



Prevalence and Pattern of Accessory Teeth (Hyperdontia) in Permanent Dentition of Iranian Orthodontic Patients

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Abstract

Background: Awareness of hyperdontia pattern/prevalence can be useful in early diagnosis and prevention by general practitioners, pediatric dentists, and orthodontists. Since the previous results regarding the pattern of hyperdontia (supernumerary teeth) are controversial, this study aimed to assess this subject among Iranian orthodontic patients.

Methods: All approved panoramic radiographs of 3374 orthodontic patients (aged 10 to 20 years old) who had visited orthodontic departments of all Tehran dentistry universities and 10 private clinics during the years 1999-2009 were investigated to establish the prevalence/pattern of hyperdontia in permanent dentition (excluding third molars). The data were analyzed using a chi-square, a chi-square goodness-of-fit, and a Fisher exact test ($\alpha = 0.05$).

Results: Of the patients, 2012 were female and 1362 were male. The prevalence of hyperdontia was 0.72% (14 females [0.69% of females], 10 males [0.73% of males], female-to-male ratio = 1:1.055). The difference between the genders was not significant ($P = 0.896$). No double or multiple supernumeraries were found. The most common accessory teeth were mesiodens (58.3%), maxillary laterals (25%), and maxillary premolars (16.7%). Hyperdontia was significantly more common ($P = 0.000$) in maxilla (there was only one mandibular accessory tooth). It was more frequent in the anterior segment ($P = 0.000$). However the occurrence was not significantly different between bimaxillary right and left quadrants ($P = 0.6$).

Conclusion: Hyperdontia was more common in premaxilla, and the most common accessory tooth was mesiodens. Unlike earlier studies, no bilateral accessory teeth were found. Also no gender dimorphism was discerned.

Keywords: Hyperdontia, Prevalence, Pattern, Permanent dentition, Sex dimorphism

Introduction

Hyperdontia or supernumerary teeth are terms referred to any excess number of teeth or odontogenic structures (1,2). Such teeth may develop due to unclear environmental and genetic factors (1-3), and may cause esthetic and functional complications such as diastema, crowding, rotation, displacement, delayed eruption, or impaction of permanent incisors, as well as root resorption or abnormal root formation of the adjacent teeth, infec-

tions (such as gingivitis, periodontitis and abscess formation), cystic lesions, and occlusal interferences (1,3-6). Since the majority (80-93%) of supernumerary teeth can cause clinical complications, their early diagnosis and orthodontic/surgical intervention are of significant value in reducing the clinical problems of the adjacent permanent teeth and the installation of the occlusion (3,6). Thus, awareness of the prevalence and

pattern of hyperdontia is of significant clinical value to the orthodontists, pediatric dentists and general practitioners who usually visit children at lower ages and can contribute to early diagnosis and planning more effective long-term interdisciplinary therapies (7).

Few, controversial studies have reported the prevalence of hyperdontia in permanent dentition of different populations, as ranging from 0.1% to 3.9% and it may be higher in Mongoloids or African Americans (1-3,5,8). The controversy might root in ethnical and methodological methods of those studies; for instance, reliability of findings might be improved by including older patients or increasing the sample size (4,9,10). Accessory teeth usually occur in the maxillary arch with a strong tendency to affect the anterior segment (3,11). They also tend to occur more in males (2-4,12). However, the evidence regarding the pattern of their development is not clear, as there is also dispute over dominance of different supernumerary teeth, different segments (midline or lateral sides) (2-4,13). In addition, controversy exists over the role of gender as a risk factor (2-4,6,14).

To our knowledge, although the prevalence of mesiodens (a supernumerary tooth type) was evaluated in Iran (15), overall hyperdontia prevalence among Iranians is not yet established. This study aimed to assess the prevalence and pattern of supernumerary teeth among 3374 orthodontic patients with full sets of dentition who had visited 4 Tehran dental universities and 10 private clinics, during 1999-2009.

Materials and Methods

This descriptive cross-sectional study was based on a review of 3374 initial panoramic radiographs of Iranian orthodontic patients 10 to 20 years old, admitted to four dental universities and ten orthodontic clinics of Tehran during 1999 to 2009. The exclusion criteria were the presence of any histories of systemic diseases, trauma, tooth extractions, any syndromes, oligodontia or anodontia, as well as incomplete patient records or poor image quality. The ethics of the study protocol were ap-

proved by internal review boards of the university and the other orthodontic departments (16).

