

ORIGINAL RESEARCH



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Prevalence of nonsyndromic hypodontia in a south-east Transylvanian region.

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Abstract

Introduction. Clinicians claim that the prevalence of hypodontia has skyrocketed in recent years. However, there is no clear evidence whether it is really a change in dentition in Homo Sapiens or a purely hypothetical observation, due to the advanced modern technology used in the diagnosis of dento-maxillary anomalies.

The aim of this study was to establish the prevalence and distribution of nonsyndromic hypodontia in young patients from the South-East Transylvanian region of Romania.

Material and methods. A number of 325 dental charts were selected. The patients who needed orthodontic treatment were treated in the Pedodontics Department and Orthodontic Department of UMFST "George Emil Palade" Targu Mures and two private dental offices during 2017-2019. The age of the patients was between 12 and 25 at the moment when the clinical and paraclinical examination were performed.

Results. From a total number of 275 cases investigated, 78 patients were diagnosed with hypodontia in permanent dentition, not taking into consideration the third molars. Hypodontia's prevalence is 6.47% for patients which seek orthodontic treatment, without taking into consideration the third molars. This value is found in the range of 2.8%-11.3% reported in studies in the literature. The present study showed that hypodontia affects a greater proportion of females (6.83%) than males (5.74%), without statistically significant differences.

Conclusions. The prevalence of non-syndromic hypodontia in permanent dentition, compared to the total number of patients who requested orthodontic treatment, is 6.47%, being higher than the data reported in the literature of our country, but falls within the range reported in the international literature in general.

Keywords: hypodontia, non syndromic hypodontia, orthodontic treatment.

Introduction

Over time, numerous studies on the prevalence of hypodontia have been published in the national and international literature, as it is considered to be one of the most common oral conditions and one of the most intriguing dental phenomena, associated with a number of other skeletal dento-maxillary abnormalities, structural variations, congenital malformations and dental position abnormalities [1].

Clinicians claim that the prevalence of hypodontia has skyrocketed in recent years. However, there is no clear evidence whether it is really a real change in dentition in Homo Sapiens or a purely hypothetical observation, due to the advanced modern technology used in the diagnosis of dento-maxillary anomalies.

Early reports of hypodontia prevalence provide much lower absolute frequencies, ranging from 2.8% in the United States [2] to 3.4% in Switzerland [3] and 3.31% in Spain, [4]. The frequency of hypodontia was lower in the population of North America, with values in

the range of 3.5% - 3.7% compared to European countries, where the reported values were much higher, in the range of 6-8%. More recent data on the absolute frequency of hypodontia, excluding wisdom teeth, range from 2.8% for the Malaysian population to 11.3% for Irish people to a maximum reported of 14.69% for the Hungarian population [3,5,6].

Hypodontia is a dental anomaly with a decreased prevalence among population (2-7%) but with a large variation of clinical aspects which first of all affects the physiognomy but also the other functions of the dento-maxillary apparatus [7].

In 2004, Polder et al. [8] performed a complex meta-analysis, based on numerous studies on the prevalence of hypodontia in the Caucasian population in Europe, North America and Australia, which reported different values by continent and sex. With the exception of the wisdom molars, the highest incidence of hypodontia, 6.3% with 7.6% for

females and 5.5% for males, was reported in Australia, followed by Europe with 5, 5% with 6.3% for females and 4.6% for males, and North America with the lowest value, respectively 3.9% with 4.6% for females and 3.2% for males. The variation of the obtained results is due to the different research conditions within the examined lots, regarding the age limit, ethnicity and the type of radiographs used.

Referring only to the canine, Sivaraajan in 2021 found a general prevalence of canine agenesis of 0.30%, higher in Asia, followed by Africa, Europe and South America, this being more common in the jaw than the mandible, more common in females in comparison with males, except Asia and Africa. The unilateral agenesis being more common in Asia and the bilateral form showing a greater prevalence in Europe [9].

Aim of the study

The aim of this study was to establish the prevalence and distribution of nonsyndromic hypodontia in patients who were treated in the Orthodontics Department of the UMFST of Târgu Mureş and two private dental offices. Following the statistical processing of the recorded data, we compared the results obtained with the specific results reported in previous studies in the literature in the country and abroad. The statistical study was performed in the following directions:

- prevalence of hypodontia in relation to the total number of patients,
- prevalence of hypodontia according to sex,
- prevalence of hypodontia in relation to the number of missing teeth,
- prevalence of hypodontia depending on the type of tooth most frequently affected,
- the prevalence of hypodontia depending on the location and distribution model at the level of the dental arches.

