

EPIDEMIOLOGICAL INVESTIGATION OF SECOND PREMOLAR AGENESIS AND ITS RELATIONSHIP WITH AGENESIS OF OTHER PERMANENT TEETH

ESTUDO EPIDEMIOLÓGICO DA AGENESIA DE SEGUNDOS PRÉ-MOLARES E SUA RELAÇÃO COM A AGENESIA DE OUTROS DENTES PERMANENTES

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ABSTRACT

Objective – This study aims to evaluate the epidemiological characteristics of a sample of patients with agenesis of second premolars, as well as to investigate its association with agenesis of other permanent teeth. **Material and methods** – A Brazilian sample of 203 patients aged from 8 to 22 years was selected, all patients presenting agenesis of at least 1 second premolar. Patient age, gender and ethnicity were recorded, as well as the history of extraction of permanent teeth and associated agenesis of other permanent teeth. **Results**: – Most individuals presenting second premolar agenesis were female (66%), a sex ratio of 2F:1M. The frequency of second premolar agenesis was higher in the mandible (61.5%) than in the maxilla (16.7%), while 21.6% of the patients showed second premolar agenesis affecting both arches. The prevalence of unilateral and bilateral agenesis was similar (50%) in the maxilla, while in the mandible 60% of the sample exhibited unilateral agenesis. The mandibular left hemi arch was the most frequently affected. Most of the patients (45.3%) had agenesis of just 1 second premolar. There was a high prevalence of agenesis of other permanent teeth associated with second premolar agenesis, especially of maxillary lateral incisors (16%) and third molars (48%). **Conclusion**: Agensis of second premolars was more prevalent in females and at the left side of the mandibular arch and was often associated with agenesis of other permanent teeth.

DESCRIPTORS: Anodontia • Tooth abnormalities • Genetics.

RESUMO

Objetivo – O presente trabalho visa avaliar as características epidemiológicas de uma amostra de pacientes com agenesia de segundos pré-molares, assim como verificar a sua associação com a agenesia de outros dentes permanentes. **Material e métodos** – Foi avaliada a documentação ortodôntica de 203 pacientes brasileiros com idade entre 8 e 22 anos, apresentando agenesia de pelo menos um segundo pré-molar. Foi feito o registro de: idade do paciente, sexo e etnia, histórico de extrações de dentes permanentes e presença de agenesias de outros dentes permanentes associadas. **Resultados** – A maior parte da amostra era composta pelo sexo feminino (66%), apresentando odds ratio de 2F:1M. A agenesia de segundo pré-molar mostrou-se mais prevalente no arco inferior (61,5%) do que no superior (16,7%), enquanto que 21,6% mostraram a referida agenesia em ambos os arcos. Os valores percentuais obtidos para agenesia tanto unilateral quanto bilateral foram semelhantes (50%) no arco dentário superior, enquanto que, no arco dentário inferior, 60% da amostra apresentaram agenesia unilateral. A maioria dos pacientes (45,3%) apresentou agenesia de apenas 1 segundo pré-molar. Observou-se uma alta prevalência de agenesia de outros dentes permanentes associada à agenesia de segundos pré-molares, principalmente dos incisivos laterais superiores (16%) e dos terceiros molares (48%). **Conclusão**: A agenesia dos segundos pré-molares foi mais prevalente no sexo feminino, no arco inferior do lado esquerdo e mostrou-se frequentemente associada a outras agenesias de dentes permanentes.

DESCRIPTORIOS: Anodontia • Anormalidades dentárias • Genética.

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INTRODUCTION

Tooth agenesis is the most common developmental disorder of human dentition, affecting 25% of the population¹. The third molar is the most affected tooth by this disorder, with prevalence of 20.7%²⁻³.

Except for the third molars, the prevalence of tooth agenesis is nearly 4.3 to 7.8%; the mandibular second molars are the most affected, with prevalence of 2.2 to 4.1%⁴⁻⁸. In fact, the second premolars present a remarkable instability of development. In addition to the high prevalence of agenesis, these teeth commonly exhibit delayed development, especially when associated with agenesis of other permanent teeth⁹. Initial mineralization of the mandibular second premolars occurs at three years of age in the average (ranging from two years and three months to three years and seven months); however, this tooth may appear up to 6 years, after 9 years, or even at 13 years of age¹⁰⁻¹³.

