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DENTAL AGENESIS IN INDIAN POPULATION: A CROSS SECTIONAL STUDY

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ABSTRACT

Introduction: The congenital absence of one or more teeth is a dental anomaly that frequently occurs throughout the world with a wide variability of distribution. This study was conducted to assess the current prevalence of dental agenesis in the permanent dentition (excluding third molars) using a sample of Indian population. **Methods**: Panoramic radiographs of 3852 Indian children between 10 and 15 years of age (1862 males and 1990 females) performed over a 3-year period (from 2015 to 2018) were carefully examined to identify congenital missing teeth. A chi-square test was used to determine the difference in the prevalence of hypodontia between genders and between arches. **Results**: The prevalence of dental agenesis was more in females than males. The most common congenitally missing teeth were the mandibular second premolars (20.3 and 18.1%) followed by the upper lateral incisors (17.8 and 17.7%) and the maxillary second premolars (7.4 and 6.3%). The absence of one tooth to five teeth was observed in 318 patients (8.73%), while 13 patients showed from six to nine missing teeth (0.36%). **Conclusions**: A detailed and careful radiographic examination was important in diagnosing one or more missing teeth. This could help plan the best possible treatments, both esthetically and functionally, for these patients.

KEYWORDS: Prevalence, Hypodontia, Dental agenesis.

INTRODUCTION

Tooth agenesis is considered one of the most common anomalies of dental development and occurs with a high frequency in the world's population compared to other development abnormalities.[1–8] Congenital or developmental absence of one or more teeth has been described in literature with different terms.[7,9,10] Congenital absence of one to six teeth (excluding the third molars) is generally called "hypodontia," while the absence of more than six teeth is named "oligodontia" and "anodontia", a very rare condition, is the absence of all teeth. More than 49 syndromes have been associated with one or more missing teeth[3,6]; the main ones are hypohidrotic ectodermal dysplasia, incontinentia pigmenti, Down syndrome, craniofacial dysostosis, and syndromes associated with growth and development defects.[2,11]

Studies based on prevalence and distribution of hypodontia demonstrated a high variability depending on sample size, gender, race, and ethnic provenance.[1,8–10,12,13] In the European population, it varied from 3.4% in Switzerland to 10.1% in the population of Norway.[10] The purpose of this study was to examine the current prevalence and distribution of hypodontia in the permanent dentition (excluding third molars) in a sample of Indian population, determining which the most affected teeth are and to compare our results with those of other studies.

MATERIALS AND METHOD

This is a retrospective research approved by the Ethical Committee of the Himachal Group of Institutions, Paonta Sahib of Dental Sciences & Research. Patients were informed regarding the study and written informed consent was taken. Panoramic radiographs of 3852 Indian children between 10 and 15 years of age (1862 males and 1990 females) performed over a 3-year period (from 2014 to 2017) were carefully examined to identify congenital missing teeth. All patients visited the college for an orthodontic evaluation. The radiographic machines were the same with uniform features.

The inclusion criteria for this study were patients of Indian origin, patients with no history of medical problems and patients with no history of any syndrome. All selected files were examined by the same operator in a dark room using X-ray viewer to identify the presence of dental agenesis (excluding third molars). A tooth was diagnosed as congenitally missing if the mineralization of its crown could not be identified on orthopantomogram. The operator analyzed the records and the medical history of the patients and excluded 208 records, considering the following exclusion criteria: agenesis of third molars, patients with missing teeth for decay processes, avulsions or extracted for orthodontics or other reasons, patients with facial clefts and craniofacial syndromes, and poor image quality of panoramic radiographs. The final sample of this study included 3644 panoramic radiographs: 1712 males with a mean age of 11.4 years and 1932 females with a mean age of 11.9 years. Data obtained from panoramic radiographs and patients' records were recorded according to gender, subject's date of birth, age at time of radiography, number of missing teeth and their location, maxillary versus mandibular agenesis, and right versus left side.

Statistical analysis

Data was analyzed using IBM SPSS. Statistics Windows, Version 20.0. (Armonk, NY: IBM Corp). The statistical significant difference among groups was determined by the Chi‑square test, and the level of significance was set at $P < 0.05$.

RESULTS

The final dataset comprised 3664 patients, of which 3313 had no missing permanent teeth. A total of 179 females and 152 males examined showed at least one congenitally missing tooth (excluding third molars), bringing the total to 331 patients. The female hypodontia prevalence was higher than males, although difference between gender was not statistically significant. The overall prevalence of hypodontia was found to be 8.73% of the total sample population (Table 1).

The most commonly congenitally missing teeth were the lower left second premolar (20.3% of the sample), followed by the lower right second premolar (18.1%), the upper lateral incisors (17.8 and 17.7%), the upper left second premolar (7.4%), the upper right second premolar (6.3%), and the upper right first premolar (2.6%). There were no significant differences between the right and left sides for any particular tooth (Table 2).

Table 1: Distribution of the patients by gender and number of missing teeth.

