribution by tooth groups among Bulgarian orthodontic patients.

MATERIAL AND METHODS

This study was approved by the Research Ethics Committee of Medical University - Sofia logged under protocol number 04/12. 05. 2022.

A prospective clinical-epidemiological study covering 2676 patients who were diagnosed and orthodontically treated over a period of 8 years was conducted. The patients included in the study met the selection criteria: to be in mixed or permanent dentition, to have detailed treatment documentation, to have given informed and written consent to use the data for scientific purposes. The analyzed contingent of patients consisted of 1705 (63.7%) women and 971 (36.3%) men.

The detected and diagnostically proven supernumerary and missing teeth are described and filled in the statistical map dividing them according to their localization. In hypodontia, the missing teeth are divided into: upper central incisors, upper laterals, upper canines, upper first and second premolars, and upper first and second molars. In the lower jaw, the group of incisors is united. In hyperdontia, supernumerary teeth are divided into: mesiodens; supernu-

merary maxillary incisors; parapremolar; paramolar; distomolar. A mesiodens group is missing in the lower jaw. We distinguish erupted and impacted form, eumorphic and dysmorphic form of the supernumerary tooth.

Data were entered and processed with the statistical package IBM SPSS Statistics 25.0. $p < 0.05$ was accepted as a level of significance at which the null hypothesis is rejected.

RESULTS

In the conducted prospective clinical-epidemiological study, 155 patients (5.79%) with hypodontia were found out of the total analyzed contingent of 2676 patients. The average age of patients with hypodontia was 15.17 ± 5.34 years, ranging from 7 to 38. The contingent of patients had a wide age range due to the inclusion of patients with persistent primary teeth who neglected the problem of hypodontia until the loss of the primary teeth. Of the 155 patients identified, 53 (34.2%) were male, and 102 (65.8%) were female (Table 1). The sex distribution of the contingent has a ratio of male to female of 1:1.92. Therefore, it can be concluded that hypodontia is a sex-related problem and affects more often the female sex.

From the entire contingent of patients, hyperdontia was detected in 84, which represents a 3.13% frequency of this biological phenomenon. The average age at which hyperdontia was detected was 11.80 ± 4.65 years, in the interval between 6 and 28. The gender distribution of the contingent of patients with hyperdontia was male: female (63.4% male and 36.6% female) - 1.7:1. Therefore, the conclusion is that hyperdontia is also a gender-related problem, affecting more often the male sex.

The data from the statistical comparison to establish dominant trends using Chi-Square Tests proved this trend and the hypothesis that there is sex relation in each of the two phenomena, but with opposite expression (Table 1).

Table 1. Proof of the sex association of hyper- and hypodontia

Sex		Hyperdontia	Hypodontia	Total	X^2	df	p
Male	N	53	53	106	18,44	1	<0,001
	%	63,10%	34,20%	44,40%			
Female	N	31	102	133			
	%	36,90%	65,80%	55,60%			
Total	N	84	155	239			
	%	100,00%	100,00%	100,00%			

Statistically credible, the hyperdontia was more frequently observed in males ($p < 0.001$), while the hypodontia was significantly more frequently observed in females ($p = 0.009$) shown in Table 1.

Hypodontia was the most commonly observed in the mandibular distal segment (46.5%), mainly involving the mandibular second premolars. The next segment in terms of frequency of hypodontia was the maxillary, frontal segment (37.4%) with the main topic lateral incisor, followed by the maxillary distal segment (32.3%), and the least affected was

the mandibular frontal segment (12.9%), (Table 2).

A comparative analysis was made for the localization of supernumerary teeth by segments in the maxilla and mandible. The difference between the maxillary, frontal segment, where in addition to supernumerary incisors (31) were also included, 25 cases of mesiodens (total 91%) compared to the maxillary distal segment (6 teeth - 9%) was significant. In the mandible, the difference between the frontal (10 teeth - 42.3%) and distal segment (14 teeth - 57.7%) was without statistical significance ($p = 0.375$).

In order to draw a parallel between the dental groups that were affected by the two phenomena (hyperhypodontia), the statistical comparison between dominant

trends in the two groups (Chi-Square Tests) was performed. Trends are presented in Table 2.