Previous studies revealed that females are more affected by tooth agenesis than males^{4,7,14-19}. Polder *et al.*⁷ conducted a meta-analysis on the prevalence of agenesis of permanent teeth in Caucasians and concluded that unilateral occurrence of tooth agenesis is more common than bilateral, and that the overall prevalence of agenesis in the maxilla is similar to that in the mandible. Additionally, they stated that one or two missing permanent teeth were observed in 83% of subjects with tooth agenesis. Endo *et al.*²⁰ evaluated a sample of Japanese patients and observed that agenesis was more frequent in the mandible than in the maxilla, and 76.3% of patients exhibited agenesis of one or more teeth.

Only one epidemiological study has specifically addressed the agenesis of second premolars. Stritzel, Symons and Gage²¹ evaluated 176 white European patients with agenesis of second premolars and observed that the mandible was more affected than the maxilla; agenesis tended to be more symmetrical in the maxilla; and agenesis of one or two second premolars occurred in 75% of cases.

This study evaluated the detailed epidemiological characteristics of a sample of Brazilian patients with agenesis of second premolars and investigated the prevalence of agenesis of other permanent teeth in this sample.

MATERIAL AND METHODS

A sample of 203 Brazilians with agenesis of 1 or more second premolars was selected from the orthodon-

tic patient files of a university dental school and 8 private dental offices. The subjects ranged in age from 8 to 22 years at the time of construction of the diagnostic records used in this study. Given the widely heterogeneous backgrounds within the Brazilian population, a rough estimate of the ethnic make-up of the sample was derived subjectively from facial photographic records: white (84%), black (13%) and Japanese (3%).

Two examiners simultaneously analyzed the clinical records and panoramic radiographs in a detailed manner. The following data were recorded for each patient:

- Age, gender and ethnicity;
- History of extraction of permanent teeth to assure that previous tooth extractions would not be diagnosed as agenesis;
- Identification of the number and location of missing second premolars;
- Agenesis of other permanent teeth.

The third molar was considered to be missing only after 14 years of age. According to Garn & Lewis (1962), this is the age limit for late appearance of third molars.

Descriptive statistics included calculation of the prevalence of agenesis of second premolars, in percentage, according to gender, affected arches, affected sides, and number of missing teeth. The frequency of agenesis of other permanent teeth in the sample was also calculated.

RESULTS

Most of the sample was composed of Caucasian patients (84.2%, n=171), followed by African (13.3%, n=27) and Asian patients (2.5%, n=5). There was higher prevalence of females in the sample, with a male to female ratio of 1:2 (Figure 1).

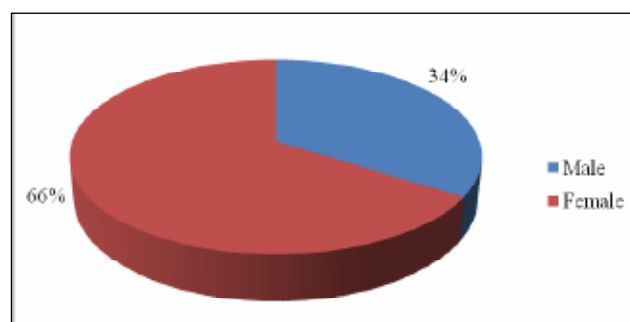


Figure 1 – Sample distribution according to gender.

Figure 2 reveals that most patients exhibited agenesis of only one second premolar, followed by absence

of two second premolars and three second premolars. Few patients presented agenesis of all second premolars. Overall, 81.8% of the sample exhibited agenesis of one or two second premolars.

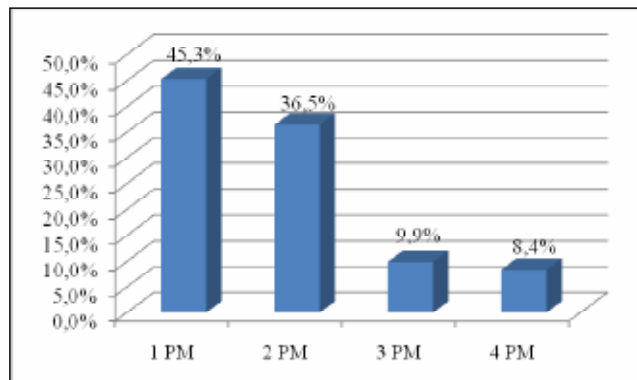


Figure 2 – Sample distribution according to the number of missing second premolars.

In 21.7% of the sample, agenesis of second premolars was observed in both dental arches. Agenesis affected only one dental arch in 78.3% of cases, being more frequent in the mandibular arch compared to the maxillary arch, at an approximate ratio of 4:1 (Figure 3).