Dental agenesis	Missing teeth	Male N (%)	Female N (%)	Total N (%)
Yes	1-5	145 (3.98)	173 (4.75)	318 (8.73)
	>6	7 (0.2)	6 (0.16)	13 (0.36)
No	0	1560 (42.8)	1753 (48.11)	3313 (90.91)
Total		1712 (46.98%)	1932 (53.02)	3644 (100%)

Table 2: Most frequent missing teeth divided between sexes.

Gender	35	45	12	22	25	15	14	24	32	42	34	44	Total
Male N (%)	41 (7.8)	39 (7.4)	39 (7.4)	43 (8.2)	20 (3.8)	11 (2.1)	10 (1.9)	8 (1.5)	8 (1.5)	6 (1.1)	5 (0.9)	4 (0.8)	234 (44.5)
Female N (%)	66 (12.5)	56 (10.6)	55 (10.4)	50 (9.5)	19 (3.6)	22 (4.2)	4 (0.8)	5 (0.9)	3 (0.6)	5 (0.9)	4 (0.8)	3 (0.6)	292 (55.5)
Total N (%)	107 (20.3)	95 (18)	94 (17.8)	93 (17.7)	39 (7.4)	33 (6.3)	14 (2.6)	13 (2.5)	11 (2.1)	11 (2.1)	9 (1.7)	7 (1.3)	526 (100)

DISCUSSION

The prevalence of tooth agenesis, excluding third molars, was observed at 4.91% among females and 4.0% for males, for a total of about 8.91% for both sexes together which is similar to the study done by Antonio L. T. Gracco[8], but this result showed a higher prevalence compared with the two previous studies on this topic and confirms that hypodontia is a common developmental anomaly in children. In the analysis of Lo Muzio et al., the prevalence was 5.17%[14], and according to the data of Polastri et al., the prevalence was 5.14%.[15] The sample studied by Polastri et al. included 700 national servicemen aged between 19 and 26, so it was much smaller and very different from our sample of patients. This research is the first of its kind in India analysing the prevalence of dental agenesis in a sample of orthodontic patients.

According to literature review on the prevalence of agenesis, we could state that the range of prevalence values varies from 2.8% in the Malaysian population[16] to 12.6% in the German population.[17] Also, in the same population, different studies reported various values of prevalence: Celikoglu et al. determined prevalence of 4.6% in Turkish orthodontic patients[18] while Sisman et al. found a prevalence of 7.54% in another sample of the Turkish population.[19] The result of this study pointed out a higher prevalence in India than in most other countries. A higher prevalence rate was found in a few other studies: Chung et al. estimated a prevalence of

11.2% in Korean population[20] and Hunstadbraten of 10.1% in Norway.[10] A very high prevalence was also reported in two German studies (12.6%[20] and 11.3%[6]). The wide range of prevalence values observed in these studies has indicated that geographic, gender, races, and genetics differences as well as the big differences in the sample size and criteria of selection play a fundamental role in the varied results of studies of hypodontia. This wide range could make the comparison of the result of this study very limiting with other previous studies.

Polder examined a total of 28 studies and concluded that the prevalence of dental agenesis in females was almost 1.4 times higher than in males.[10] In this study, there was no significant difference between the prevalence of hypodontia in males (4.0%) and females (4.91%). Females presented a higher prevalence of congenital missing teeth, which is in agreement with the majority of reports by Grahnèn[21], Haavikko[22] and Fekonja[6], But Larmour et al.[23] found that in the primary dentition, there was no gender distribution, while in the permanent dentition, females are affected more frequently than males by a ratio of 3:2. In the study of Behr et al. on the German population[17] and of Laganà et al.[24], the percentage was equally distributed between males and females.

We found that the most often congenital missing tooth types in patients observed in our study were mandibular second premolars, followed by maxillary lateral incisors and maxillary second premolars. Lo Muzio et al.[14] and Laganà et al.[24] had similar findings in the previous study, whereas Polastri[15] found that the most affected tooth was the maxillary lateral incisor followed by the mandibular second premolar. There is some variation in the literature concerning the description of the most frequently missing tooth, excluding third molars. In the European population, the teeth that were most frequently affected by hypodontia are the following: mandibular second premolar, maxillary lateral incisor, and maxillary second premolar.[10] The mandibular second premolar is the most frequently missing tooth also reported by Polder et al.[10], In Malaysian[19], Turkish[25], and American populations, the most commonly missing tooth was the maxillary lateral incisor.[13] In the Chinese population, the most frequently missing teeth are mandibular central and lateral incisors.[10] Teeth with the lowest frequency of agenesis were canines (6 males and 15 females) and the first molars (0 males and 3 females). The first molar was missing only in patients with oligodontia.

CONCLUSIONS

We found a higher prevalence of congenital missing teeth (8.91%) compared to previous similar studies, so hypodontia is not an uncommon anomaly in the Indian population. There were no significant differences in the distribution of congenitally missing teeth between the sexes or in localization by arches and quadrant sides. The mandibular second premolars were the most frequently missing teeth, followed by the maxillary lateral incisors and maxillary second premolars. By early detection of missing teeth, alternative treatments can be discussed and planned with a multidisciplinary team to minimize the complications of congenital missing teeth and to restore the patient's dental esthetics and functionality.

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