

Research Article

Epidemiological Valuation of the Frequency of Congenitally Missing Maxillary Lateral Incisors Among Schoolchildren Aged 6–14 Years in Duhok City: A Cross-Sectional Study

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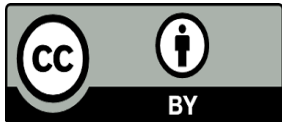
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Abstract

Aims: The present study aimed to analyze the frequency of congenitally missing maxillary lateral incisors and evaluate gender-related differences among children in Duhok City, Iraq.

Materials and Methods: The study was conducted by collecting 600 ortho pantomographs (OPGs) of patients aged 6–14 years from a private dental center in Duhok. Patients with prior extractions, craniofacial anomalies, or orthodontic treatment were omitted. The presence of unilateral or bilateral maxillary lateral incisor agenesis was recorded, and statistical analysis was performed via Fisher's exact test, with significance usually at $p < 0.05$.

Results: Total prevalence of maxillary lateral incisor agenesis was 5.67%. Female patients confirmed a significantly higher prevalence (7.74%) related to males (3.45%) ($p < 0.0001$). Bilateral agenesis was more common than unilateral cases. Side-specific analysis illustrates slight differences: the left side is commonly affected in females and the right side in males.

Conclusion: Maxillary lateral incisor agenesis is less common, because % is 5% among children in Duhok, with a higher incidence in females. Early detection and multidisciplinary management are essential for heightening esthetic and functional results. Further studies are recommended to discover innovative genetic and environmental risk factors.

Keywords: Agenesis, Congenital missing, Prevalence, Maxillary lateral incisors.

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INTRODUCTION

One of the dental problems that affects the esthetics and function is the congenital missing of permanent teeth, a state known as agenesis (1). Genetic tooth loss can have a number of causes, including genetics, some medical disorders, and environmental factors (2). Hypodontia may occasionally be inherited. Restoring these teeth offerings an aesthetic challenge for every dental team; so, they select the best course of action for each patient. Clinicians have always faced a significant difficulty when it comes to the aesthetic management of missing lateral incisors. Typically, hypodontia is inherited, and many affected people have a family history of hypodontia or related dental conditions. Anomalies in orthodontics (3,4)

Agenesis of an upper lateral incisor, recognized as unilateral maxillary lateral incisor agenesis (UMLIA), Bolton's discrepancy is an important complication in orthodontics, mostly when it co-occurs with a peg-shaped contralateral maxillary lateral incisor. Agenesis of upper lateral incisors is considered the second most common type of dental agenesis beyond mandibular second premolars, accounting for around 20% of all cases in the Caucasian population, excluding third molars (5).

It is preferable to consult with a specialist in conservative dentistry. They can assist in selecting the optimal course of action to produce a natural-looking and effective solution. Additionally, improving the appearance of the face in general and the grin in particular. These days, patients place significant importance on the appearance of their physical features (6,7). This study aimed to assess the frequency of agenesis and its relation with gender. Many causes associated with lateral incisor agenesis, including genetic influences, were eventually accepted as the primary cause. Several studies have identified key genes that affect the early stages of odontogenesis. Significantly, mutations in *MSX1*, *PAX9*, and *EDA* damage the epithelial–mesenchymal interactions required for tooth initiation and morphogenesis. Frequently inherited in an autosomal dominant form with varied expressivity, these genetic defects indicate a complicated inheritance process (8). Lateral incisor hypodontia is associated with both non-syndromic and syndromic conditions, including Rieger syndrome, ectodermal

dysplasia, and cleft lip/palate syndromes. The fact that tooth agenesis usually agrees with systemic abnormalities among these patients supports the theory that similar developmental pathways may affect both dental development and craniofacial (9).

MATERIALS AND METHODS

The current study was done in Duhok city from September 2024 to April 2025. This investigation was designed as a descriptive cross-sectional study. The study protocol was approved by the relevant institutional ethical committee, and it adhered to the principles of the Declaration of Helsinki.

A total of 600 orthopantomographs (OPGs) of children aged 6–14 years were retrospectively collected from private dental centers in Duhok city. The sample was selected using non-probability convenience sampling based on the availability of clear diagnostic radiographs. The study aimed to determine the prevalence of congenital maxillary lateral incisor agenesis and to evaluate its association with gender. Orthopantomograph (OPGs) records of all orthodontic patients aged 6 to 14 years. (six hundred children) were collected from private dental centers in Duhok city.

