PREVALENCE AND DISTRIBUTION OF HYPODONTIA IN PAKISTANI ORTHODONTIC POPULATION

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ABSTRACT

The aim of this study was to determine the prevalence and distribution of hypodontia in the permanent dentition of Pakistanis, who reported for orthodontic treatment at Armed Forces Institute of Dentistry (AFID) Rawalpindi, Pakistan. Orthodontic records of 1185 patients [375 males and 810 females with mean age 16.9 years (11.2 to 45.4)] which comprised orthopantomograms, study models and anamnestic and clinical data, were explored for hypodontia. A total of 51 patients (25 males and 26 females) presented with hypodontia of permanent teeth. Calculated prevalence was 4.2% (males-6.7% and females-3.2%). A total of 77 permanent teeth excluding third molars were found congenitally absent. Mandibular second premolar (21, 27%) was the tooth most frequently found missing followed by maxillary lateral incisors (18, 23%). Majority of patients (48, 94%) had one or two teeth missing. The number of missing teeth were more in mandible (42,55%) as compared to maxilla (35,45%), more on left side (42,55%) as compared to right (35,45%) side and more in posterior (40,52%) as compared to anterior (37,48%) region.

Key words: Prevalence, Hypodontia, Pakistani, Panoramic radiograph

INTRODUCTION

The term hypodontia in literature is defined as developmental absence or agenesis of one or more teeth, and a condition that is commonly encountered in patients reporting to orthodontists. A considerable body of literature about hypodontia has shown large differences in the prevalence of dental agenesis worldwide, varying from 0.3% in Jerusalem to 36.5% in a Caucasoid population.

Wide range of hypodontia prevalence can be attributed to differences in the methods of sampling and examination, age distribution, gender, and racial origin. Hypodontia can occur as an isolated anomaly (non-syndromic) or as part of a multiple congenital anomaly (MCA) i.e, syndromic.

In most cases, familial non-syndromic hypodontia has been shown to be inherited as an autosomal-dominant trait. Mutations in genes PAX9, MSX1 and AXIN2 have been determined to be associated with autosomal-dominant tooth agenesis. It is seen more frequently in females, however gender distribution has shown some local variations when studies are compared. Although there is some variation in the reported frequency of developmental dental absence (Table 1), the majority of studies indicate that the most frequently absent teeth are: lower second premolar, followed by maxillary lateral incisors and upper central incisor.

METHODOLOGY

This study included orthodontic records of 1348 subjects (432 males and 916 females) who visited the orthodontic department of Armed Forces Institute of Dentistry, Rawalpindi (Pakistan). Their mean age was 16.9 years (range; 11.2 to 45.4). Orthodontic records comprised subject’s biodata with clinical findings, orthopantomograms and study models. Subjects in which an accurate diagnosis of hypodontia could not be established were excluded. Patients with developmental anomalies (CL or CLP, ED), syndromes, history of previous orthodontic treatment

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and extraction of permanent teeth were also excluded from the study.

Minimum age range of sample was in accordance with the prerequisite for such study to prevent labeling of late mineralizing teeth as congenitally missing. A tooth was labeled as congenitally missing when no signs of its mineralization could be identified on orthopantomo-gram and periapical radiograph. Diagnosis was further substantiated through study models and history from patients and parents regarding extractions of permanent teeth.

RESULTS

Evaluation of the total sample (1348) according to the inclusion and exclusion criteria, yielded a final study sample of 1185 (375 males and 810 females) after ruling out 163 patients. A total of 51 patients (25 males, 26 females) were found to have hypodontia in permanent dentition, with a prevalence of 4.2%.

Gender wise prevalence was presented as 6.7% and 3.2% in males and females respectively. The number of missing teeth per child ranged from one to five with an average of 1.5 teeth per child in this study. Of the children with hypodontia, 94% had either 1 or 2 missing teeth (45% for boys, 49% for girls).

Majority of cases (31) presented with single tooth missing (60.7%). The single most severe case of hypodontia (a 13 year old female) exhibited 5 permanent teeth missing. (Table 2)
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**TABLE 1. THE PREVALENCE OF HYPODONTIA IN DIFFERENT SAMPLES AND POPULATIONS**

<table>
<thead>
<tr>
<th>Study</th>
<th>%age of hypodontia</th>
<th>Most common tooth involved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aasheim &amp; Øgaard, 1993, Norway</td>
<td>6.5</td>
<td>Max lateral incisor</td>
</tr>
<tr>
<td>Horowitz, 1966, USA</td>
<td>6.5</td>
<td>Lower second premolar</td>
</tr>
<tr>
<td>Johannsdottir <em>et al.</em>, 1997, Iceland</td>
<td>5</td>
<td>Lower second premolar</td>
</tr>
<tr>
<td>Magnusson, 1977, Iceland</td>
<td>7.9</td>
<td>Lower second premolar</td>
</tr>
<tr>
<td>Muller <em>et al.</em>, 1970, USA</td>
<td>3.5</td>
<td>Max lateral incisor</td>
</tr>
<tr>
<td>Rølling, 1980, Denmark</td>
<td>7.8</td>
<td>Lower second premolar</td>
</tr>
<tr>
<td>Tavajohi-Kermani <em>et al.</em>, 2002, USA</td>
<td>8.8</td>
<td>Lower second premolar</td>
</tr>
<tr>
<td>Thilander and Myberg, 1973, Sweden</td>
<td>6.1</td>
<td>Lower second premolar</td>
</tr>
</tbody>
</table>