Table 2. Comparative assessment of the different expression by tooth groups of the two phenomena

Tooth group		Hyperdontia	Hypodontia	Total	X ²	df	p
Maxillary front	N	56	58	114	18,68	1	<0,001
	%	66,70%	37,40%	47,70%			
Maxillary distal segment	N	6	50	56	19,15	1	<0,001
	%	7,10%	32,30%	23,40%			
Mandibular front	N	10	20	30	0,05	1	0,824
	%	11,90%	12,90%	12,60%			
Mandibular distal segment	N	14	72	86	20,98	1	<0,001
	%	16,70%	46,50%	36,00%			

In both phenomena, the same zones were affected, the mandibular distal segment and maxillary frontal segment prevailed, but with a reversed dominance for the two conditions, as the differences found were statistically significant (p<0.001). In hypodontia, the mandibular distal segment was mainly affected, and in the hyperdontia - the maxillary frontal segment. Accordingly, the second places were also exchanged.

When comparing the manifestations of hyperdontia and hypodontia according to the number of affected teeth, the following results were obtained: hyperdontia most often occurs as a single manifestation (72.6%); in the case of hypodontia, the highest percentage has cases of two missing teeth (43.9%). The data are presented in Table 3.

It is necessary to conclude that the tendency to affect a significantly large number of tooth germs was more in hypodontia, where patients with missing 8 and even 13 teeth were registered (Table 3). While the highest number of supernumerary teeth, 6 each, was described in only two patients. Casuistic cases were not a large percentage. The most common were the clinical manifestations with one or two affected teeth in both phenomena. From the trend analysis for hypodontia or hyperdontia up to 2 teeth, which were the most common forms in both anomalies and those more than 2 teeth involved, the distributions presented in Table 4 were obtained.

Table 3. Distribution of the single and multiple form of manifestation in both phenomena

No of Teeth		Hyperdontia	Hypodontia	Total
1	N	61	57	118
	%	72,60%	36,80%	49,40%
2	N	19	68	87
	%	22,60%	43,90%	36,40%
3	N	0	13	13
	%	0,00%	8,40%	5,40%
4	N	2	7	9
	%	2,40%	4,50%	3,80%
5	N	2	3	5
	%	2,40%	1,90%	2,10%
6	N	0	2	2
	%	0,00%	1,30%	0,80%
8	N	0	4	4
	%	0,00%	2,60%	1,70%
13	N	0	1	1
	%	0,00%	0,60%	0,40%
Total	N	84	155	239
	%	100,00%	100,00%	100,00%

Table 4. Distribution in the two phenomena with a manifestation of up to 2 and more than 2 affected teeth

No of Teeth		Hyperdontia	Hypodontia	Total	X ²	df	p
Up to 2 teeth	N	80	125	205	9,51	1	0,002
	%	95,20%	80,60%	85,80%			
Above 2 teeth	N	4	30	34			
	%	4,80%	19,40%	14,20%			
Total	N	84	155	239			
	%	100,00%	100,00%	100,00%			

A relatively small number of teeth (up to 2) were most often affected in both problems - 95.2% of all patients with hyperdontia and 80.6% of all patients with hypodontia. When it comes to the multiple forms, the percentage of cases involving hypodontia was more significant than cases involving hyperdontia - 14.2%, against only 4.85%. The established results are statistically reliable ($p < 0.002$).

DISCUSSION

In the scientific literature, the frequency of the phenomenon of hypodontia varies widely. In some studies on the subject, a frequency of up to 36.5% is cited, with results depending on the studied population. There is a current trend of increase in the size of patients affected by hypodontia, who seek orthodontic treatment. The incidence of hypodontia found by us was 5.8%, which is within the range of most commonly cited values for this problem.

Most patients have one or two missing teeth, the most commonly mandibular second premolars and maxillary lateral incisors [15]. Greco ALT, et al. reported a 9% incidence of hypodontia among orthodontic patients, with rates of 9.1% for females and 8.7% for males [16]. According to the same author, the problem is more often found in the maxilla than in the mandible [17]. Our analysis shows that 108 missing teeth have been proven in the maxilla, while in the mandible, there are 92. At the same time, the mandibular distal segment (lower second premolars) is the leader in missing tooth germs, followed by the premaxilla (upper laterals), table 2. The frequency of hypodontia is significantly increased in studies that included the absence of third molars. For example, a study from 2015 [6] found a frequency of 13.71% if hypodontia, including third molars, were examined. In her dissertation, T. Yordanova cites a prevalence of 7.66% for non-syndromic hypodontia in permanent dentition, and according to her, the lateral maxillary incisors are most often affected [18].

