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ORIGINAL ARTICLE

Sexual dimorphism, pattern of third molar and mandibular second premolar agenesis in Indian paediatric orthodontic patients

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KEYWORDS

Tooth agenesis;
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Pattern of agenesis;
Missing third molar

Abstract *Objective:* To determine and compare the prevalence and pattern of agenesis of third molar and mandibular second premolar in paediatric orthodontic patients of age group 9–15 for sexual dimorphism.

Methods: The digital orthopantograph was obtained from the archive record of patients of age group 9–15 year. Radiographs of 301 patients were evaluated after taking exclusion criteria into account and were assessed for the presence/absence of third molars and mandibular second premolar. Tooth development evaluation followed the method of Demirjian et al., based on eight stages of tooth formation. The agenesis of third molar in maxilla and mandible between age groups and gender was compared using Chi-squared test.

Results: The rate of agenesis of third molars was observed 36.8% in the present study. Twenty-four (24.3%) percentage of the study population showed agenesis of all the four third molars. The agenesis of third molars was found to be higher among males than females ($p > 0.05$). Prevalence of agenesis of mandibular second premolar was 4.7–5%.

Conclusions: Agenesis of third molars was more commonly seen in the maxilla, having male predilection. Maxillary right third molar was the most commonly missing tooth irrespective of gender.

1. Introduction

Evolving with the evolution, the modern human stomatognathic system has undergone many considerable changes. The variation in the number of permanent teeth has drawn the attention of researchers repeatedly, resulting in abundance of literature establishing two generations of pedigrees for missing teeth, prevalence of agenesis in Mendelian population and demographic variation (Garn et al., 1963). According to Bolk's

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theory of terminal reduction, due to the phylogenetic evolution of mankind, the reduction in the distal element of a tooth group occurs more frequently than mesially placed teeth (De Beer, 1953), thus establishing an axiom, that most common missing teeth would be third molar, second premolar and lateral incisor. Another reasoning suggested by Butler's field theory related to mammalian teeth, states that the most mesial situated tooth is the most stable in each morphological class laying down a blueprint for human dental genetics and tooth polymorphism (Butler, 1939). Third molar being last tooth to calcify and erupt shows a large amount of variation with a prevalence of 20–30% for agenesis of at least one third molar (Lavelle et al., 1970). Therefore irrespective of the influence of genetic drift and consanguinity on population, the polymorphism in the number of third molar still holds ground for study and comparison of human population with evolution. Butler in his classic study on horse fossil dentition advocated that reduction in number of teeth in a morphological class is associated with reduction in size of teeth for that class (Butler, 1939). This could be due to varying expression of genes responsible for teeth formation and their eruption and similarly might affect the formation and eruption of other tooth.

Overview of literature reveals abundance of data regarding prevalence of agenesis in adult orthodontic patients (Celikoglu et al., 2010; Upadhyaya et al., (2012); Saravakumar and George, 2015). However, there is still lack of data when orthodontic patients of age 9–15 years are concerned. The present study was aimed to determine the prevalence of agenesis of maxillary and mandibular third molar for each quadrant separately along with agenesis of mandibular second premolar, in paediatric orthodontic patients.

2. Material & methods

The study design was approved by the institutional ethical committee (Reference no. ECM II-B/P19). The digital orthopantograph radiograph (OPG) was obtained from the archive records of patients in age group 9–15 years, who attended the outpatient door in the department of paediatric and preventive dentistry in the time period of December 2014 to April 2015 for orthodontic treatment needs. The rationale behind the use of OPG was that it allowed quick evaluation of both the maxilla and mandible in a single radiographic film and also assessment of the status of unerupted teeth in all four quadrants at the same time. The exclusion criteria were child suffering from any systemic disease, oligodontia, malnourished/underweight children and patients with syndromes. Radiographs of 301 patients were evaluated after taking exclusion criteria into account. Tooth development evaluation followed the method of Demirjian et al. (1973), based on eight stages of tooth formation. The minimum age was set at 9 years for the present study as calcification of third molar starts from 7 to 10 years and crown calcification completes at 12–16 years of age (Massler et al., 1941). The presence of calcification of third molar was determined radiographically for all four quadrants so as for the mandibular second premolar.

3. Results

Total 301 digital OPG was examined for the presence/absence of third molar in all the quadrants and so as mandibular second premolar by two different observers. The inter observer reliability was (kappa) 0.82. The demographic profile showed, out of the total patients' records examined 86.7% were of age more than 10 years and 51.5% were males. The presence/absence of third molar in maxilla and mandible between age groups and gender was compared by using Chi-square test. The p-value < 0.05 was considered significant. All the analyses were carried out using SPSS 16.0 version (Chicago, Inc., USA).

The prevalence of the absence of third molar was found to be highest for maxillary right third molar (28.6%) while least for mandibular left third molar (21.6%) (Table 1). Comparing the study parameter with age, the absence of right and left third molar in maxilla and mandible was observed to be higher among the patients of <10 years than ≥ 10 and the differences were statistically significant ($p = 0.0001$) (Table 2). Sexual dimorphism with agenesis of third molar showed a marked increase in agenesis of third molars in males as compared to females; however, the difference was not statically significant (Table 3). Comparing the prevalence of bilateral absence of third molars with gender, the higher number of prevalence for the agenesis was found for females as compared to males (Table 4). The order of agenesis for the third molar was observed to be any three third molars missing (5.3%) followed by one third molar missing (7.3%), followed by two third molars (13.3%) missing and all four third molars missing (24.3%) (Table 5).

4. Discussion

In the present study agenesis of third molars was more prevalent in males as compared to females which was in agreement with the study conducted by Kaur et al. (2012), Upadhyaya et al. (2012) but was in contrary to the findings of Sandhu and Kaur (2005) and Sujon et al. (2016) as they observed agenesis to be more prevalent in females. However, the difference was not statistically significant, and this finding of the present study is in concurrence with the studies conducted by Endo et al. (2006), Chung et al. (2008), Celikoglu and Kamak, (2012). Alam et al. (2014) reported that third molar agenesis was not influenced by sex.

Celikoglu et al. (2011) concluded that agenesis of all four third molars simultaneously was the most prevalent form of third molar agenesis which was in agreement with the present study (24.3%). The rate of agenesis of third molar in the present study was 36.8%, which was found to be higher than the findings of Nanda and Chawla (1959) (25.8%) and Kruger et al. (2011) (15.2%) but is in agreement with the findings of Sujon et al. (2016) (38.4%).

Agenesis of third molars was more commonly seen in the maxilla than mandible. The finding was in agreement with those of Sandhu and Kaur (2005), Rahardjo (2006), Jacob et al. (2012) and Sujon et al. (2016) but was in contrast to the findings of Nanda (1954), Keene (1965) and Kermani et al. (2002). It is evident that in due course of evolution the size of skull has shrunken from that of ape to modern human being and so has the size of jaws. In an animal study, Yamada and Kimmel (1991) observed that diet and masticatory function had a direct relationship with craniofacial growth, affecting the mandible, which could be responsible for the presence/agenesis of third molar. Thus, it can be postulated that with the advance in evolution, there is reduction in the size of maxilla when compared with mandible.

Intra arch comparison revealed maxillary right third molar to be most commonly missing tooth irrespective of gender which is in agreement with the findings of Sujon et al. (2016), John et al. (2012) followed by maxillary left third molar.

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