Annali di Stomatologia
The Italian Journal of Odontostomatologic Sciences
Vol. 17 | No. 2 | 2026 | pp. 517-525 | eISSN 1971-1441 | ISSN 1824-0852

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Prevalence and clinical characteristics of missing teeth among dental students at Albanian University: a cross-sectional study

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Abstract

Missing teeth are one of the most common clinical and public health concerns. They can affect quality of life by compromising esthetics and function. Therefore, early diagnosis may reduce their consequences. The prevalence of missing teeth varies across populations and is related to several etiologic factors. This study aimed to assess the prevalence and clinical characteristics of missing teeth among dental students at Albanian University.

Material and methods

A cross-sectional study was conducted from November to December 2025. The study sample consisted of 200 dental students randomly chosen at Albanian University, of whom 69% were female and 31% were male. A questionnaire was administered to the sample, and data were collected through clinical and radiological examinations. Written informed consent was obtained from each participant. The Chi-square test or Fisher's exact test, as appropriate, was used for statistical analysis.

Results

Overall, 55 students (27.5%) presented with missing teeth. Mild severity was the most common form among affected students (52/55, 94.5%). The prevalence of dental agenesis was 6.5%, with no statistically significant differences by sex, jaw, or malocclusion class. Missing teeth were slightly more frequent among males than females (29.0% vs. 26.8%, respectively).

Conclusions

In this study, the most frequently affected congenitally missing teeth were the maxillary lateral incisors and second premolars. Most students with missing teeth had not received any treatment, and the most common clinical consequence among affected participants was temporomandibular joint dysfunction.

Keywords: missing permanent teeth; dental agenesis; hypodontia; malocclusion; temporomandibular joint dysfunction.

Article History

Received: February 27, 2026
Accepted: June 2, 2026
Published: June 30, 2026

DOI

https://doi.org/10.59987/ads/2026.2.517-525

Journal Info

eISSN 1971-1441 | ISSN 1824-0852
Scopus | DOAJ | Crossref
Peer Review: Double-anonymous

How to Cite

Valbona Disha, Eni Disha, Esmeralda Murtini, Blerina Zeza, Bora Zaimi, Elizana Petrela. Prevalence and clinical characteristics of missing teeth among dental students at Albanian University: a cross-sectional study. Annali di Stomatologia. 2026;17(2):517-525. doi: 10.59987/ads/2026.2.517-525

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Introduction

Dental agenesis is among the most prevalent dental anomalies, defined as the failure of one or more teeth to develop during embryonic development. It is characterized by the congenital absence of one or more permanent or primary teeth [1-2], with permanent teeth more commonly affected. Dental agenesis can occur in one or both jaws and can be unilateral or bilateral. In addition, the missing tooth is generally the most distal tooth within each tooth group [3]. Congenitally missing teeth are those that have not erupted in the oral cavity and are not evident on radiography [4-5]. According to the number of missing teeth, this condition can be classified as hypodontia (one to six missing teeth, excluding third molars), oligodontia (six or more missing teeth, excluding third molars), or anodontia (complete absence of teeth).

This condition can occur alone or as a component of syndromes such as Down syndrome, Rieger syndrome, Williams syndrome, and oro-facial-digital syndrome [6], as well as other conditions such as incontinentia pigmenti. Therefore, when several dental abnormalities are present, radiographic confirmation and, when appropriate, genetic counseling are advised. In addition, dental agenesis can be associated with other dental anomalies, including canine impaction and transposition, as well as maxillary hypoplasia [7-8].

Although the exact cause of dental agenesis is unknown, several potential contributing factors have been suggested, including systemic diseases such as rickets, syphilis, and ectodermal dysplasia [9, 10], localized inflammation, orofacial clefting [11], radiation, chemotherapy, dentoalveolar injuries, and heredity, including mutations of the PAX9 and MSX1 genes [12-14]. On the other hand, teeth may also be absent because they have been extracted. Causes of tooth extraction include dental caries, periodontal disease, malocclusion, socioeconomic factors, and other clinical conditions.