The frequency of hyperdontia found by us of 3.1% is covered by the values described for the occurrence of the phenomenon in the literature. We cannot fail to note that the value approaches the upper limit of the quoted frequencies for hyperdontia [19]. These results are influenced by the studied contingent – the orthodontic treated patients and the specialized focus of the researchers. Our results identified the maxillary, frontal segment as the area with the greatest concentration of supernumerary teeth – a total

of 59 supernumerary teeth (including mesiodens). Data from the specialized literature, as well as our study, indicate that in cases of one or two supernumerary teeth, they are located most often in the premaxilla area, followed by the mandibular premolar area (14 teeth). In the orthodontic contingent of patients examined by us, we found that the anomaly at least frequently in the distal segments of the maxilla, which places the area in last place in terms of frequency.

A comparative assessment of the manifestation by dental groups of the two phenomena shows that the same zones prevail in both of them - mandibular distal segment and maxillary frontal segment, but with an exchanged priority as the established differences are statistically significant. The two opposite conditions - of increased and decreased tooth count affect the canine group extremely rare. If we compare the results of frequency and distribution of the two phenomena - of reduced and increased number of teeth, it is noticed that they have their typical characteristics: sex relatedness and locus manifestation. These confirmed trends result in better targeted and earlier diagnosis of the problem, during the clinical examinations of the dentist. The anomalies in the development of teeth are an important category of dental symptoms. These abnormalities may also occur as part of a syndrome or disease and then have guiding diagnostic and medical significance. Some of the syndromes can be diagnosed significantly earlier based on the appearance of supernumerary teeth. Numerous studies have shown a potential link between disturbances in the number of teeth and other common diseases. In recent years, special attention has been paid to supernumerary teeth. They can be used as a source of stem cells to be used in the treatment of systemic diseases.

CONCLUSIONS

Hypodontia and hyperdontia are orthodontic deformities with a high rate of occurrence. The knowledge of their clinical characteristics and time to diagnosis and significance are important for targeted early diagnosis and treatment. Both problems have been proven to be sex related, which also guides diagnostic monitoring. Both of these specific problems have an effect on an individual's function and psychosocial well-being. The frequency of involvement of the upper frontal segment by hypodontia or hyperdontia creates aesthetic and health disturbances for patients.

REFERENCES:

1. Anthonappa RP, King NM, Rabie AB. Aetiology of supernumerary teeth: a literature review. *Eur Arch Paediatr Dent*. 2013 Oct; 14(5):279-88. [[PubMed](#)]
2. Bonczek O, Balcar VJ, Šerý O. PAX9 gene mutations and tooth agenesis: A review. *Clin Genet*. 2017 Nov;92(5):467-476. [[PubMed](#)]
3. Cobourne MT, Sharpe PT. Making up the numbers: The molecular control of mammalian dental formula. *Semin Cell Dev Biol*. 2010 May; 21(3):314-24. [[PubMed](#)]
4. Schonberger S, Shapira Y, Pavlidi AM, Finkelstein T. Prevalence and Patterns of Permanent Tooth Agenesis among Orthodontic Patients--Treatment Options and Outcome. *Applied Sciences*. 2022; 12(23):12252. [[Crossref](#)]
5. Liu F, Chu EY, Watt B, Zhang Y, Gallant NM, Andl T, et al. Wnt/beta-catenin signaling directs multiple stages of tooth morphogenesis. *Dev Biol*. 2008 Jan 1; 313(1):210-24. [[PubMed](#)]