Material and methods

A number of 325 dental charts were selected. The patients that needed orthodontic treatment were treated in the Pedodontics Department and Orthodontic Department of UMFST "George Emil Palade" Targu Mures

and two private dental offices during 2017-2019. The age of the patients was between 12 and 25 at the moment when the clinical and paraclinical examination were done.

The study material was focused of the dental charts of the patient which include: personal data, family history, personal history, extra oral examination, intraoral examination, radiographic examination and study models.

The diagnostic of hypodontia was made on the radiographic examination together with the study model and the chart.

The inclusion criteria were the following:

- The patient did not follow an orthodontic treatment,
- Patients aged 25 or younger,
- Quality radiographic documents,
- The type of the missing teeth could be confirmed.

The exclusion criteria were:

- Lack of complete documentation,
- The absence of some teeth which suffered a trauma in the past,
- Younger than 12 years old.

From the total number of charts we selected only 275 with complete documentation. We analysed all the x-rays on a light box, and we considered as a congenital missing of a tooth, the situation in which it did not erupt in the oral cavity and it could not be identified or spotted on the radiograph based on its calcification, and there is no proof of its extraction. To avoid getting a false-positive result and also because the premolars present a high variability in starting the calcification, we took into consideration the hypodontia of second premolars only after the age of 7, and hypodontia of the wisdom teeth was not included in this investigation.

The statistical processing of data consisted of operation, centralization, ordering, grouping and representation of the data in the form of series, tables and graphs. The centralization of the data represented the totalization of the individual values on the entire studied sample. All the datas were statistically analysed using SPSS software (Statistical Package for Social Sciences, Windows Vista, version 19.0, SPSS Inc.).

Results

From the total number of 275 cases investigated, 78 patients were diagnosed with hypodontia in permanent dentition, not taking into consideration the third molars.

Biomechanical constitutional field

Appreciating the biochemical constitutional field of the patient according to the Firu classification, we found that the majority of patients in the group with hypodontia (63.89%) belong to the phosphocalcic type, followed by the fluorocalcic type (19.44%), respectively, carbocalcic (16.67%) (Figure 1).

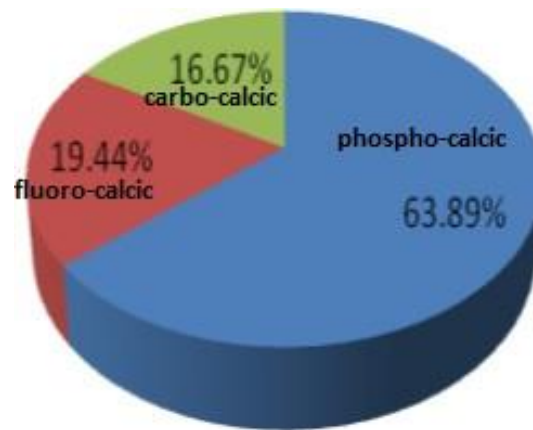


Figure 1. Biochemical constitutional field of patients with hypoplasia

From the point of view of the pattern of development of the cephalic extremity, the teeth affected by hypoplasia were more common in patients with dolichocephalic type (47.22%),

followed by those with mesocephalic developmental pattern (36.11%), and by those with brachycephalic pattern (16.67%) (Figure 2).

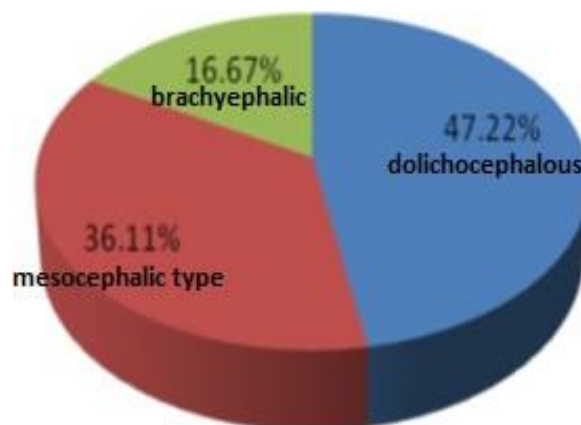


Figure 2. Pattern of development of the cephalic extremity in patients with hypoplasia

Regarding the divergence of the mandibular basal branch, we noticed that half of the patients with hypoplasia were hypodivergent, followed by

those with a pattern normodivergent (38.89%), and hyperdivergent (11.11% of cases) (Figure 3).