Diagnosis of missing teeth requires both clinical and radiographic examination. Dental agenesis is determined radiographically when dental buds are not visible on radiographs [15]; however, because chronological dental development can vary substantially, caution is warranted when assessing whether a tooth is congenitally missing. The extent of hypodontia determines whether therapy is simple or complex. Early diagnosis can help patients receive appropriate care by allowing treatment to begin early and reducing possible consequences [16]. Early detection also provides important information on environmental influences, genetic predispositions, and possible links with other medical disorders.

Among dental anomalies, hypodontia is one of the most prevalent dentofacial defects [17]. Agenesis of one or two permanent teeth affects at least one person out of every ten to twenty in many countries [18-21]. Although different populations show different rates of developmentally missing teeth in the permanent dentition, a recent meta-analysis calculated an overall hypodontia prevalence of 6.4% [22]. Regarding sex, Khalaf et al. reported a higher prevalence of permanent missing teeth in females, whereas a major epidemiological survey conducted in Japan found no sex-related differences [23]. In addition, a higher prevalence of missing teeth has been reported in Class III malocclusion than in other malocclusion types [24].

Missing teeth can affect general health and quality of life. Loss of anterior teeth affects appearance and may increase communication barriers in social settings because of lower self-confidence [25]. From a functional perspective, tooth loss has a detrimental effect on nutrition. Patients who have lost teeth may experience malocclusion, impaired chewing and speech function, periodontal disease, inadequate alveolar bone growth, and temporomandibular disorders (TMD) [26].

Because treatment for missing teeth can be costly and complex [27], early examination is crucial for providing appropriate therapeutic solutions. A multidisciplinary team is usually required for tooth replacement interventions [28]. Treatment options include opening or closing the edentulous space with orthodontic treatment and replacing the edentulous area with dental implants or bridges.

This study aimed to evaluate the prevalence of missing teeth among young adults in Albania; its distribution by sex and malocclusion; the most affected teeth; its effects on occlusion and temporomandibular joint function; and treatment choices.

Material and Methods

The present study was conducted at the Department of Dentistry, Albanian University, Tirana. The study sample consisted of 200 dental students aged 17-26 years, and the study period was from November to December 2025. This study was approved by the Council of Ethics UMT, No. 2538/16. Informed consent was obtained from all students who participated in this study.

This cross-sectional study consisted of a questionnaire covering demographics and dental history, followed by a clinical examination of students to evaluate the prevalence of missing teeth. Student age, sex, number and type of missing teeth, site of dental agenesis, possible consequences, and type of chosen treatment were taken into consideration.

Inclusion criteria

All students who provided consent to participate in this study.

Information on missing teeth, including extraction due to caries or periodontal pathology and impacted teeth, was included.

Exclusion criteria

Students who did not provide consent to participate in this study.

Students who had systemic disease.

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doi: 10.59987/ads/2026.2.517-525

Students who had trauma or fracture of the jaw.

Data collection

All students were evaluated during a clinical visit by a single examiner. The presence of dental agenesis was evaluated through clinical and radiologic examination (panoramic radiography). The severity of missing teeth was evaluated based on the number of missing teeth, using the numerical thresholds commonly applied for hypodontia: 1 to 2 missing teeth (mild), 3 to 5 missing teeth (moderate), and 6 or more missing teeth (severe) [29]. In addition, all students were classified into three malocclusion classes based on Angle's classification [30]: Class I, Class II, and Class III, to assess the relationship between missing teeth and malocclusion.

