An Orthopantomographic Study of Prevalence of Hypodontia and Hyperdontia in Permanent Dentition in Vadodara, Gujarat

Abstract

**Background:** Developmental anomalies in the number of teeth can result from disturbances in the developing dental lamina of the tooth. The dental lamina may become hyperactive leading to the formation of a supernumerary tooth or may fail to proliferate leading to the congenital absence of a primary or permanent tooth. **Aims:** The aim of the study was to assess the prevalence and distribution of hypodontia and hyperdontia in permanent dentition, excluding the third molars in children in Vadodara, Gujarat. **Setting and Design:** A descriptive, analytical, and cross-sectional study was conducted to determine the above-mentioned aims. **Materials and Methods:** In the study, panoramic radiographs of 1816 children (967 girls and 849 boys), aged 8 to 14 years were recorded and inspected for anomalies in the number of teeth. **Statistical Analysis Used:** The data was analyzed using SPSS version 10.00 (Statistical Package for the Social Sciences, Chicago, USA). Descriptive statistics and Chi-square-test were used to compare the results. The level of significance was set at 0.05. **Results:** The prevalence of hypodontia was 11.01%, and the most frequently absent tooth was the maxillary lateral incisor. There was an increased prevalence of hypodontia in females and in the mandibular arch of the permanent dentition. The prevalence of hyperdontia was 2.97% and the most common supernumerary tooth was mesiodens. There was an increased prevalence of hyperdontia in males and in the maxillary arch of the permanent dentition. **Conclusions:** There was a high prevalence of hypodontia and a low incidence of hyperdontia in the studied population. Prompt diagnosis of these anomalies can help plan treatment modalities at an early age to establish a functional and esthetic dentition.

**Keywords:** Etiology, hypodontia, prevalence, supernumerary tooth

Introduction

The formation of a tooth is a complex process which involves an interaction of the epithelium and the mesenchymal tissues. A lack of initiation of the development of dental lamina can result in the absence of teeth, and an abnormal initiation may result in the development of supernumerary teeth. Congenitally missing teeth is one of the most common developmental problems in children. By definition, congenitally missing teeth are those that fail to erupt in the oral cavity and remain invisible on a radiograph, which implies that they are caused by disturbances during the early stages of tooth development. The congenital absence of one to six teeth, excluding the third molars is termed as hypodontia. When more than six teeth are absent, it is termed as oligodontia. The condition of complete absence of teeth, either in the primary dentition and/or in the permanent dentition is termed as anodontia.

The absence of teeth may be a result of combination of genetic and environmental factors, and it can also occur as an isolated condition (nonsyndromic hypodontia) or can be associated with a systemic condition or syndrome (syndromic hypodontia). Syndromic hypodontia has been seen in 49 syndromes known to human. In context to the genetic causes of hypodontia, by far two genes have been identified by mutational analysis as the major causes of nonsyndromic hypodontia: PAX9 and MSX1. Environmental factors can cause tooth agenesis by a variety of means that can be broadly placed into two groups: Invasive and noninvasive. These can act either additively or independently to affect the positioning and physical development of the tooth. Jaw fractures, surgical procedures, extraction of the preceding primary tooth, and changes in muscle pressure from the facial and lingual sides are all examples of invasive factors that can affect tooth development and positioning leading to the congenital absence of teeth.
to tooth agenesis and impaction. Among noninvasive factors, the most common are developing teeth which are irreversibly affected by chemotherapy and irradiation in an age- and dose-dependent manner, nutrient deprivation, and endocrine disturbances.[2] The prevalence of hypodontia varies from 0.03% to 10.1% among various populations.[6]

Supernumerary teeth are additional teeth apart from those present in the normal human adult dentition. They may cause displacement, rotations, or complete impaction of certain permanent teeth leading to malocclusion. The etiology of hypodontia has been attributed to the “dichotomy theory,” hyperactivity of the dental lamina, or environmental factors. However, the most documented etiology for supernumerary teeth has been heredity. The prevalence of hypodontia in the permanent dentition is reported to be 0.5%–3.8% among populations.[7]

Patients with tooth number anomalies, especially of the anterior teeth suffer from emotional, esthetic, and functional problems and a series of treatment are required continuing from adolescence to adulthood to provide a normal healthy occlusion. Early detection of dental anomalies is vital to provide comprehensive treatment and prevent malocclusions.