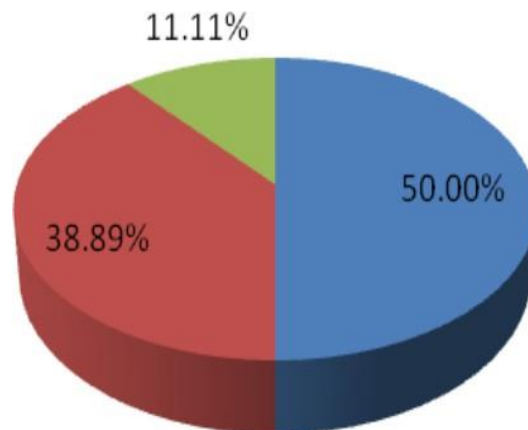


Figure 3. Facial pattern of patients with hypoplasia, related to the divergency of the mandibular basal branch

Related to the entire sample, the prevalence of hypodontia is 6.47% of patients who needed

orthodontic treatment in the Orthodontic Department in Targu Mures (Figure 4).

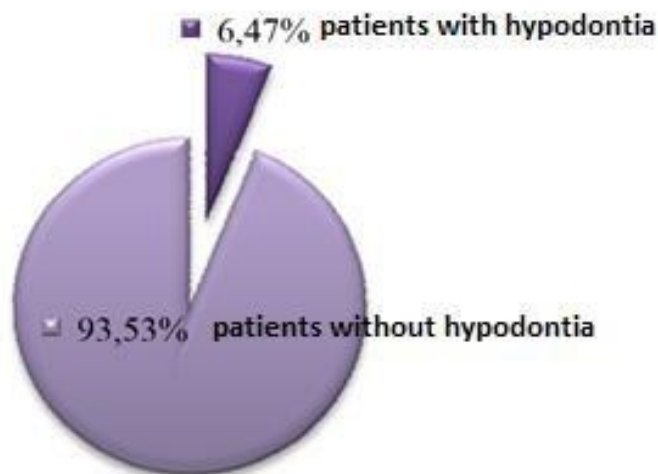


Figure 4. Prevalence of hypodontia of the study sample

Female patients, 55 in the investigated sample, with a prevalence of 6.83%, and male patients 23, the prevalence of hypodontia in this case is 5.74% (Figure5).

The Chi-square test (χ^2) applied shows that

although the proportion of female patients with hypodontia is higher than that of males, the differences are not statistically significant between both sexes because p calculated > 0.05 . (Table 1)

Table 1. Prevalence of hypodontia of the studied sample based on gender (n=78)

GENDER	NUMBER OF PATIENTS		PREVALENCE (%)
	Affected	Examined	
FEMALE	55	805	6,83
MALE	23	401	5,74
TOTAL	78	1206	6,47

Figure 5 graphically represents the total composition of the sample, with the mention of the fact that hypodontia within female

subjects is higher than of the male subjects, maybe because of esthetic considerations also.

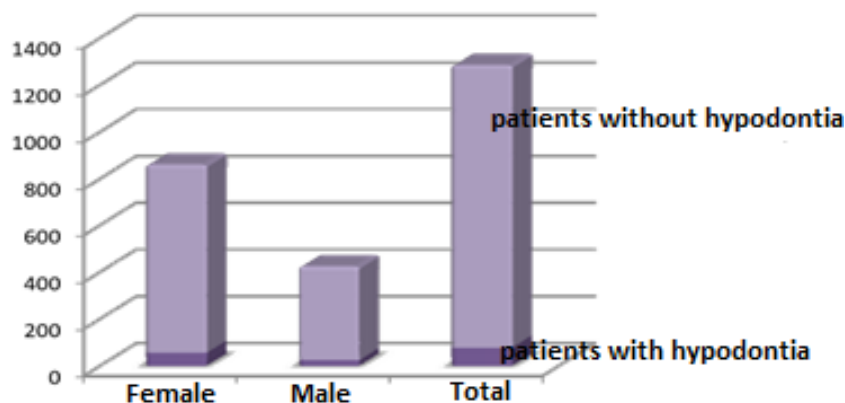


Figure 5. Repartition of the patients of the entire sample based on gender

The total number of missing teeth (without taking into consideration the third molar) is 172, from which 115 for males and 57 for females, with an average of 2,2 per patient. Out of a total of 78 patients diagnosed with

hypodontia, 76.92% have one or two missing teeth, 19.23% have three to five missing teeth and 3.85% have severe hypodontia, respectively missing six or more teeth. (Table 2)