The prevalence of hyperdontia was investigated twice by a dentist (and when not clear, by an orthodontist), taking into account the variables gender, types of accessory teeth (mesiodens, other anterior accessory teeth, premolars, paramolars, and distomolars), and the involved sides (midline, left, and right / anterior vs. posterior) (16).

Reliability of the method

After about four months, 1120 randomly selected images as well as those difficult to read were reassessed by both examiners (16). According to the Cohen's Kappa, there were more than 90% inter- and intra-observer agreements ($P < 0.001$).

Statistical analysis

After calculating the descriptive statistics, a chi-square, a chi-square goodness-of-fit, and a Fisher exact test were used to analyze the data. The level of significance was predetermined as 0.05.

Results

The mean age of the patients was 13.9 ± 2.7 years. Of them, 1362 (40.3%) were male with a mean age of 14.3 ± 3.0 years, and 2012 (59.7%) were female with a mean age of 13.7 ± 2.2 years (16). The hyperdontia was observed in the permanent dentition of 24 orthodontic patients (0.72% of the sample, 95% confidence interval for the prevalence = 0.4% - 1.0%), including 10 males (0.73% of males) and 14 females (0.69% of females, female-to-male ratio = 1:1.055). No affected individuals had more than one supernumerary tooth, and all the accessory teeth were unilateral. No significant difference was observed between the prevalence of hyperdontia in males and females ($P = 0.896$ [chi-square], Table 1).

The supernumerary teeth were composed of 14 mesiodens teeth (58.3%), 6 accessory laterals (25%), and 4 paramolars (16.7%, Fig. 1). No significant differences existed between the two genders regarding the frequency distribution of the tooth types ($P = 0.3$ [Fisher exact test], Table 2); follow-

ing the mesiodens teeth, accessory laterals were more common in males while paramolars were more frequent in females (Table 2).

Table 1: Hyperdontia distribution in the genders

Hyperdontia	Gender		Total
	Female	Male	
Positive	14	10	24
Negative	1998	1352	3350
Total	2012	1362	3374

No accessory canines, premolars, or distomolars were observed in this sample. All the supernumerary teeth in males were in the maxilla, while there was only one mandibular paramolar in females (5% of all accessory teeth, 7.2% of accessory teeth in females). No significant differences were found between the frequency of hyperdontia in the maxilla and mandible of the two genders ($P = 1.0$ [Fisher exact test], Table 3). However, regardless of gender, the prevalence of hyperdontia was significantly greater in maxilla ($P = 0.000$ [chi-square goodness-of-fit test]).

