

# Research Paper: Prevalence and pattern of congenitally missing of maxillary lateral incisors and mandibular second premolars in a sample of dental patients in North of Iran



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## ABSTRACT

**Introduction:** Congenital missing of maxillary lateral incisors and mandibular second premolars are one of the most common developmental dental anomalies that can affect patient's function and aesthetics. The aim of this study was to determine the prevalence and pattern of congenital missing of lateral maxillary teeth and second mandibular premolars in patients referred to the Dental Faculty of Guilan University of Medical Sciences in a 5-year period.

**Materials and Methods:** In this study, 1054 panoramic radiographs from 9-to-14-year-old patients (476 males and 578 females) were evaluated for the congenital missing of lateral maxillary incisors and mandibular second premolars. The data collected were analyzed using Kruskal Wallis, Mann-Whitney, Fisher Exact and Chi-square tests.

**Results:** Among 1054 panoramic radiographs, 75 cases indicated missing of maxillary lateral incisor and mandibular second premolar (7.1%). The prevalence of congenital missing of second mandibular premolar was higher in females compared to males, and this difference was statistically significant ( $P = 0.012$ ), however the missing of upper lateral incisors did not show the same sex tendencies ( $P = 0.294$ ). There was no significant relationship between the distribution of congenital missing of maxillary lateral incisors and mandibular second premolars with the incidence side ( $P = 0.330$ ,  $P = 0.197$  respectively), also no significant difference was detected between the unilateral or bilateral occurrence of missing ( $P = 0.689$ ,  $P = 0.617$ ).

**Conclusion:** since the lack of teeth causes serious problems in aesthetic and function, frequent examination of children for early detection seems necessary.

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## Introduction

Congenital Missing Teeth (CMT) is the most prevalent developmental dental anomaly. Hypodontia and oligodontia are terms defining the absence of less and more than six permanent teeth except third molars, respectively (1).

CMT is the result of a disorder during the early stages of dental development. In cases of congenital absence of a primary tooth, its permanent successor may also be absent. Genetics play an important role in CMT, this has been confirmed by studies on homozygous twins (2).

According to Butler's field theory, four morphological domains (Incisory, canine, premolar, and molar) are defined in each jaw. The most mesial tooth in each of these areas is the most genetically stable tooth and rarely develops CMT. While the most distal tooth in each domain has less genetic stability (3).

Studies on twins have indicated that the pattern of CMT in homozygous twins can be different which indicates multifactorial etiology (4). Therefore, a combination of environmental and genetic factors can lead to dental agenesis (2).

Hypodontia occurs in both non-syndromic and syndromic forms, with non-syndromic form being the most common cause of CMT and occurring in isolation (5). The inheritance pattern for the isolate form can be autosomal dominant, recessive, or sex-dependent. Mutations in genes such as PAX9, MSX or TGFA can cause CMT in different racial groups (2). In general, dento-facial changes in patients with oligodontia are more prominent than those without CMT. These changes are more related to dental and functional compensatory changes than to a specific growth pattern (6). An ideal CMT diagnosis requires clinical and radiographic examination. Panoramic radiography is highly validated for this purpose (7). The age of CMT examination has a significant impact on the result. Mineralization of the permanent crown except the third molars, begins at the age of three and is usually completed by the age of six. Since observation of radiographic evidence of dental buds requires a certain degree of calcification, examination at an

early age can produce inaccurate and unreliable results. This is more important in mandibular premolars. Accordingly, some researchers have recommended the exclusion of children younger than nine years in the study of CMT prevalence (2).

The incidence of CMT is not common in the primary dental system and has been reported to range from 0.4 to 1.2%. Dental agenesis in the primary dental system is usually associated with permanent substitute agenesis. The prevalence of CMT in the permanent dental system, except for the third molar, has been reported to be 0.45 to 2.46%. This difference can be due to different assessment methods, different inclusion and exclusion criteria, and racial differences (2). CMT can cause problems in mastication, speech, occlusion, and beauty; causing problems such as excessive space, shifting adjacent teeth, and interfering with dental treatment plans (8). Early diagnosis of this problem leads to a better prognosis and treatment plans preventing malocclusion, periodontal problems and alveolar ridge developmental problems (9). Studies on the prevalence of permanent teeth absence in different races have reported significant differences; however, the fact that the prevalence of congenital missing in the maxillary lateral incisors and mandibular second premolars is higher than other teeth have been more widely accepted (2,6,8).

By recognizing the prevalence of this anomaly and its contributing factors, early treatment can be provided and the resulting functional and aesthetic problems will be reduced. Since the prevalence of these cases varies widely in different regions and the figures provided by other researchers are not generalizable to the Iranian community, and there are few studies examining the prevalence and pattern of specific teeth in Iranian population, the aim of this study was to evaluate the prevalence and pattern of congenital missing of permanent maxillary lateral incisors and mandibular second premolars in 9-14 year old children referred to Dental Faculty of Guilan University of Medical Sciences for a five year period.