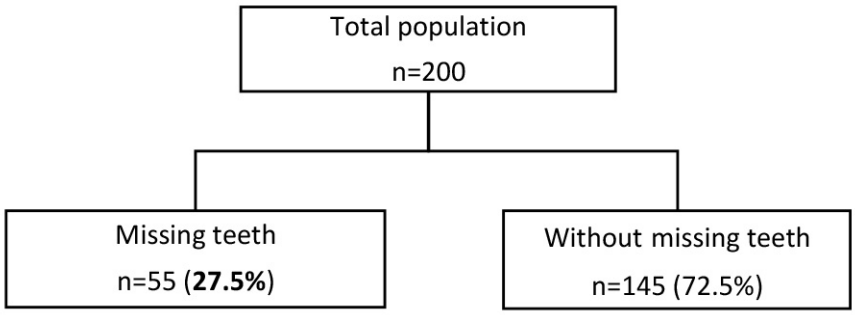
Statistical analysis

Descriptive statistics for all categorical variables (including nominal, binary/dichotomous, and ordinal scales) were reported as absolute frequencies and corresponding percentages. Sex-related differences were assessed using the Chi-square test or Fisher's exact test, as appropriate. A p-value of ≤ 0.05 was considered statistically significant.

Results

The study included 200 participants, of whom 55 (27.5%) had missing teeth, and 145 (72.5%) did not (Figure 1).

Figure 1. Flow diagram of the study population according to missing-teeth status.



The prevalence of missing teeth was 26.8% among females (37/138) and 29.0% among males (18/62). Tooth extraction was the predominant cause of tooth loss, accounting for 40 cases (72.7% of participants with missing teeth; 20.0% of the total study population), whereas dental agenesis and impacted teeth were less common causes, reported in 13 (23.6%; 6.5% of the total study population) and 2 (3.6%; 1.0% of the total study population) participants, respectively (Table 1).

Regarding the severity of missing teeth, most affected participants exhibited mild severity, with 52 individuals (94.5%) missing one or two teeth. Moderate severity (3-5 missing teeth) was observed in only 3 participants (5.5%), while no cases of severe missing teeth (six or more missing teeth) were identified.

Assessment of occlusal relationships showed that Angle Class I malocclusion was the most frequent pattern among participants with missing teeth, affecting 35 individuals (63.6%), followed by Class II malocclusion in 14 participants (25.5%) and Class III malocclusion in 6 participants (10.9%).

Several clinical consequences associated with missing teeth were observed. Temporomandibular joint (TMJ) dysfunction was the most common finding, affecting 28 participants (50.9%), followed by displacement of teeth adjacent to the edentulous space in 23 participants (41.8%). Displacement of antagonist teeth was identified in 6 participants (10.9%), while midline deviation was relatively rare, occurring in only 1 participant (1.8%).

Regarding treatment status, the majority of participants with missing teeth had not received any treatment (36 participants, 65.5%). Orthodontic treatment was reported in 12 participants (21.8%), while 6 participants (10.9%) had been rehabilitated with dental implants. Bridge-supported restorations were the least common treatment modality, reported in only 1 participant (1.8%).

Table 1. General characteristics of participants with missing teeth.

General characteristics	Participants with missing teeth N=55 (%)
Sex	
Female	37 (67.3)
Male	18 (32.7)
Cause of missing teeth	
Dental agenesis	13 (23.6)

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General characteristics	Participants with missing teeth N=55 (%)
Impacted teeth	2 (3.6)
Tooth extraction	40 (72.7)
Severity of missing teeth	
Mild (1-2 missing teeth)	52 (94.5)
Moderate (3-5 missing teeth)	3 (5.5)
Severe (6 or more missing teeth)	0 (0.0)
Angle malocclusion class	
Class I	35 (63.6)
Class II	14 (25.5)
Class III	6 (10.9)
Possible clinical consequences	
Displacement of teeth in the jaw with missing teeth	23 (41.8)
Displacement of antagonist teeth	6 (10.9)
Displacement of median line	1 (1.8)
Dysfunction of TMJ	28 (50.9)
Treatment status and treatment alternatives	
Participants without any treatment	36 (65.5)
Orthodontically treated participants	12 (21.8)
Participants treated with dental implants	6 (10.9)
Participants treated with fixed bridges	1 (1.8)
Total	55 (100.0)

Data are presented as n (%). Percentages were calculated among participants with missing teeth (n = 55), unless otherwise specified.