Patients with old extractions and any orthodontic appliance were excluded. Variables such as age and gender were determined. 290 radiographs were related to male patients, while 310 were related to female patients. Ortho pantomographs assisted in detecting the presence of unilateral/bilateral maxillary lateral incisors. The study protocol was reviewed and approved by the Institutional Ethical Committee of [University of Duhok/College of Dentistry], Duhok, Iraq (15102025-8-7). Since this was a retrospective radiographic study, informed consent was obtained from the parents or legal guardians of the children at the time of radiographic record collection, and patient confidentiality was strictly maintained. All data were anonymized prior to analysis.

Statistical Analysis

The number of missing maxillary lateral incisors among orthodontic adolescent patients was reported as frequencies. The prevalence of agenesis according to sex and

side (right and left) was expressed as percentages. Differences in the prevalence of missing lateral incisors between males and females, as well as between the right and left sides, were assessed using Fisher's exact test. Statistical significance was set at $p < 0.05$. All statistical analyses were performed using **JMP® software (Version 18.0; SAS Institute Inc., Cary, NC, USA, 1989–2023)**.

RESULTS

In a sample of 600 patients, radiographs were collected from archival records for a retrospective survey; 290 (48.33%) belonged to male patients, while 310 (51.67%) belonged to female patients (Table 1).

Table 1: Sex distribution of orthodontic adolescents.

n=600	Number	Percent %
Gender		
Male	290	48.33
Female	310	51.67

The prevalence of missing lateral incisors on both sides (right and left) was 3.45% among orthodontic male patients; for females, it was 7.74%. The prevalence of congenitally missing lateral incisors among 600 patients was 5.67%. There was a statistical difference between males and females (p -value < 0.0001) (Table 2, Figure 1).

Table 2: Prevalence of missing lateral incisors among orthodontic adolescent patients

Distribution of missing lateral incisors no. (%)					
n=600	No.	missing both sides	No missing	P	Prevalence of all missing (%)
Male	290	10 (3.45)	280 (96.55)	<0.0001	5.67
Female	310	24 (7.74)	286 (92.26)		

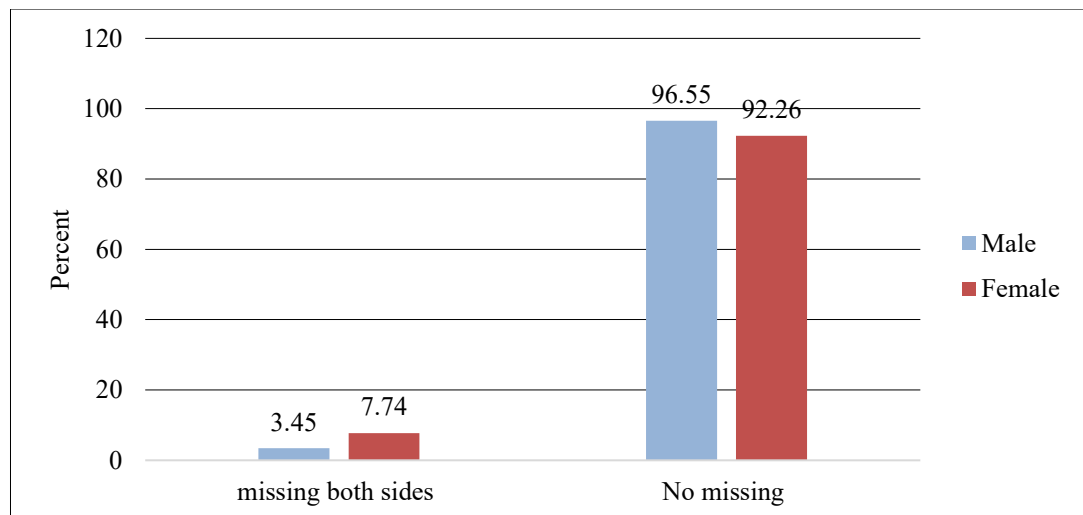


Figure 1: Missing both sides of male and female patients

Prevalence of MLI on the right side in orthodontic adolescent male patients was [1.03%], while for females it was [0.97%]. Prevalence of MLI in left-sided males was [0.69%]. While for females it was [1.29%] (Table 3, Figure 2).