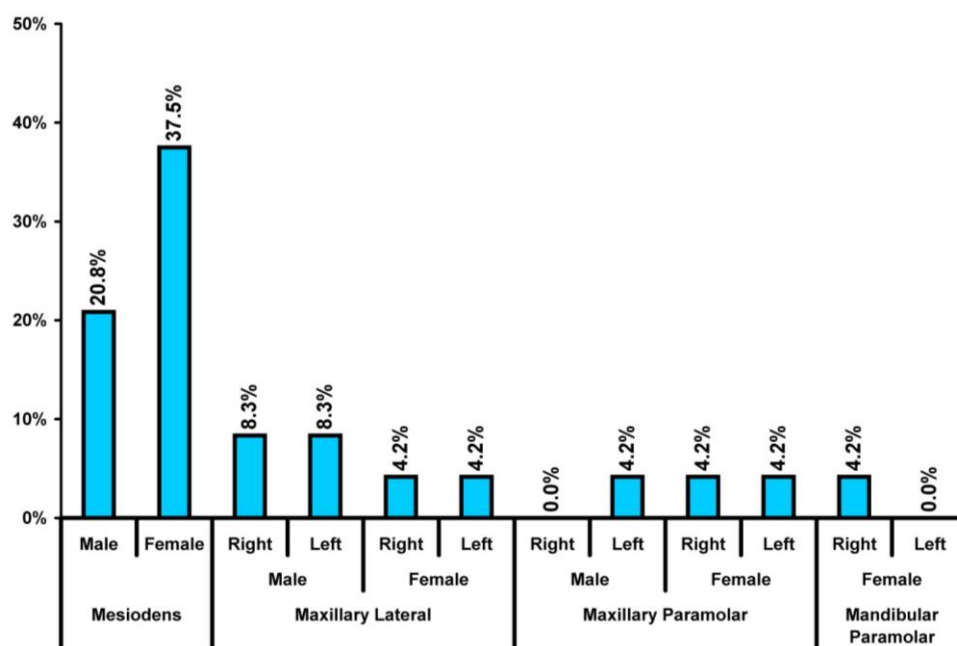


Fig. 1: Frequency distribution of the accessory teeth

Table 2: Presence of different accessory teeth in genders

Tooth	Gender		Total
	Female	Male	
Mesiodens	9	5	14
Paramolar	3	1	4
Lateral	2	4	6
Total	14	10	24

Of the accessory teeth, 14 were in the midline (58.2%), 5 were on the right side (20.9%), and 5 were on the left side.

Table 3: Involvement of jaws in males and females

Arch	Gender		Total
	Female	Male	
Maxilla	13	10	23
Mandible	1	0	1
Total	14	10	24

The Fisher test did not show a significant difference between the distributions of supernumerary teeth in the midline as well as bimaxillary left and right quadrants of males and females ($P = 0.6$, Table 4).

Of the supernumerary teeth, 20 were in the anterior segment and 4 were in the posterior segment. This difference was significant ($P = 0.000$ [chi-square goodness-of-fit test]).

Table 4: Side involvement between the sexes

Side	Gender		Total
	Female	Male	
Midline	9	5	14
Right	3	2	5
Left	2	3	5
Total	14	10	24

Discussion

It is important for dentists, anthropologists, and other health professionals to know the prevalence of dental anomalies in different communities (1). Various controversial results have been reported regarding the prevalence of hyperdontia in different ethnic backgrounds through different times. Even the rates may vary considerably in one country (12,17). The prevalence of hyperdontia observed in this sample (0.7%) falls within the range reported in the studies performed on Caucasians, being 0.1% – 3.9% (1-3,12,13). The studied population, methodology used for detection (i.e., differences in the radiography techniques, the sampling methods such as epidemiological samples vs. orthodontic patients, the age of the subjects as well as environmental factors and ethnic backgrounds) could account for the wide range of prevalence rates reported (2,10,12,13,18-21). Hyperdontia is reported from about 0.1% to 3.8% in countries between Caspian and Black seas, while might be skewed to higher rates in Arabs and Asians (between 0.4% and 3.4%) (2,3,12,13). The prevalence might be affected by population types (enrolling dental patients versus epidemiological samples). Children with dental anomalies might be more prone to visit orthodontists compared to individuals without such anomalies, which this might bias our findings and narrow down the generalisability (16,22). The same reason can also account for potential overestimation of abnormalities in girls, because esthetics might be of more significance to them or their parents, compared to boys (16).

While some studies have examined directly patients or their dental casts in order to diagnose hyperdontia without radiographic examinations (23), it is impossible to establish the prevalence of hyperdontia correctly without the use of radiographs (7,12,13,18,24). Nonetheless, exposing children to X-ray without having any treatment needs is not ethical (13,16,25). Therefore, pre-treatment panoramic radiographs of orthodontic patients were used in this study.

Patterns of occurrence

Supporting the findings of several previous studies, the most common supernumerary tooth was mesiodens in the present study which had a prevalence rate close to those reported previously (5,6,11-13,18-21,24,26,27). In contrast, some authors found paramolars (14), maxillary centrals (2,7) or laterals (9), and even distomolars (4) (which were not found in this sample) as the most frequent supernumerary teeth.

In the present study, mesiodens was only slightly more common in females, however in some previous studies its prevalence in men was as twice as in females (19,28). Accessory maxillary lateral was the second most common supernumerary tooth in the present study, which was similar to the findings of some other researches (13,20) and in contrast to some others which have reported premolar as the second most frequent one (6,11,12,26). The accessory lateral was much more common in males of this sample, which was contrary to the findings of some previous studies (13,29). Like the results of some studies (12,26), the third most common accessory tooth in this sample was paramolar with a similar prevalence to those studies (16%-18%). However, there are some reports of mandibular premolar or lateral as the third most common supernumerary teeth (6,13); also some investigators cited the paramolar as the second most common supernumerary tooth (10), while some others did not find any paramolars among thousands of patients (29). The prevalence rates of hyperdontia might be affected by the sampling methods. Those supernumerary teeth affecting the dental appearance might be more prevalent in studies on samples selected from orthodontic pa-

tients (13,28,30). Nevertheless, the very small rate of hyperdontia and the fact that approximately one-half of the supernumerary teeth were mesiodens indicates that other factors (biologic or environmental) are involved as well. None of the subjects in this study had more than one supernumerary tooth, which this was in contrast to several previous studies, according to a review to the literature (2).