6. Yordanova G. Tooth agenesis - the problem and its solving in our practice, prevalence and relation with other deformities. *J of IMAB*. 2015 Jul-Sep;21(3):859-863. [[Crossref](#)]
7. Souza-Silva BN, Vieira WA, Bernardino ÍM, Batista MJ, Bittencourt MAV, Paranhos LR. Non-syndromic tooth agenesis patterns and their association with other dental anomalies: A retrospective study. *Arch Oral Biol*. 2018 Dec;96:26-32. [[PubMed](#)]
8. Eshgian N, Al-Talib T, Nelson S, Abubakr NH. Prevalence of hyperdontia, hypodontia, and concomitant hypo-hyperdontia. *J Dent Sci*. 2021 Mar;16(2):713-717. [[PubMed](#)]
9. Larmour CJ, Mossey PA, Thind BS, Forgie AH, Stirrups DR. Hypodontia--a retrospective review of prevalence and etiology. Part I. *Quintessence Int*. 2005 Apr;36(4): 263-70. [[PubMed](#)]
10. Polder BJ, Van't Hof MA, Van der Linden FP, Kuijpers-Jagtman AM. A meta-analysis of the prevalence of dental agenesis of permanent teeth. *Community Dent Oral Epidemiol*. 2004 Jun;32(3):217-26. [[PubMed](#)]
11. Celikoglu M, Kazanci F, Miloglu O, Oztek O, Kamak H, Ceylan I. Frequency and characteristics of tooth agenesis among an orthodontic patient population. *Med Oral Patol Oral Cir Bucal*. 2010 Sep 1;15(5):e797-801. [[PubMed](#)]
12. Celikoglu M, Kamak H, Oktay H. Prevalence and characteristics of supernumerary teeth in a non-syndrome Turkish population: associated pathologies and proposed treatment. *Med Oral Patol Oral Cir Bucal*. 2010 Jul 1;15(4):e575-8. [[PubMed](#)]
13. Brinkmann JC, Martínez-Rodríguez N, Martín-Ares M, Sanz-Alonso J, Marino JS, Suárez García MJ, et al. Epidemiological Features and Clinical Repercussions of Supernumerary Teeth in a Multicenter Study: A Review of 518 Patients with Hyperdontia in Spanish Population. *Eur J Dent*. 2020 Jul;14(3):415-422. [[PubMed](#)]
14. Tworkowski K, Gasowska E, Baryla D, Gabiec K. Supernumerary Teeth – Literature Review. *J Pre-Clin Clin Res*. 2020; 14(1):18-21. [[Crossref](#)]
15. Al-Ani AH, Antoun JS, Thomson WM, Merriman TR, Farella M. Hypodontia: An Update on Its Etiology, Classification, and Clinical Management. *Biomed Res Int*. 2017; 2017:9378325. [[PubMed](#)]
16. Gracco ALT, Zanatta S, Forin Valvecchi F, Bignotti D, Perri A, Baciliero F. Prevalence of dental agenesis in a sample of Italian orthodontic patients: an epidemiological study. *Prog Orthod*. 2017 Oct 16; 18(1):33. [[PubMed](#)]
17. Al-Abdallah M, AlHadidi A, Hammad M, Al-Ahmad H, Saleh R. Prevalence and distribution of dental anomalies: a comparison between maxillary and mandibular tooth agenesis. *Am J Orthod Dentofacial Orthop*. 2015 Nov;148(5):793-8. [[PubMed](#)]
18. Yordanova-Ignatona T. [Genetic factors the etiopathogenesis of tooth agenesis. Optimization of the treatment plan.] [Dissertation] Sofia, Bulgaria, Medical University Sofia. 2022. 158 p. [in Bulgarian]
19. Hajmohammadi E, Najirad S, Mikaeili H, Kamran A. Epidemiology of Supernumerary Teeth in 5000 Radiography Films: Investigation of Patients Referring to the Clinics of Ardabil in 2015-2020. *Int J Dent*. 2021 Feb 22;2021:6669436. [[PubMed](#)]

Please cite this article as: Yordanova G, Grancharov M. Comparing the frequency of manifestation of hyperdontia and hypodontia. *J of IMAB*. 2023 Jul-Sep;29(3):5021-5025. [[Crossref](#) - <https://doi.org/10.5272/jimab.2023293.5021>]

Received: 27/03/2023; Published online: 20/07/2023



Address for correspondence:

Greta Yordanova,
 Department of Orthodontics, Faculty of Dental Medicine, Medical University
 – Sofia;
 1, Georgi Sofiyski Str., Sofia, Bulgaria.
 E-mail: gretayordanova@gmail.com,