The distribution of causes of missing teeth according to sex is presented in Table 2. Tooth extraction was the most common cause of missing teeth, accounting for 72.7% of all cases, followed by dental agenesis (23.6%) and impacted teeth (3.6%). Among females, tooth extraction was reported in 29 participants (78.4%), and among males, in 11 (61.1%). Dental agenesis was observed in 7 females (18.9%) and 6 males (33.3%), whereas impacted teeth were identified in one participant of each sex (2.7% and 5.6%, respectively). No statistically significant association was found between sex and the cause of missing teeth (chi-square = 1.83, df = 2, p = 0.400).

Table 2. Causes of missing teeth by sex among participants with missing teeth.

Cause of missing teeth	Female, n (%)	Male, n (%)	Total, n (%)	p-value*
Dental agenesis	7 (18.9)	6 (33.3)	13 (23.6)	
Impacted teeth	1 (2.7)	1 (5.6)	2 (3.6)	
Tooth extraction	29 (78.4)	11 (61.1)	40 (72.7)	
Total	37 (100.0)	18 (100.0)	55 (100.0)	0.400

** Chi-square test.*

The severity of missing teeth did not differ significantly between sexes (Table 3). Mild severity (1-2 missing teeth) was the predominant form, affecting 35 females (94.6%) and 17 males (94.4%). Moderate severity (3-5 missing teeth) was observed in only 2 females (5.4%) and 1 male (5.6%). No cases of severe missing teeth (≥6 missing teeth) were identified in the study population. Fisher's exact test showed no statistically significant association between sex and severity (p = 1.000).

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Table 3. Severity of missing teeth by sex among participants with missing teeth.

Severity of missing teeth	Female, n (%)	Male, n (%)	Total, n (%)	p-value*
Mild (1-2 missing teeth)	35 (94.6)	17 (94.4)	52 (94.5)	
Moderate (3-5 missing teeth)	2 (5.4)	1 (5.6)	3 (5.5)	
Severe (≥6 missing teeth)	0 (0.0)	0 (0.0)	0 (0.0)	
Total	37 (100.0)	18 (100.0)	55 (100.0)	1.000

** Fisher's exact test.*

Among participants with missing teeth, Angle Class I malocclusion was the most prevalent occlusal pattern, observed in 35 participants (63.6%), followed by Class II in 14 participants (25.5%) and Class III in 6 participants (10.9%). Among females, 64.9% presented with Class I malocclusion, 21.6% with Class II, and 13.5% with Class III. Corresponding proportions among males were 61.1%, 33.3%, and 5.6%, respectively. No statistically significant association was found between sex and Angle malocclusion class among participants with missing teeth (chi-square = 1.38, df = 2, p = 0.50) (Table 4).

Table 4. Angle malocclusion class by sex among participants with missing teeth.

Angle malocclusion class	Female, n (%)	Male, n (%)	Total, n (%)	p-value*
Class I	24 (64.9)	11 (61.1)	35 (63.6)	
Class II	8 (21.6)	6 (33.3)	14 (25.5)	
Class III	5 (13.5)	1 (5.6)	6 (10.9)	
Total	37 (100.0)	18 (100.0)	55 (100.0)	0.50

** Chi-square test.*

Among the possible clinical consequences associated with missing teeth, temporomandibular joint (TMJ) dysfunction was the most common finding, affecting 28 participants (50.9%). TMJ dysfunction was significantly more prevalent among females than males (62.2% vs. 27.8%, p = 0.016). Displacement of teeth adjacent to the edentulous space was observed in 23 participants (41.8%), with no significant sex-related difference (p = 0.78). Likewise, no significant differences between sexes were found for displacement of antagonist teeth (10.9%, p = 1.000) or displacement of the median line (1.8%, p = 1.000) (Table 5).

Table 5. Possible clinical consequences associated with missing teeth by sex.