-Midline vs. lateral involvement

Among the subjects of this study, supernumerary teeth tended to occur mostly in the midline and then equally in either of the two left/right sides. This was in line with the results of several earlier studies (2,12,13,18-20,24,26,27), and seemed to be affected by the prevalence of mesiodens. However, a few have reported a higher rate in the right side (52%), while in their study, the hyperdontia in the midline was very rare (8%) (13). Moreover, hyperdontia tended to occur mostly in the anterior segment in this study, similar to several previous researches (2-4). This could again be reflective of the high prevalence of mesiodens. It is not known why mesiodens is the most common permanent supernumerary tooth (1). Hyperdontia in general might be caused by interrelated genes being affected by environment, while the details are unknown (1,2,28,31,32).

Another reason for the very higher prevalence of mesiodens might be its much greater effect on the esthetics compared to other accessory teeth. Therefore, in a sample from orthodontic patients, there might be more children with mesiodens (13,28,30). With this reason in mind, it appears that girls with mesiodens might attend orthodontic offices more. Although in our study a slight non-significant dominance was seen in girls, most of studies on epidemiologic samples reported considerable sex ratios in favor of males (such as 2.2:1, 5:1 or 6.5:1) (1,2,15), which might imply that sampling bias.

-Maxilla vs. mandible

All previous studies have consistently stated that supernumerary teeth are much more common in the maxilla (4,17,26), supporting the findings of

this study. Although the reason is not fully understood, it might be attributed to the very higher prevalence of hyperdontia in premaxilla, the reason of which is not yet clearly known again (2,6,7,11-13,18,20,21,24,26,33).

-Sex dimorphism

Although females affected with anterior hyperdontia might be more prone to visit dental clinics due to aesthetic concerns, the prevalence of hyperdontia was shown to be much higher in males in several previous studies with about a 2:1 ratio in Caucasians to about 3:1 to 6.5:1 ratios in Caucasians and Mongoloids favoring males (2-4,6,8,12,15,18,24,33). However some investigations similar to the present one did not find a significant difference (9,11,13); also a few reported a higher prevalence rate of hyperdontia in females (14). Occurrence of hyperdontia does not follow a Mendelian pattern (1,31). The odds of genetic transmission via an autosomal dominant trait with the absence of penetration have been found; additionally an X-linked inheritance has been reported, which can explain gender imbalance in favor of males (1,32). Besides such genetic etiologies (1,31,32), environmental factors might also play a role in the occurrence of mesiodens as well as splitting of the tooth bud or the dichotomy theory (1,2). According to the dichotomy theory, splitting of the tooth bud into two equal or unequal sections may either form two similar teeth or a normal and a dysmorphic tooth (1,2). However, the most acceptable etiologic factor in the development of mesiodens might be the hyperactivity theory that is the restricted increase in the activity of dental lamina (1,2).

-Unilateral vs. bilateral occurrence

No double and/or bilateral cases of hyperdontia were found in this sample. This was contrary to some other studies which have reported 17% to 24% bilateral hyperdontia (2,7,8). Some other dental anomalies such as hypodontia or congenital missing of teeth as well tend to occur mostly bilaterally (16). It is not known why all the accessory teeth were only unilateral; however, the asymmetric pattern might imply the potential role of

environmental etiologies. This should be reassessed with a sample consisting of more lateral supernumerary teeth, as the small number of such teeth in the present setup did not allow drawing clear conclusions.

Conclusions

The prevalence of hyperdontia in these orthodontic patients was within the range reported previously. Mesiodens and lateral incisors had higher prevalence. There was no gender dimorphism. Hyperdontia frequency was not affected by the left/right sides. However, there was a considerably higher rate in the anterior segment and in the maxilla.

Ethical considerations

Ethical issues (including plagiarism, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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