Table 2. Distribution of missing teeth number in patients with hypodontia (p=0.01)

NUMBER OF MISSING TEETH	FEMALE	%	MALE	%	TOTAL	%	P	SIG
1	18	23,08	7	8,97	25	32,05	0.01	S
2	26	33,33	9	11,54	35	44,87	0.001	S
3	4	5,13	1	1,28	5	6,41	0.36	NS
4	4	5,13	3	3,85	7	8,97	1.00	NS
5	1	1,28	2	2,56	3	3,85	1.00	NS
6≥	2	2,56	1	1,28	3	3,85	1.00	NS
TOTAL	55	70,51	23	29,49	78	100		

The applied Chi – square test (χ^2) reveals statistically significant differences in the case of patients with reduced hypodontia (1-2 missing teeth).

A percentage of 32.05% of the total number of patients has unidentified hypodontia, with a prevalence of 8.97% in males and 23.08% in females (Figure 6).

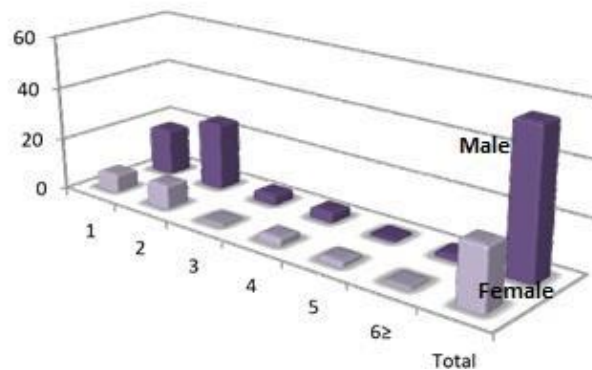


Figure 6. Allocation of unilateral hypodontia based on genders

The distribution of hypodontia and statistical comparisons according to the type of tooth absent in the upper and lower arch, both females and males are presented in Table 3.

Tracking the distribution of the number of missing teeth in relation to the jaws and the arch area concerned, allows the observation of the prevalence of higher hypodontia in the upper jaw with a value of 53.48% compared to

46.52% in the mandible.

Regarding the prevalence of hypodontia compared to the affected arch area, we can see a preponderance in the incisor region (46.99%), with a clear advantage in favor of the upper arch (30.81%), followed by the premolar region (44.72) %, with a higher value at the level of the lower arch (26.14%).

Table 3. Distribution and statistical comparison of missing teeth according to location at the level of dental arches (n = 172)

Tooth	Maxillar		Tooth	Mandible	
	Number	%		Number	%
1.1	0	0	4.1	17	9.8
1.2	23	13.37	4.2	3	1.74
1.3	0	0	4.3	1	0.58
1.4	5	2.9	4.4	3	1.74
1.5	11	6.39	4.5	21	12.2
1.6	2	1.16	4.6	2	1.16
1.7	0	0	4.7	2	1.16
2.1	1	0.58	3.1	6	3.48
2.2	29	16.86	3.2	2	1.16
2.3	1	0.58	3.3	1	0.58
2.4	5	2.9	3.4	5	2.9
2.5	11	6.39	3.5	16	9.3
2.6	2	1.16	3.6	1	0.58
2.7	2	1.16	3.7	0	0
Total	92	53.48		80	46.52

Regarding the most frequently affected tooth reported, the data of this study place *the upper lateral incisor* on the *first place* with an incidence of 30.23%, followed by the second lower premolar (21.5%), the lower central incisor (13.28%), upper second premolar (12.78%), upper first premolar (5.8%), lower first premolar (4.64%), lower lateral incisor (2.9%), upper first molar (2.32%).

Teeth considered stable have a much lower frequency: lower first molar (1.74%), lower canine, upper and lower second molar (1.16%), upper canine and upper central incisor (0.58%).

Statistical comparisons and the distribution of missing teeth according to the location at the

level of the upper arch, depending on the sex of the patient are shown in Figure 7.