Although there have been numerous studies on tooth number anomalies throughout the world, there have been very few studies reporting the prevalence of tooth number anomalies in India and no earlier records of the same in Gujarat. Hence, the aim of the study was to assess the prevalence and distribution of hypodontia and hyperdontia in permanent dentition, excluding the third molars in children in Vadodara, Gujarat.

Materials and Methods

The study was carried out in Department of Pediatric and Preventive Dentistry, Vadodara. The study was approved by the University Ethical Committee and consent was taken from the parent/guardian before the participation of individuals in the study.

A total of 1816 patients (967 females and 849 males) aged between 8 and 14 years attending the Department of Pediatric Dentistry were included in the study. Patients with the history of tooth loss due to trauma, extraction, or cleft lip, and palate or missing due to syndromes were excluded from the study. Orthopantomograms (OPGs) were recorded and analyzed on a lightbox using a magnifying lens. OPGs with poor image quality were not included in the study.

All the OPGs were evaluated by the principal investigator under normal room lighting using a magnifying glass on a lightbox. The congenitally missing and supernumerary teeth were recorded in a datasheet. Third molars were not included in the study.

The data were analyzed using SPSS version 10.00 (Statistical Package for the Social Sciences, Chicago, USA). Descriptive statistics were used to compare the results. Chi square-test was used to analyze the differences between hypodontia and hyperdontia in both sexes and maxillary and mandibular arches. The level of significance was set at 0.05.

Results

A total of 1816 OPGs, 967 females (53.24%) and 849 males (46.76%), with a mean age of 12.30 ± 2.55 years were included in the study [Table 1]. Out of 1816 patients, 200 patients showed hypodontia and 4 patients showed oligodontia [Figure 1]. The prevalence of hypodontia was more in females (54.90%) as compared to males (45.10%) [Table 1]. The difference was not statistically significant among both the sexes [Figure 2]. The most common missing teeth were maxillary lateral incisors followed by the mandibular second premolars.

Figure 3 demonstrates that hypodontia was found to be higher in the mandibular arch (194 teeth) as compared to the maxillary arch (154 teeth) for both males and females. However, no statistically significant difference was seen between the sexes. Majority of patients reported missing one or two teeth, but very few participants had more than two teeth missing [Table 2].

Table 3 demonstrates the distribution of symmetrical hypodontia, and it was seen that 59 participants (36 females and 23 males) showed the congenital absence of contralateral maxillary lateral incisors and 21 participants (13 females and 8 males) showed the congenital absence of contralateral mandibular second premolars.

The overall prevalence of hyperdontia was 2.97%, with increased prevalence in males (2.09%) as compared to females (0.88%). The most common supernumerary tooth was mesiodens, followed by premolars [Figure 4].

In relation to the primary teeth, there was no evidence of hypodontia or hyperdontia (0%) in the radiographs.

Discussion

Hypodontia is the most common developmental anomaly observed in the permanent dentition. Early diagnosis and prompt intervention play an important role in the prevention of its serious ethical, physiological, functional, and emotional complications.[8]

Determination of the congenitally missing teeth by clinical examination alone may lead to underestimation as they

| Parameters                  | Female (%) | Male (%) | Total (%) |
|-----------------------------|------------|----------|-----------|
| Number of patients          | 967 (53.24)| 849 (46.76)| 1816 (100) |
| Number of patients with hypodontia | 112 (54.90) | 88 (45.10) | 200 (11.01) |
| Number of missing teeth     | 182 (52.30)| 166 (47.70)| 348 (100)  |
may be visible on radiographs. Hence, OPGs were used for the study rather than clinical examinations and dental history. The calcification of crowns of all permanent teeth except the third molars is not complete until 6 years of age. Therefore, the age range of the patients included in the study was from 8 to 14 years. Early detection before that might cause false and unreliable results.[9]

In the total sample of 1816 patients, 200 patients (11.01%) were affected with hypodontia. The results of our study are similar to the study by Guttal et al.[10] and Vibhute et al.,[11] in which they found the prevalence of hypodontia to be 10.3% and 10.45%. Contrasting results were found by Shetty et al.[12] in a study in Karnataka where the prevalence of hypodontia was found to be 0.32% and Kathariya et al.[13] in Maharashtra reported a prevalence of hypodontia as 4.8%. Similarly, the reported prevalence rates were 4.7% and 4.19% as reported by Mukhopadhyay et al.[14] in West Bengal and Gupta et al.[15] in Madhya Pradesh [Table 4].