## Materials and Methods

In this descriptive cross-sectional study, panoramic radiographs of 9-14-year-old patients referred to the Maxillofacial Radiology Department of Guilan Dental Faculty during the years 2012-2017 were extracted. This study was ethically approved by the research committee of Guilan University of Medical Sciences. Since the absence of tooth in some tooth types cannot be diagnosed before the age of 9, moreover by the age of 14, permanent tooth germs (excluding wisdom tooth) are observable in radiographs, the age range of 9-14 was considered. Children whose radiographs did not have diagnostic clarity, children with developmental anomalies such as ectodermal dysplasia, cleft lip and/or palate and children with a history of loss or extraction of maxillary lateral incisors and mandibular second premolars due to trauma or caries were excluded from the study. In cases where panoramic radiographs had been taken many times, the most recent panoramic radiograph was used to evaluate missing teeth. A total of 1054 radiographs remained for appraisal in this study. All radiographs were examined by an oral and maxillofacial radiologist to evaluate the congenital absence of permanent maxillary lateral incisors and mandibular second premolars (absence of any evidence of crown mineralization were studied).

### *Statistical analysis:*

Data were collected and entered into SPSS software version 22 (IBM Corp, Armonk NY, USA), using frequency descriptive statistics to determine the prevalence of congenital missing maxillary lateral incisors and mandibular second premolars. Also, Chi-square test, Fisher Exact, Mann-Whitney and Kruskal Wallis tests were used to analyze differences in the distribution of prevalence, sex, involved side and unilateral or bilateral type.

## Results

In the current study, panoramic radiographs of 1054, 9-14-year-old children (578 (54.8%) female

and 476 (45.1% male) were evaluated. The mean age of the participants was  $11.81 \pm 1.79$  years. Congenital missing of maxillary lateral incisor and mandibular second premolar was detected in 75 cases (7.1%) which, 52 (69.33%) were female and 23 (30.66%) were male. The prevalence of congenital missing of maxillary lateral incisor and mandibular second premolar were 3.6% and 3.98% respectively. Chi-square test was used to determine the relationship between age and gender and CMT, and the result was not statistically significant ( $P=0.526$ ) (table 1).

Table 2 indicates the occurrence of missing based on gender, in which, absence of mandibular second premolar was significantly more prevalent among females ( $P=0.012$ ). However, no significant relationship was observed between gender and maxillary lateral incisors missing ( $P=0.294$ ).

According to specific quadrant, the most prevalent missing pattern for maxillary lateral incisors was left side and bilateral, whereas bilateral missing was the most prevalent pattern for mandibular second premolars. However, based on the results achieved, no significant relationship was found between the tooth location and the missing tooth ( $P=0.659$ ).

Observations showed that missing of both mandibular second premolars and maxillary lateral incisors did not have any significant relationship with the incidence side (left/right) with P-values 0.197 and 0.330, respectively. Meanwhile, table 3 demonstrates the distribution of CMT, unilateral versus bilateral in both mandibular second premolars and maxillary lateral incisors, although there was no statistically significant relationship.

Table 1. Prevalence of congenital missing of maxillary lateral incisors and mandibular second premolars according to age and gender

Age	Lack of teeth		Existence of teeth		Total	
	Female N(%)	Male N(%)	Female N(%)	Male N(%)	Female N(%)	Male N(%)
9	10 (13.33)	2 (2.66)	102 (10.41)	89 (9.09)	112 (10.62)	91 (8.63)
10	7 (9.33)	2 (2.66)	91 (9.29)	85 (8.68)	98 (9.29)	87 (8.25)
11	7 (9.33)	5 (6.66)	79 (8.06)	66 (6.74)	86 (8.15)	71 (6.73)
12	4 (5.33)	2 (2.66)	85 (8.68)	50 (5.10)	89 (8.44)	52 (4.93)
13	16 (21.33)	8 (10.66)	74 (7.55)	74 (7.55)	90 (8.53)	78 (7.40)
14	8 (10.66)	8 (10.66)	95 (9.70)	89 (9.09)	103 (9.77)	97 (9.20)
Total	52 (69.33)	23 (30.66)	526 (53.72)	453 (46.27)	578(54.83)	476 (45.16)
	4.22 <sup>a</sup>		6.11 <sup>b</sup>		5.18 <sup>b</sup>	
Sig	0.526		0.295		0.394	

a. Fisher's Exact Test; b. Pearson Chi-Square

Table 2. Distribution of missing of maxillary lateral incisors and mandibular second premolars according to gender