Fig 3: Regional (anterior-posterior) distribution of congenitally missing teeth (n=77)

Fig 4: Segment wise distribution of congenitally missing teeth (n=77)

[UR= Upper right, UL= upper left, LR= Lower right, LL= Lower left]
A total of 77 teeth (38 in boys and 39 in girls) were found missing excluding third molars. (Fig1) The most common tooth found congenitally missing was second premolar PM2(25), followed by lateral incisors LI (22), central incisors CI(12), first premolars PM1(11), first molars M1(4), cuspids C(3). (Table3) The left side was found predominantly involved in 42 cases (55%) as compared to 35(45%) on the right side. (Fig 2)
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Regionally, congenitally missing teeth were found slightly more in posterior region (40) as compared to the anterior region (37). (Fig 3)

Distribution of congenitally missing teeth in terms of quadrants (Fig 4) and upper and lower jaws presented with overall mandibular predominance over maxillary arch. (Table 4)

DISCUSSION

Occasional congenital absence of teeth in modern man is not surprising, when viewed in an evolutionary perspective. Throughout human evolution, reductions in the number of teeth and the size of the jaws have occurred, along with decreases in the surface area needed for mastication. Tooth agenesis (currently the most common anomaly in the development of the human dentition) is one of the most intriguing phenomena because it has been frequently found associated with other oral anomalies, structural variations and malformations of other teeth. The World Health Organisation (WHO) classifies this condition under the heading of ‘Handicapping dentofacial anomalies describing the presentation as ‘an anomaly which causes disfigurement or impedes function and which requires treatment if the disfigurement or functional defect is, or is likely to be, an obstacle to the patient’s physical or emotional well being’. The term hypodontia is generally used in a narrow sense when the number of missing teeth is one or few. Terms oligodontia and anodontia are used to express more severe situations. Although there is no clear definition in the literature concerning the limits of these terms, however in recent years, following definitions have been used:

Hypodontia: 1 to 6 teeth missing (excluding third molars)

Oligodontia: more than six teeth missing (excluding third molars)

Anodontia: Complete absence of teeth.

Calcifications of crowns of the permanent teeth, except the third molars, start at the age three and are generally complete by the age six. In some individuals, there may be delayed development of premolars; hence, no one can be absolutely certain that these teeth are missing below the age of about nine years, especially among males.

All permanent teeth get erupted by the age of 12 to 14 except third molars therefore 12-14 year old children are suitable for diagnosis of permanent teeth except third molars. Minimum age in this study sample (11.2 yrs) was in accordance with this criterion.

Local literature has revealed only one previous study exploring this anomaly in orthodontic patients of Khyber Pakhtunkhwa (NWFP) province, with a very high (12.8%) prevalence as compared to present study. Being in an Army Institute the present sample was of diverse nature, with predominantly representing Rawalpindi and Kashmir areas. Gross difference of reported prevalence of hypodontia owes to inclusion of third molars in that study. Leaving third molars aside, prevalence (5.6%) comes closer to the results of this study. Teeth most commonly involved i.e., maxillary lateral incisors and mandibular second premolars were however closely matched with the results of present study.

Internationally hypodontia is a subject that has been widely reported in different parts of the world. The studies have included case reports, missing teeth in populations of orthodontic cases, and epidemiologic studies. Majority of these are retrospective radiographic studies, like current study and reported rates vary from 2.6% to 11.3%. These studies vary widely in presenting gender and racial differences in terms of the prevalence rates and most frequently recorded absent teeth. For the purpose of review, comparison and future reference, investigators of this research have compiled more recent studies (within last 10 years) on prevalence of hypodontia (Table 5) carried out in different regions of the world involving either local populations or patients getting orthodontic treatment. Prevalence of hypodontia in this sample was well within the overall range of 2.6 – 13.3%. Mandibular second premolar and maxillary lateral incisors were the teeth most commonly found missing in all of these studies, totally in consistence with current results.

Many studies have demonstrated that there is no consistent finding as to which jaw has more missing teeth and very few have compared the prevalence rates of tooth agenesis between the anterior and posterior regions and distribution of missing teeth between right and left sides. Current study also displayed a scattered distribution of missing teeth in terms of right and
left sides, antero-posterior regions and upper and lower jaws.

CONCLUSION

Congenital absence of permanent teeth has direct clinical implications. Early detection of the number of missing teeth and evaluation of the size and the number of teeth present is of immense value in the planning and managing treatment with a multidisciplinary team approach to achieve an aesthetic and functional dentition and reduce the complications of hypodontia. Results of the present study revealed a prevalence of hypodontia 4.2% in Pakistani orthodontic patients. The majority of patients had one or two teeth missing, but seldom three or more. The most common congenitally missing teeth found are mandibular second premolars followed by maxillary lateral incisors. Hypodontia depicted a diffuse maxillo-mandibular and regional distribution in jaws with marginal predominance of mandible over maxilla, posterior over anterior and left over right side. This data on the prevalence and distribution of hypodontia should be of value for future investigations.

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