The prevalence of congenitally missing teeth in the permanent dentition excluding the third molars ranges between 0.15% and 16.2% around the world.[16] A study by Chung et al.[17] reported the incidence of hypodontia as 11.2% in Korea and similar results were found by Fekonja[1] in Slovenia with a prevalence rate of 11.3%. The wide variations in the prevalence may be due to differences in the types of populations examined, genetic factors, sample size, and presence or absence of radiographs during the examination.[14]

In our study, the number of missing teeth was 182 in females and 166 in males. The results of our study are in agreement with multiple studies conducted across the world.[11,14,15] Mattheeuws et al.[16] reviewed 19 papers from a total of 42 studies and reported that girls have a higher tendency of congenital absence of teeth as compared to boys of the same age. A factor that can contribute to the increased reported rates of hypodontia in females is the existence of a higher orthodontic treatment need as there is a definitive concern regarding their appearance.[19] In
The prevalence of oligodontia is nearly 0.22% which is comparatively lower than the results of Chung et al.[17] and Polder et al.[18] Anodontia was not present in any participant of the study.

In the assessed radiographs, number of participants with unilateral (120 participants) and bilateral (114 participants) missing teeth were nearly similar. The difference between them was not statistically significant. There was an increased prevalence of congenital absence of maxillary lateral incisors (51.75%) bilaterally as compared to mandibular second premolars (18.42%). It is suggested that unilateral agenesis might be more common in the case of the upper and lower second premolars, whereas bilateral missing might be more common in the maxillary laterals.[18,25]

The presence of supernumerary teeth in the alveolar bone may cause disturbances to the developing teeth or to the eruption of teeth into the oral cavity leading to functional and esthetic problems. A mesiodens is the presence of a supernumerary tooth between the maxillary central incisors, a paramolar occurs between the permanent second and third molars and a distomolar is a fourth molar, usually placed distal to third molar.[26]

The prevalence of hyperdontia in our study was 2.97% and the most common supernumerary tooth was mesiodens. The results of our study were in synchrony with the study by Vibhute et al.,[11] in which the prevalence was 3.1% and contrasting to the study by Shetty et al.[12] and Karadas et al.,[28] in which prevalence was 0.24% and 0.96%.

The most common supernumerary tooth was premolar in both the above-mentioned studies.[11,27] Kazanci et al.[28] and Rajab and Hamdan[29] reported that the prevalence of hyperdontia was higher in males than females, which is consistent with our results. Mesiodens may cause delayed or ectopic eruption of the permanent incisor or may alter the occlusion and appearance of the individual. Early diagnosis is therefore needed for appropriate treatment which might reduce the invasiveness of surgery, orthodontic treatment, and possible future complications.[10]

On examination of all OPGs, there was no evidence of hypodontia or hyperdontia present in the primary teeth. Previous studies have shown the prevalence of hypodontia and hyperdontia in primary teeth to be 0.1%–0.9% and 0.1%–0.3% among various populations.[31,32] The age range of participants included in our study was 8–14 years, thereby nearly in all cases the permanent incisors had erupted. Hyperdontia appears to have a greater predilection in the premaxillary region,[33] therefore, it was not seen in the primary teeth.

### Conclusions

The prevalence of hypodontia in the permanent dentition among children in Vadodara was 11.01%. Maxillary lateral incisors were the most common missing teeth. There was an increased prevalence of hypodontia in females and in the
mandibular arch of the permanent dentition. The absence of teeth unilaterally was almost similar to those absent bilaterally. The prevalence of hypodontia was 2.97% and the most common supernumerary tooth was mesiodens. There was an increased prevalence of hypodontia in males and in the maxillary arch of the permanent dentition.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

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