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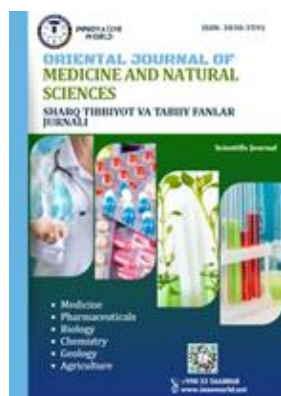
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Frequency and causative mechanisms of diastema

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Relevance. The upper jaw diastema (UJD) is a common aesthetic problem among people seeking orthodontic treatment, which means a distance of more than 0.5 mm between the lateral surfaces of the central incisors of the upper jaw. The causes of UJD may be as follows: high attachment of the frenulum; microdontia; macrognathia; supernumerary teeth; absence of lateral incisors; cysts on the midline, and unhealthy oral habits.

Objectives. The objectives of this study were to determine the prevalence of UJD among patients of the dental clinic of TSMU seeking orthodontic treatment and to identify the factors associated with this anomaly.

Materials and methods. For 6 months, 468 patients aged 14 to 35 years, visiting the dental clinic of TSMU in search of orthodontic treatment, were selected to determine the prevalence and etiology of UJD.

Results. UJD was found in 116 patients (24.8%). The frequency of UJD was the same in men and women. It is highest in the young age group and lowest in the older age group (37.5% versus 9.2%).

Conclusion. The most frequent factor among the observed etiological factors was an unhealthy oral habit, identified in 38.8% of patients with UJD and in 9.6% of all cases.

Keywords: upper jaw diastema, high attachment of the frenulum, microdontia, macrognathia, unhealthy oral habits.

Introduction. A distance of more than 0.5 mm between the proximal surfaces of adjacent teeth is called a "diastema," and if it is located in the anterior part of the upper jaw along the midline, it is called a "midline diastema," which is a common aesthetic complaint of people seeking orthodontic treatment. The upper jaw diastema (UJD) is a common aesthetic problem in mixed and early permanent dentitions. For many children, during

the eruption of the permanent upper central incisors, this can be considered normal. However, if the midline diastema is present after the eruption of the canines or measures more than 2–4 mm, there is always a hidden cause.

A definite etiology for diastema has not been identified. Diastema can be physiological, dentoalveolar, due to a missing tooth, due to lateral teeth with a peg shape, median supernumerary teeth, inclination of the upper labial segment, prominent frenulum, or due to pathology caused by self-injury during tongue piercing (8). Angle's suggestion of an abnormal frenulum as a cause of diastema has been supported by other studies.

A discrepancy in tooth size can be considered one of the main causes of upper jaw diastema. The most commonly encountered discrepancy in tooth size is the presence of peg-shaped teeth (1). Depending on oral habits, any habit such as tongue thrusting, finger sucking, biting fingers, and biting the lower lip, which leads to prolonged pressure causing separation of the upper anterior teeth, should be considered a possible etiological factor (1). Accurate diagnosis is necessary before the start of treatment. Treatment should not be started if the diastema is physiological, and usually if the canines have not yet erupted (9).

The objectives of this study were to determine the prevalence of upper midline diastema among patients of the dental clinic of TSMU seeking orthodontic treatment and to determine the factors associated with diastema. **Materials and methods.** 468 patients who applied to the dental clinic of TSMU for orthodontic treatment during 6 months (from January 10, 2025 to June 10, 2025) were randomly selected to determine the prevalence and etiology of diastema. The age range was from 14 to 35 years in order to exclude diastema caused by the ugly duckling stage or periodontal disease. Patients were excluded if they had a history of previous orthodontic treatment, any artificial crowns or proximal restorations on the central incisors, without periapical and/or periodontal lesions, to exclude any factors that could create or alter the width of the diastema.

After obtaining informed consent, patients with visible spacing between the upper central incisors were clinically examined by measuring the width at the incisal third of the upper central incisors. The presence of a space of 0.5 mm or more between the upper central incisors was considered a diastema, and the patient was considered positive. Measurements were taken using a graduated Williams periodontal probe.

Photographs of the patients were taken after obtaining informed consent. Causative factors were identified during intraoral examination of the labial frenulum, generalized spacing, peg-shaped upper incisors, missing upper lateral incisors, and oral habits (Figures 1, 2). The results of the clinical examination of patients meeting the study criteria were recorded. Panoramic radiographs were taken to correlate clinical data.