Possible clinical consequences	Female, n (%)	Male, n (%)	Total, n (%)	p-value*
Displacement of teeth in the jaw with missing teeth	15 (40.5)	8 (44.4)	23 (41.8)	0.78
Displacement of antagonist teeth	4 (10.8)	2 (11.1)	6 (10.9)	1.000†
Displacement of median line	1 (2.7)	0 (0.0)	1 (1.8)	1.000†
Dysfunction of TMJ	23 (62.2)	5 (27.8)	28 (50.9)	0.016

** Chi-square test unless otherwise indicated. † Fisher's exact test.*

Most participants with missing teeth had not received any form of treatment (65.5%). Orthodontic treatment was reported in 21.8% of participants, while 10.9% had been treated with dental implants and 1.8% with fixed bridges. Females had a higher proportion of orthodontic treatment than males (27.0% vs. 11.1%), whereas males were more frequently untreated (77.8% vs. 59.5%). However, no statistically significant association was found between sex and treatment status (chi-square = 2.51, df = 3, p = 0.473) (Table 6).

Table 6. Treatment status and treatment modalities by sex among participants with missing teeth.

Treatment status/treatment modality	Female, n (%)	Male, n (%)	Total, n (%)	p-value*
Participants without any treatment	22 (59.5)	14 (77.8)	36 (65.5)	
Orthodontically treated participants	10 (27.0)	2 (11.1)	12 (21.8)	
Participants treated with dental implants	4 (10.8)	2 (11.1)	6 (10.9)	
Participants treated with fixed bridges	1 (2.7)	0 (0.0)	1 (1.8)	
Total participants with missing teeth	37 (100.0)	18 (100.0)	55 (100.0)	0.473

** Chi-square test.*

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doi: 10.59987/ads/2026.2.517-525

Discussion

Dental agenesis, one of the most common dental anomalies, can present both functional and esthetic difficulties and may require a complex, costly, multidisciplinary treatment strategy [31]. This study involved 200 dental students from the Department of Dentistry, Faculty of Medical Sciences, Albanian University, 138 of whom were female and 62 male. Students in the study were between 17 and 26 years old, and most were in the 17-25-year age group (94.5%).

Numerous studies have evaluated the prevalence of congenitally missing teeth across a range of populations, with varying findings. The results of this investigation indicated that the prevalence of dental agenesis was 6.5%, which was higher than that reported by Musaed et al. (3.23%) [32] and Katanaki et al. (4-5%) [33], lower than that reported by Gracco et al. (9%) [25] and Schonberger et al. (11%) [34], and similar to the prevalence reported by Khalaf et al. (6.4%) [22]. Differences in the prevalence of dental agenesis may be related to variations in the populations studied, sample size, selection criteria, genetic factors, and other methodological factors [35].

In the present study, the prevalence of dental agenesis was relatively balanced between sexes, with no statistically significant sex-related difference. Other studies have reported controversial results: Schonberger et al. [15] and Arif et al. [36] reported a higher incidence in females, whereas Hagiwara et al. [23] found no sex-related differences in the prevalence of missing teeth. Furthermore, this study found that dental agenesis was more evident in Class I malocclusion. This differs from other studies, which have reported controversial results. Uslu et al. [24] reported a higher prevalence of dental agenesis in Class III malocclusion, whereas Ota et al. [37] reported that dental agenesis was more common in Class II Division 2 malocclusion. These differences may be related to study methodology, genetic susceptibility, hormonal influences, environmental factors, and other population-specific characteristics.

The study showed that dental agenesis was more frequent in the maxilla, but no statistically significant difference was found between the jaws. Arif et al. [36] and Katanaki et al. [33] reported a higher prevalence in the upper jaw, in contrast to Hassan et al. [35] and Zhang et al. [38], who reported a higher prevalence in the lower jaw. One possible explanation for these differences may be related to differences in jaw ontogenesis, as maxillary teeth form earlier in embryonic development, and interference with this process may contribute to dental agenesis. Furthermore, this study showed that the distal segments of the jaws were more affected by dental agenesis than the anterior segments, and that dental agenesis occurred similarly on the right and left sides of both jaws. Similar results have been reported in other studies [2, 39].