Similarly, the distribution of missing teeth according to the location at the lower arch is shown in Figure 8.

Statistically significant differences were found for five of the 14 teeth investigated, namely the upper lateral incisor, upper second premolar, lower first premolar, lower central incisor and upper first premolar. The prevalence of hypodontia in females was higher than in males in almost all types of affected teeth, both in the upper and lower arch.

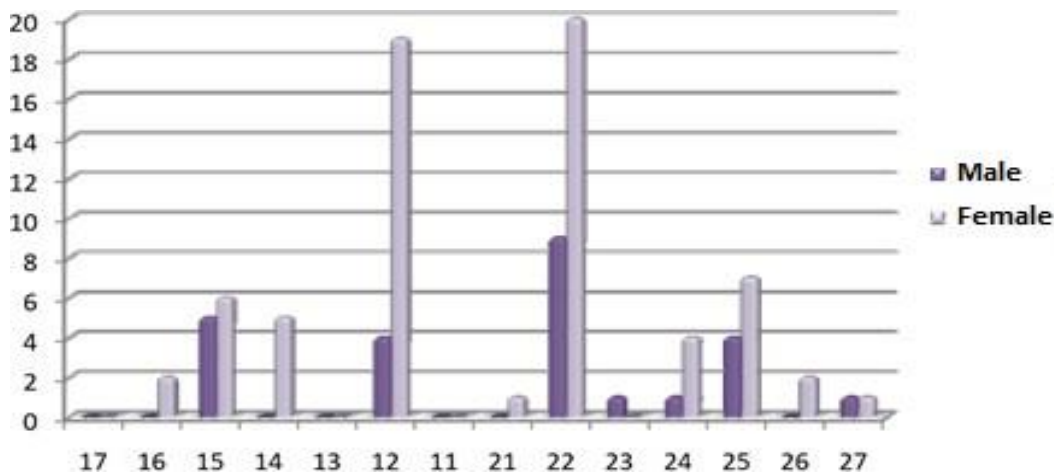


Figure 7. Distribution of hypodontia based on the type of the tooth and gender

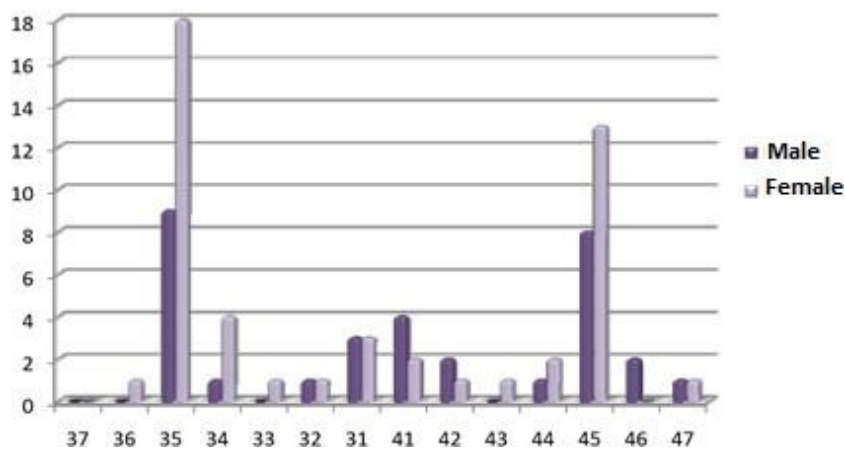


Figure 8. Distribution of hypodontia in lower arch

As we can see on the chart the most affected tooth is the left lateral incisor, 2.2 followed by the right lateral incisor, 1.2.

For the mandible the most frequent absent tooth is the second premolar on the right part, 3.5, followed by the second premolar from the

left side, 4.5.

Discussions

Hypodontia's prevalence is 6.47% for patients which seek orthodontic treatment, without taking into consideration the third molars. This value is found in the range of 2.8%-11.3% reported in studies in the literature. A study about the prevalence of hypodontia in orthodontically treated patients in Brazil, conducted by Gomes et al. [10] between 1998-2000 reported a relative frequency of hypodontia of 6.3% in patients who requested orthodontic treatment, with no statistically significant differences between females and males.