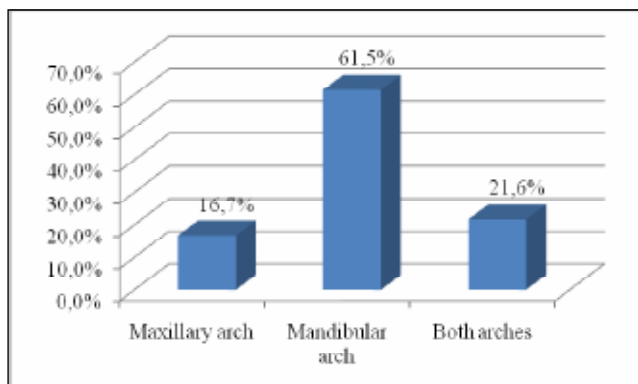


Figure 3 – Sample distribution according to dental arches affected by agenesis of second premolars.

With regard to distribution of agenesis according to hemiarch, the mandibular left hemiarch was the most affected, followed by the mandibular right, maxillary right and maxillary left hemiarches, as presented in Figure 4.

In the maxillary dental arch, the percent values of prevalence of unilateral and bilateral agenesis was similar (50%), different from the mandibular arch, in which 60% of the sample exhibited unilateral agenesis (Figures 5 and 6, respectively).

Figures 7, 8 and 9 display the distribution of prevalence of missing teeth in patients with agenesis of one,

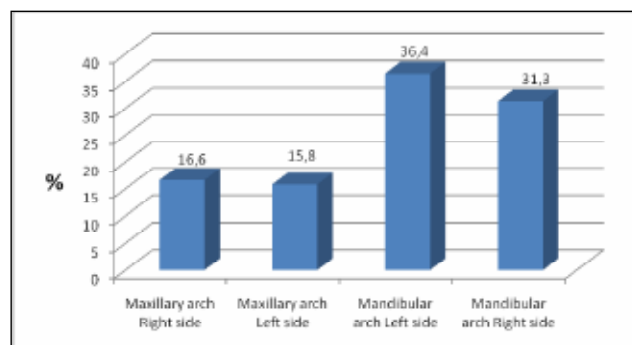


Figure 4 – Sample distribution according to hemiarch affected by agenesis of second premolars.

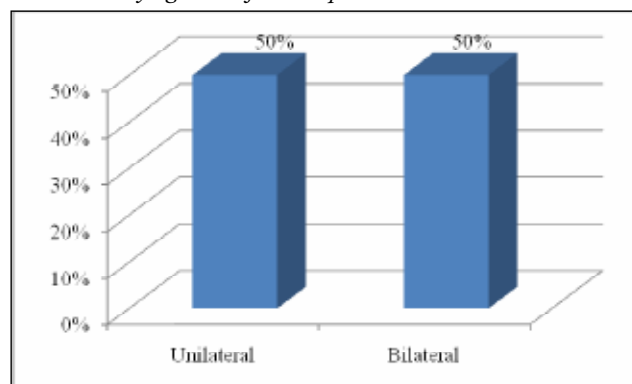


Figure 5 – Distribution of unilateral/bilateral agenesis in the maxillary arch.

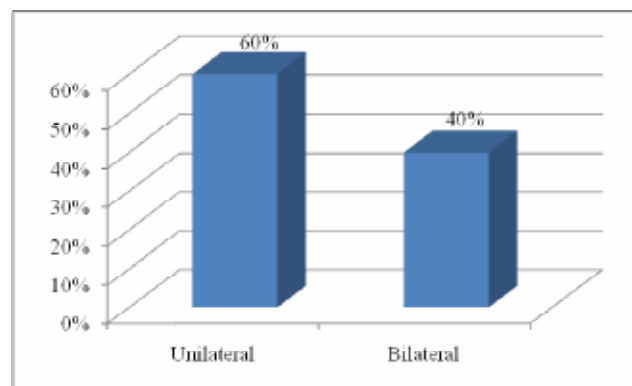


Figure 6 – Distribution of unilateral/bilateral agenesis in the mandibular arch.

two or three second premolars, respectively.

- Evaluation of prevalence of other tooth abnormalities

The prevalence of agenesis of other permanent teeth in individuals with agenesis of second premolars, except for third molars, corresponded to 21%. In decreasing order of prevalence, the sample exhibited agenesis of maxillary lateral incisors, mandibular central incisors, mandibular first premolars, maxillary first premolars,

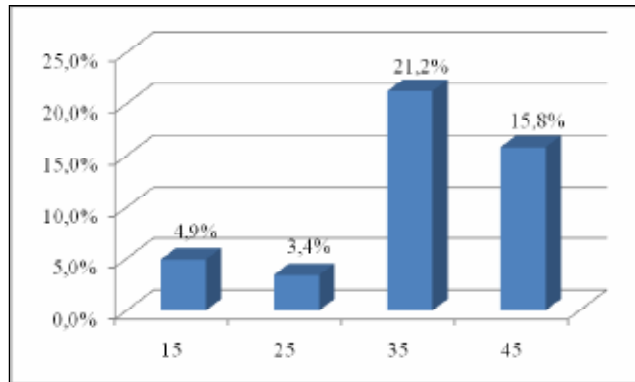


Figure 7 – Distribution of patients with agenesis of one second premolar, according to the missing teeth.