Table 3: Prevalence of MLI in right and left sides in orthodontic adolescent patients

		One-sided missing lateral inc		One-sided missing lateral in		P
n=600	No.	Right (no.)	Left (no.)	right (%)	left (%)	
Male	290	3	2	1.03	0.69	0.1084
Female	310	3	4	0.97	1.29	

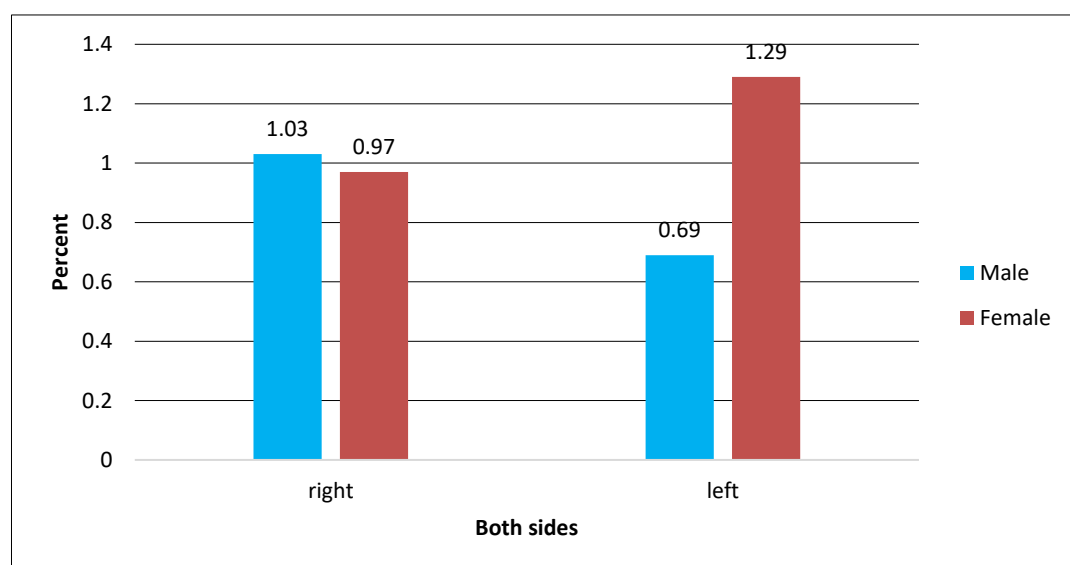


Figure 2: MLIS on the right and left sides in orthodontic adolescent patients

DISCUSSION

These associations highlight the importance of collaboration in diagnosis and treatment planning. They are less frequent; environmental factors may influence the development of oral agenesis among genetically susceptible individuals. Radiation therapy, prenatal infections, and maternal illnesses during pregnancy can affect the normal development of the dental lamina(10). Nevertheless, it is still challenging to determine the impacts of these exposures due to the genetic–environmental connections. Asian people had higher incidences of MLI agenesis than African or Caucasian residents (11). According to many experts, these patterns might be the outcome of evolutionary adaptations toward missing teeth in response to variations in food and craniofacial structure.

Genetic variables—specifically, mutations in developmental genes—show the most important role, with syndromic, contextual, and evolutionary impacts serving as modifying factors, as supported by our discussion. To illuminate these pathways and boost the diagnosis and more affordable treatment of patients with oral agenesis, additional genomic and molecular research is necessary.

The extensive use of social media has raised people's awareness of their dental health. The number of persons seeking orthodontic treatment has increased dramatically in recent years. Malocclusion affects people's quality of life in several ways. Numerous physical and physiological problems arise from. Congenital tooth loss is one of the complicated conditions that need for wisely thought-out orthodontic cure. The study's sample size was adequate to collect epidemiological evidence about the loss of LI in the upper arch .

The prevalence of missing permanent teeth in this study was 5.67%, which is consistent with the findings of (Amini et al, 2012), but higher than the 3.36% reported by (Al-Mayali et al, 2021). In the present study, the prevalence of bilaterally missing lateral incisors (both right and left) was 5.6%, which aligns with the reported prevalence of MI agenesis in other studies, including those by (Fujita et al, 2009), (13-15). However, these results differ from those of (Ibraheem, 2018) reported a lower

prevalence of 2% for missing upper lateral incisors (1.5% in females and 0.5% in males). This discrepancy may be attributed to differences in the populations studied. The prevalence of congenitally missing teeth (CMT) varies across populations, ranging from 1.1% to 15.88% (17). Prevalence of MLI was higher in females than in males, and this is approved with (Swarnalatha, 2020) (12-13). It is clear that the ratio of bilateral MLIS in female (7.74%) was higher than male (3.45%), and the table was higher in the left side (Female)(1.29%) than the right side (0.97%), while in male right side (1.03%) was higher than left side (0.69) This trend is in agreement with other studies (Swarnalatha, 2020), who explained that the bilateral missing lateral is due to the decreased mesiodistal widths in both the maxillary and mandibular anterior segment (18).