Tooth	Tooth condition	Sex		$\chi^2$	P-VALUE
		Male N(%)	Female N(%)		
Mandibular second premolar	Missing	11 (26.19)	31 (73.80)	6.36	0.012
	Existence	465 (45.94)	547 (54.05)		
	Total	476 (45.16)	578 (54.83)		
Maxillary lateral incisors	Missing	14 (36.84)	24 (63.15)	1.10	0.294
	Existence	462 (45.47)	554 (54.52)		
	Total	476 (45.16)	578 (54.83)		

Table 3. Distribution of unilateral and bilateral missing of mandibular second premolars and maxillary lateral incisors

Tooth	Tooth condition			$\chi^2$	P-VALUE
	Existence of teeth	Unilateral missing	Bilateral missing		
Maxillary lateral incisor	1016 (96.39)	23 (2.18)	15 (1.42)	0.74	0.689
Mandibular second premolar	1012 (96.01)	22 (2.08)	20 (1.89)	0.96	0.617

## Discussion

Developmental lack of one or more teeth, except third molars, is called hypodontia or congenital missing teeth which is one of the most prevalent dental anomalies (11,12). Regional and racial diversities can lead to different prevalence of CMT, although the exact causes of this differences are still unknown (13,14).

Numerous studies have investigated the prevalence of congenital missing teeth; however, there are few studies investigating the

prevalence of congenital missing of maxillary lateral incisors and mandibular second premolars in Iranian population. The current study excluded children under the age of 9 years, which may increase the reliability of the findings compared to other studies, since the evidence of crown mineralization of mandibular premolars may not be seen on radiographs until the age of 9, and screening of children younger than 9 years old may lead to overestimation of congenital missing of premolars (9,10).

In a study carried out by Chung et al , analyzing 1,622 patients in Korea, hypodontia prevalence was calculated as 11.2 % (15). In Brazil, the prevalence of hypodontia was estimated as 6.3 % (16). In Sudan, this figure was 5.1 %, in Slovenia 6.9 % and in Iran 10.9 %. (17,18,19). The current study revealed a CMT rate of 7.1% in the studied population, the observed differences can be the result of different study methods, such as sample size, type of studied teeth and inclusion and exclusion criteria including the age range or considering third molars, or regional and ethnical diversities.

The present study showed that missing of maxillary lateral incisors were higher in females than males, however it was not significant which is similar to some other studies specially those evaluating Iranian populations. (9,19,20).

On the other hand, this study revealed that the higher rate of mandibular second premolars missing among females was statistically significant which is consistent with the results of Sheikhi et al., Shafi et al. and Lakshmanan et al. (12,19,21), but it is in controversy with some other studies (9,22). The higher rates noted in females may be associated with biological differences like smaller jaws, which may cause external factors where the formation of dental germs is postponed, and so the adjacent tissues have undermined the required space (12). The differences that was mentioned above, can be due to the racial varieties or the study design; for example, some of these studies were carried out among orthodontic patients. As we know aesthetics concerns leading to orthodontic treatments are higher in females and their families, so choosing the sample from orthodontic clinics can affect the results. However, some of these studies despite having more female patients, did not indicate any significant higher missing rate (2,9).

There was no relationship between occurrence of missing tooth and the side of occurrence. This result is consistent with various studies conducted in Korea, Brazil and Malaysia (15,16,23), while it is in contrary with results from other populations in Iran and Sudan (9,17).

The prevalence of unilateral and bilateral missing of the studied teeth were not significantly different, which correlates with studies in Korea, Malaysia and Japan (15,23,24). Conversely, some other studies reported significantly higher bilateral missing (9,22). Differences can be attributed to variations in ethnicity, or methods of study. For example, it is likely that the sort of teeth examined may have an effect, so the prevalence of unilateral teeth may be even higher than those of bilateral teeth, and bilateral missing may also be more prevalent in the anterior teeth (9).

The strengths of this retrospective study include the sample size, whereas the panoramic radiographs were collected from a 5-year archive, and also choosing the age range of 9-14 years old, which helped to inhibit the overestimation of congenital missing tooth prevalence especially mandibular second premolars. However, the present study has a certain limitation. The data were collected from panoramic radiographs of dental patient which may result in bias, because it is more likely that people with congenital dental anomalies refer more often to dental clinics and dentists than people without congenital dental anomalies.

Therefore, the prevalence observed in the present study may be higher than the real prevalence of the community population (16,20,24).

## Conclusion

The present study showed a rather high prevalence of the congenital missing of maxillary lateral incisor and mandibular second premolar. Meanwhile, mandibular second premolars missing was significantly higher among females. Since the lack of teeth can causes serious problems in function and aesthetic, on-time diagnosis would accelerate treatment process and prevent the following problems.

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