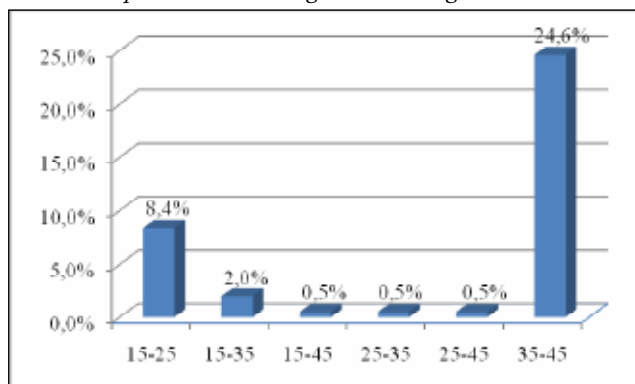


Figure 8 – Distribution of patients with agenesis of two second premolars, according to the missing teeth.

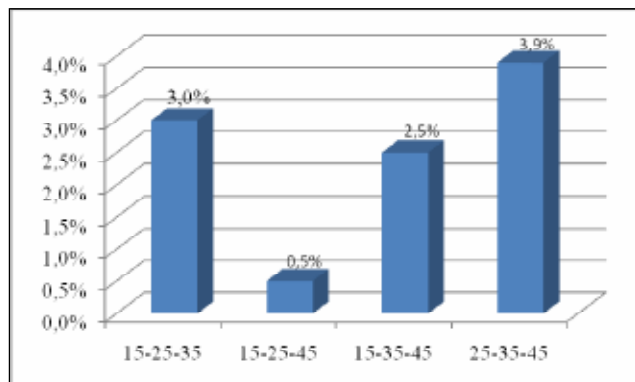


Figure 9 – Distribution of patients with agenesis of three second premolars, according to the missing teeth.

mandibular second molars, maxillary second molars, mandibular lateral incisors, maxillary first molars, maxillary canines and mandibular first molars. No patients with agenesis of second premolars presented agenesis of maxillary central incisors or mandibular canines (Figure 10).

Interestingly, the higher number of missing second premolars, the higher was the prevalence of agenesis of

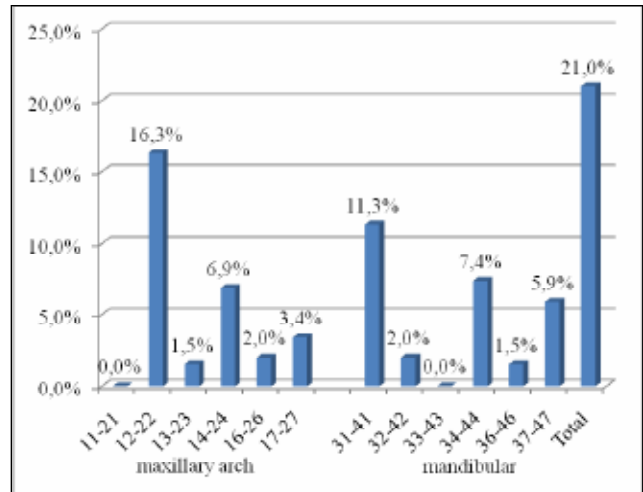


Figure 10 – Prevalence of agenesis of other permanent teeth, excluding the third molars, in the sample with second premolar agenesis.

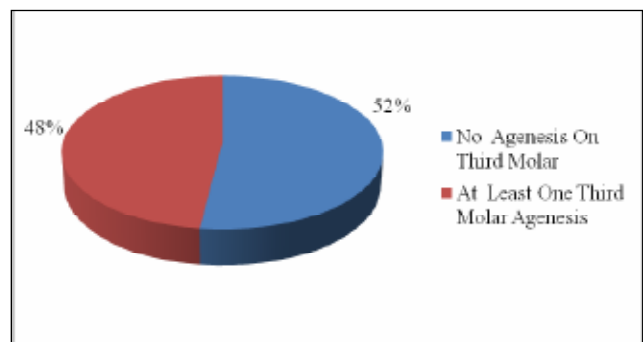


Figure 11 – Prevalence of agenesis of third molars in the sample.

other permanent teeth. The prevalence of agenesis of other permanent teeth in patients with one or two missing second premolars was approximately 15%.