In this study, the most affected teeth were the maxillary lateral incisors and second premolars. Maxillary lateral incisors and second premolars have also been reported as among the most frequently missing teeth in other studies [33, 40-43].

Another study [38] reported mandibular second premolars and mandibular incisors as the teeth most likely to be missing. One explanation for differences in the incidence and distribution of missing teeth may be ethnicity. According to Fekonja [39], mandibular second premolars and maxillary lateral incisors are among the teeth most likely to be absent in Caucasian populations.

Tooth agenesis can lead to tooth shifting and malocclusion by affecting the skeletal structure, craniofacial anatomy, and soft-tissue patterns. It can also result in increased tooth spacing and reduced alveolar process growth [44-45]. In the present study, 28 participants with missing teeth (50.9%; 14.0% of the total study sample) experienced temporomandibular joint (TMJ) dysfunction, while 23 participants (41.8%; 11.5% of the total study sample) showed displacement of adjacent teeth within the jaw associated with tooth loss. Gungor et al. [46] reported a significant relationship between dental agenesis and a tendency toward concave facial profiles, retrusion and overeruption of incisors, lower mandibular plane angles, and more retrusive upper lips.

Tooth extraction was another reason for missing teeth in this investigation and accounted for 20.0% of the total study sample, with females contributing the majority of extraction cases. According to Broers et al. [47], the most common reasons for tooth extraction were dental caries (36-55.3%), periodontitis (24.8-38.1%), and periapical disease (7.3%-19.1%). In the present investigation, 36 participants with missing teeth (65.5%; 18.0% of the total study sample) had not undergone any dental treatment, even though some were dental students.

The functional and esthetic consequences of tooth agenesis and missing teeth may have long-term implications if not managed appropriately. Alterations in occlusal relationships can compromise masticatory efficiency and increase stress on the temporomandibular joint, potentially exacerbating TMJ disorders. From an orthodontic perspective, untreated agenesis may complicate treatment planning and outcomes because of asymmetry, space discrepancies, and altered craniofacial growth patterns. Therefore, early diagnosis and interdisciplinary management involving orthodontic, prosthodontic, and restorative approaches are essential to minimize functional disturbances and improve facial harmony in young adults affected by missing teeth.

In addition, the relatively high prevalence of untreated missing teeth among young adults may reflect inadequate awareness, limited access to dental care, or socioeconomic barriers that discourage timely treatment. This finding is relevant because missing teeth can negatively affect mastication, speech, esthetics, and overall quality of life. Early tooth loss may also predispose individuals to occlusal disturbances, alveolar bone resorption, and further tooth loss later in life. Therefore, preventive strategies, improved oral health education, and regular dental check-ups are important for reducing the prevalence of tooth extraction and promoting tooth preservation among young adults in Albania.

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Limitations of the study

The study sample was limited to dental students at Albanian University. Therefore, the prevalence level found here does not accurately reflect the frequency and patterns of tooth agenesis or missing teeth in the general population. In addition, the cross-sectional design and the small number of students with dental agenesis limit the interpretation of tooth-specific distributions and associations with occlusal or temporomandibular findings. Further studies with larger and more representative samples are required.

Conclusion

The prevalence of dental agenesis was 6.5%, with no statistically significant sex-related difference. Dental agenesis showed a similar distribution between the jaws. Within the limits of this sample, the most affected teeth were the maxillary right lateral incisor (#12), maxillary right second premolar (#15), and mandibular left second premolar (#35). Most participants with missing teeth had not received any treatment, and temporomandibular joint dysfunction was the most common clinical consequence observed among affected participants.

Funding: This publication is funded by Albanian University No. 293/2026.

Competing interests: The authors declare no competing interests.

Ethics Committee Approval: The study was conducted in accordance with the Declaration of Helsinki and was approved by the Council of Ethics (Certificate no. 2538/16; ethics approval date 30.10.2025).

Consent to participate: Informed written consent was obtained from each participant at the time of recruitment. The subjects were informed that they could withdraw from the study at any stage, and they were assured of confidentiality.

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doi: 10.59987/ads/2026.2.517-525