Figure 1: patient with a midline upper jaw diastema caused by generalized spacing.

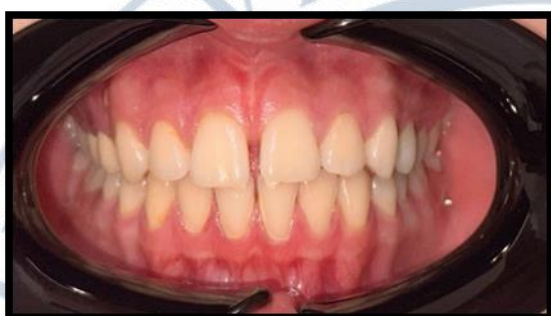


Figure 2: patient with a midline diastema caused by a labial frenulum.

Results: A total of 468 individuals were examined during the study, of whom 116 (24.8%) had a diastema. The age ranged from 14 to 35 years. The sample consisted of 148 males (31.6%) and 320 females (68.4%). The majority of participants (58.8%) were between 20 and 29 years of age. Regarding the presence of potential risk factors, 8 individuals (1.7%) had a high frenulum, 10 individuals (2.1%) had missing lateral incisors, 32 individuals (6.8%) had generalized spacing, and 45 (9.6%) had unhealthy oral habits (Table 1).

Table 1: Main characteristics of the sample

<i>Характеристики</i>		№	%
<i>Overall</i>		468	100
<i>Diastema</i>			
Present		116	24,8
Absent		352	75,2
<i>Gender</i>			
Male		148	31,6
Female		320	68,4
<i>Age</i>			
14-19		128	27,4
20-29		275	58,8
30-35		65	13,9
<i>High frenulum</i>		8	1,7
<i>Absence of lateral incisors</i>		10	2,1

<i>Generalized spacing</i>	32	6,8
<i>Oral habits</i>	45	9,6
<i>Presence of a peg-shaped incisor</i>	21	4,5

Table 2 compares males and females in relation to potential risk factors. The age groups were similarly distributed between men and women. Although high frenulum attachment was more common in females than in males (1.9% vs. 1%), the difference was not statistically significant ($P = 0.4$). Likewise, congenital absence of lateral incisors occurred more frequently in females compared to males (6 vs. 4), but the difference was also not statistically significant ($P = 0.3$). In addition, unhealthy oral habits were more prevalent in females than in males (10.9% vs. 6.8%) without statistical significance ($P = 0.1$). Generalized spacing and the presence of peg-shaped incisors were more common in males than in females, but these differences were also not statistically significant ($P = 0.2$) (Table 2).

Table 2: Comparison of males and females according to potential risk factors

Potential risk factor	Males n (%)	Females n (%)	P-value
<i>Age 14-19</i>	39 (26.4%)	89 (27.8%)	$\chi^2=0.8$, $P=0.7$
<i>Age 20-29</i>	90 (60.8%)	185 (57.8%)	$\chi^2=0.6$, $P=0.4$
<i>Age 30-35</i>	19 (12.8%)	46 (14.4%)	$\chi^2=0.9$, $P=0.3$
<i>High frenulum attachment</i>	2 (1.3%)	6 (1.9%)	$\chi^2=0.6$, $P=0.4$
<i>Absence of lateral incisors</i>	4 (2.7%)	6 (1.9%)	$\chi^2=0.9$, $P=0.3$
<i>Generalized dental spacing</i>	12 (8.1%)	20 (6.3%)	$\chi^2=2.1$, $P=0.2$
<i>Oral habits</i>	10 (6.8%)	35 (10.9%)	$\chi^2=2.8$, $P=0.1$
<i>Peg -shaped incisor</i>	11 (7.4%)	10 (3.1%)	$\chi^2=2.2$, $P=0.2$

Table 3 shows the presence of diastema according to potential risk factors. The prevalence of diastema was similar in males and females (21.6% vs. 26.2%). Regarding age groups, the prevalence of diastema was highest in the younger age group (14–19 years) and lowest in the older age group (30–35 years) (37.5% vs. 9.2%), and this difference was statistically significant ($P \leq 0.001$). Other statistically significant risk factors included the presence of a high frenulum attachment, missing lateral incisors, oral habits, generalized spacing, and the presence of peg-shaped incisors.