Most dentists agree that the motivation for replacing lateral incisors was either aesthetics or both aesthetics and function (19). Regardless of the patients' opinions regarding facial aesthetics in general and smile aesthetics in particular, it is obvious that the study's sample accepted the aesthetics of their smiles despite the missing teeth, since they believe that missing teeth have no impact on their appearance.

CONCLUSIONS

Within the limitations of this study:

The prevalence rate of agenesis of upper lateral incisors in children aged 6-14 years old in Duhok city was 5.67%. Females had a higher percentage of agenesis of upper lateral incisors (7.74%) when compared to males (3.45%). This difference is thought to be due to genetic variations or different environmental factors. A multidisciplinary treatment protocol must be planned to manage missing maxillary lateral incisors and to restore the impaired esthetics and function.

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Authors' Contribution

Hassan HM., Tahir DSH., Mudhir AM., Qasim HJ completed the conceptualization, data curation, formal analysis, finding acquisition, investigation, resources, software, validation, visualization, writing- original draft, writing- review, and editing. Hassan HM, Tahir DSH,

Mudhir AM. Qasim HJ completed the Conceptualization, Investigation, Methodology, Project administration, Supervision, Visualization, Writing, Writing- review & editing. Manton finished the Conceptualization, investigation, methodology, project administration, supervision, visualization, and writing- review & editing.

Ethical statement:

The protocol for this retrospective cross-sectional study was reviewed and approved by the **Ethical Committee of the College of Dentistry, University of Duhok**. The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki.

Conflict of interest

The author declares that there are no conflicts of interest regarding the publication of this manuscript.

Availability of data and materials: All data generated or analyzed during this study are included in this published article and its supplementary information files.

Declaration of Generative AI and AI-assisted technologies

The authors employed a grammar tool to enhance the manuscript's readability while it was being prepared. The authors accept full responsibility for the publication's content and have reviewed and amended it as necessary.

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التقييم الوبائي لتكرار غياب القواطع الجانبية العلوية الخلقي بين أطفال المدارس الذين تتراوح أعمارهم بين 6 و14 عامًا في مدينة دهوك: دراسة مقطعية

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الملخص

الأهداف: هدفت هذه الدراسة إلى تحليل مدى شيوع غياب القواطع الجانبية العلوية الخلقي، وتقييم الاختلافات بين الجنسين لدى الأطفال في مدينة دهوك، العراق. **المواد وطرائق العمل:** أجريت الدراسة بجمع 600 صورة بانورامية للأسنان (OPG) لمرضى تتراوح أعمارهم بين 6 و14 عامًا من مركز أسنان خاص في دهوك. استبعد من الدراسة المرضى الذين خضعوا لعمليات خلع أسنان سابقة، أو يعانون من تشوهات قحفية وجهية، أو تلقوا علاجًا تقويميًا. سُجِّل وجود غياب أحادي أو ثنائي الجانب للقواطع الجانبية العلوية، وأجري التحليل الإحصائي باستخدام اختبار فيشر الدقيق، مع اعتبار مستوى الدلالة الإحصائية عند قيمة $p < 0.05$. **النتائج:** بلغ معدل انتشار غياب القواطع الجانبية العلوية 5.67%. وسُجِّل معدل انتشار أعلى بشكل ملحوظ لدى الإناث (7.74%) مقارنةً بالذكور (3.45%) ($p < 0.0001$). وكان الغياب الثنائي أكثر شيوعًا من الغياب الأحادي. يُظهر التحليل الخاص بكل جانب اختلافات طفيفة: فالجانب الأيسر هو الأكثر شيوعًا لدى الإناث، بينما الجانب الأيمن هو الأكثر شيوعًا لدى الذكور. **الاستنتاجات:** يُعدّ غياب القواطع الجانبية العلوية أقل شيوعًا، حيث تبلغ نسبته 5% بين الأطفال في دهوك، مع ارتفاع نسبة الإصابة لدى الإناث. يُعدّ الكشف المبكر والإدارة متعددة التخصصات ضروريين لتحسين النتائج الجمالية والوظيفية. يُوصى بإجراء المزيد من الدراسات لاكتشاف عوامل الخطر الوراثية والبيئية الجديدة.

الكلمات المفتاحية: غياب القواطع، الغياب الخلقي، الانتشار، القواطع الجانبية العلوية.