Similar to this study, in Slovenia, Fekonja [2] reported 11.3% in a group of 212 patients, and in Hungary, Gábris et al. [11] reported a much higher frequency with a net higher value of 14.69%, also without statistically significant differences between females and males. The result of this statistical study is much lower than the value of 8.5% reported by Endo et al. [12] in Japan in 2006, than 11.3% reported in 2005 by Fekonja [2] in Slovenia and much lower than the 14.69% value obtained by Gábris et al. [11] in Hungary in 2006.

Compared to similar studies conducted in Romania, the value obtained is higher than the value of 3.53%, reported by other studies done over the years and is between the values detected by Tarmure et al. [13]. The variation of the results obtained could be attributed to the different methods used by each of the authors mentioned.

The present study showed that hypodontia affects a greater proportion of females (6.83%) than males (5.74%), without statistically significant differences. This result is in agreement with the results obtained by the following authors, Fekonja [2], Endo et al. [12], while other studies who found significant differences between females and males [13].

Regarding the number of missing teeth, in descending percentage order, out of the total number of patients affected by the numerical reduction, two teeth were missing in 44.85% of patients, one tooth in 32.05%, four teeth in 8.97%, three teeth at 6.41%, five teeth and 6 or more teeth at 3.85% of the total number of

patients. The result of this study indicates that 76.92% of all patients with hypodontia have one or two missing teeth. Studies on this issue by other authors, such as Fekonja [2], Gomes [10] and Endo et al [12], have reported a much higher frequency for reduced hypodontia.

Regarding the distribution of hypodontia according to the type of tooth affected, except for the three molars, the upper lateral incisor is the most frequently affected tooth in a proportion of 30.23% of cases, followed by the second lower premolar (21.5%) the lower central incisor (13.28%) and the upper second premolar (12.78%). Hypodontia of the lower and upper canines, of the upper and second upper and lower molars, has a very low percentage.

These results are in agreement with most previous studies [13-17] and in contradiction with other authors like Endo et al. [12], which places the lower second premolar first.

Meta-analysis performed by Polder et al. [8], in 2004, based on the analysis of several studies on the incidence of hypodontia, has shown that the upper lateral incisor is most frequently affected in the Caucasian population, a fact confirmed by the results obtained in the present study. In addition, differences between groups of patients seeking orthodontic treatment may reflect various psychosocial issues between regions. Probably, in countries where the aesthetics of the smile is well appreciated, the hypodontia of the lateral incisor motivates patients and their parents to request orthodontic treatment in specialized clinics.

The study revealed that the prevalence of hypodontia occurs in both jaws, but is more common in the upper jaw with a value of 53.48%, compared to 46.52% in the mandible. This result is consistent with the results obtained by Fekonja [2] and in contradiction with the values reported by Endo et al. [12] and Gábris [11].

Regarding the prevalence of hypodontia compared to the affected arch sector, we observed a preponderance in the upper incisor region, with a proportion of 30.81%, followed by the lower premolar region with a proportion of 26.14%, which confirms the results obtained by Fekonja [2] and Endo et al. [12] who

obtained as the area most frequently affected by hypodontia, the upper incisor region.

We observed an almost remarkable similarity in the distribution of missing teeth between the left and right sides of the dental arches in the patients investigated in this study. These results are in agreement with the results obtained by previous studies conducted by Endo et al. [12].

Conclusions

1. The prevalence of non-syndromic hypodontia in permanent dentition, compared to the total number of patients who requested orthodontic treatment, is 6.47%, being higher than the data reported in the literature of our country, but falls within the range reported in the international literature in general.
2. In relation to the number of teeth involved, we obtained an increased result with an average value of 2.2 teeth per patient, which confirms that hypodontia is common in patients who have been referred for orthodontic treatment, requiring a diagnosis and prompt therapeutic resolution to prevent associated aesthetic and functional problems.
3. The results of the present study showed that in the case of the studied group there were no statistically significant differences in the prevalence of hypodontia by sex.
4. The present study shows that the highest degree of damage is encountered at the upper lateral incisor, followed by the lower second premolar, supporting the theory of increased lability of teeth located distally in each dental group.
5. Most patients had reduced hypodontia, severe forms being infrequent, which is a favorable aspect in the therapeutic conduct of this dental abnormality.
6. Hypodontia occurs in both jaws, but mainly in the upper jaw.
7. The increasing trend of the prevalence of this dental anomaly justifies the special clinical interest and the implementation of preventive strategies with the main purpose of the efficiency of interceptive, educational and curative management.

Conflict of interest: None to declare.

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