Table 3: Presence of diastema according to potential risk factors

Potential risk factor	Diastema n (%)	No diastema n (%)	P-value
<i>Gender</i>			
Present	32 (21.6%)	116 (78.4%)	$\chi^2=0.9$, $P=0.335$
Absent	84 (26.2%)	236(73.8%)	
<i>Age Group</i>			
14-19	48 (37.5%)	80 (62.5%)	$\chi^2=20.3$, $P < 0.001$
20-29	62 (22.5%)	213(77.5%)	
30-35	6 (9.2%)	59 (90.8%)	
<i>High frenulum attachment</i>			
Yes	8 (100.0%)	0 (0.0%)	$\chi^2=20.8$, $P < 0.001$
No	108(23.5%)	352(76.5%)	
<i>Absence of lateral incisors</i>			
Yes	10(100.0%)	0 (0.0%)	$\chi^2=27.0$, $P < 0.001$
No	106(23.1%)	352(76.9%)	
<i>Generalized dental spacing</i>			
Yes	32(100.0%)	0 (0.0%)	$\chi^2=99.9$, $P < 0.001$
No	84 (19.3%)	352(80.7%)	
<i>Oral habits</i>			
Yes	45(100.0%)	0 (0.0%)	$\chi^2=146.6$, $P < 0.001$
No	71 (16.8%)	352(83.2%)	
<i>Peg-shaped incisor</i>			
Yes	21(100.0%)	0 (0.0%)	$\chi^2=62.6$, $P < 0.001$
No	95 (21.3%)	352(78.7%)	

Discussion: The frequency of upper jaw diastema (UJD) in the present study was 116 (24.8%). This rate is lower than 23%, which represents the prevalence of UJD in the Asir region of Saudi Arabia (8), and higher in our sample compared to the prevalence of UJD among orthodontic patients attending the Armed Forces Institute of Dentistry in Pakistan - 12.59% (2), as well as compared to the prevalence in the United Kingdom - 3.4% among whites (3) and 1.6% among South Indians (9). This difference may be attributed to variations in methodology, sampling methods, chronological stratification of population groups, or possibly a genetic predisposition due to the higher rate of consanguineous marriages in our country.

Regarding age groups, there was a significant difference in the prevalence of diastema, with the highest rate observed among the younger age group (14–19 years) and the lowest among the older age group (30–39 years) (37.5% vs. 9.2%). This may be explained by the unaesthetic appearance of UJD, which could motivate younger individuals to seek treatment more often than older ones for aesthetic reasons.

Concerning gender, the frequency of UJD was almost the same in both sexes: 26.2% in females and 21.6% in males. Similarly, the association of UJD with potential risk factors was statistically insignificant between males and females. This finding is consistent with the study conducted by Dissanayake et al. (8), which found no significant gender difference in UJD prevalence. In contrast, the study by Lukman et al. (4) reported a higher prevalence of UJD among males than females. Differences among epidemiological studies may be associated with the number of contributing factors to midline diastema, with the definitions used to explain its presence, and with sex and racial variations in the distribution of hereditary traits in this condition (1).

In the present findings, among the potential risk factors, the most frequent one was unhealthy oral habits, accounting for 45 patients (9.6% of all 468 cases) and 38.8% of the 116 UJD patients. However, in some reports, the most common factor was generalized spacing. Deep bite was significantly associated with UJD in the study conducted by Oesterle and Shellhart (1999) (6), whereas in another study, the most frequent etiological factor was excessive premaxillary protrusion (2). This may also be due to the presence of more than one etiological factor that can be attributed to UJD in many cases.

The current study could not focus on identifying a single, exact etiology of UJD. The individual frequency of each observed etiological factor might be one of the reasons for this limitation. Additionally, anterior spacing, Bolton discrepancies, impacted canines, extractions, variable premaxillary size, and periodontal problems should also be considered. Future research should aim to correlate UJD with a single etiological factor using more refined sampling techniques (2).

Conclusions: The prevalence of upper jaw diastema (UJD) in the examined sample was 24.8%, and the frequency was similar in both males and females. Although the association with potential risk factors did not differ significantly between genders, the frequency of UJD was higher among younger age groups and lower among older individuals.

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