Conversely, nearly 50% of patients with three or four missing second premolars exhibited agenesis of other permanent teeth.

Considering only the subgroup in the age range from 14 to 22 years (n=77), the prevalence of agenesis of third molars in patients with agenesis of second premolars was 48% (Figure 11).

DISCUSSION

In the present sample of patients with agenesis of second premolars, 1/3 of subjects were males and 2/3 were females (Figure 1). Therefore, the sex ratio corresponded to 1:2. These data agree with several studies in the literature, which report that agenesis, in general, is more prevalent in females^{4, 7, 14-19}. Stritzel, Symons and

Gage²¹ also observed higher prevalence among females compared to males in a sample of patients selected according to agenesis of second premolars, even though no statistically significant difference was found. Conversely, Rolling¹⁸ 1980, Endo *et al.*⁶ 2006 and Grieco⁹ 2007 did not find statistically significant differences between genders as to agenesis of permanent teeth in samples of Danish, Japanese and Brazilian patients, respectively. Other tooth abnormalities, such as transposition between maxillary canines and first premolars, were also more prevalent in females²². Analysis of the sample according to the number of missing second premolars (Figure 2) revealed that most patients exhibited agenesis of one or two teeth, while few presented agenesis of all second premolars. General epidemiological studies reported that the absence of one or two teeth is the most common condition in patients with agenesis, either Caucasians^{5,7} or Asians²⁰. Similar results were reported in a sample selected exclusively according to agenesis of second premolars²¹.

The mandibular arch was the most affected by agenesis of second premolars (Figure 3). The current results agree with previous epidemiological studies that reported higher occurrence of agenesis of second premolars^{23,21,15} and permanent teeth⁵ in the mandibular arch.

Evaluation of the hemiarch most affected by agenesis of second premolars revealed a decreasing order of occurrence in the mandibular left hemiarch, followed by the mandibular right, maxillary right and maxillary left hemiarches, as presented in Figure 4. Therefore, the maxillary left second premolar was the most commonly affected by agenesis.

The unilateral or bilateral occurrence of agenesis was related to the dental arch analyzed. In the maxillary arch, half of the cases were unilateral and half were bilateral. Conversely, in the mandibular arch, unilateral occurrence was more common (60%). Stritzel, Symons and Gage²¹ 1990 observed similar results, reporting that agenesis was more symmetrical in the maxilla compared to the mandible. Based on a meta-analysis on agenesis of permanent teeth, Polder *et al.*¹⁶ 2004 observed that unilateral occurrence is more common than bilateral for agenesis of all permanent teeth, except for the maxillary

lateral incisors. However, Endo *et al.*⁶ 2006, reported that “symmetrical” agenesis was more prevalent in Japanese individuals.

The prevalence of agenesis of other permanent teeth was remarkably increased in patients with agenesis of one or more second premolars. According to the results, the probability of agenesis of other permanent teeth in patients with agenesis of second premolars, except for the third molars, was quite increased (Figure 10). Analysis of the sample revealed that agenesis may affect all types of teeth, except for the maxillary central incisors and mandibular canines, with higher prevalence of agenesis of maxillary lateral incisors (Figure 7). Interestingly, the higher the number of missing second premolars, the higher was the prevalence of agenesis of other permanent teeth. The probability of agenesis of third molars in patients with agenesis of second premolars was also higher (Figure 11).

Only one study in the literature has previously addressed the association of occurrence of tooth agenesis. In the 1960s, Garn and Lewis⁷ 1963 observed that patients with agenesis of third molars presented increased prevalence of agenesis of other permanent teeth. The prevalence of agenesis of permanent teeth in the group with agenesis of third molars was 13 times higher than the prevalence of agenesis in the control group. Even stable teeth as central incisors, canines and first premolars were missing in the sample with agenesis of third molars. Specifically concerning the second premolars, the prevalence of agenesis in the study group corresponded to 11%, compared to 1.5% in the control group. This is explained because a single genetic defect may cause several anomalies; that is to say, agenesis of two or more teeth in a single patient may have a common genetic origin. The present results revealed increased prevalence of agenesis of permanent teeth associated with agenesis of second premolars, thereby corroborating these findings.

CONCLUSION

Agenesis of second premolars was more prevalent in females, in the mandibular arch and at the left side, and was often associated with agenesis of other permanent teeth.

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