

# Prevalence, Characteristics and Self-Management of Aphthous-Type Oral Ulcers among Yemeni Dental Students: Multicenter Cross-Sectional Study

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## ABSTRACT

**Background and Objective:** Aphthous-type oral ulcers, often discussed in relation to recurrent aphthous stomatitis, can impair eating, speaking, and quality of life. Dental students may be particularly susceptible due to academic stress and other risk factors, yet data from Yemen are limited. This study aimed to determine the prevalence, clinical characteristics, triggers, and self-management practices of aphthous-type oral ulcers among Yemeni dental students.

**Methods:** A multicenter cross-sectional survey was conducted among 278 dental students from seven universities in Yemen. The questionnaire recorded demographic variables, smoking status, family history of aphthous ulcers, self-reported ulcer experience, reported sites, pain, interference with eating/drinking/speaking, other associated symptoms, perceived triggers, and management measures. Data were summarized descriptively using frequencies and percentages. Results were deemed significant when  $p < 0.05$ .

**Results:** Of the 278 respondents, 186 (66.9%) reported a history of aphthous-type oral ulcers. Commonly reported sites were the labial mucosa (37.5%), buccal mucosa (18.8%), and gingiva (18.8%). Among respondents who completed the symptom items, 72% reported pain and 76% reported interference with eating, drinking, or speaking. Stress was the most frequently perceived trigger (66.7%), followed by certain foods (22.2%). Self-management was common; antiseptic mouth rinses were the most frequently selected measure (31.0%), whereas only 4.0% sought professional care.

**Conclusion:** The overall finding of the current study highlights the negative effect of aphthous ulcers on quality of life and academic performance. These findings underscore the need for preventive strategies such as stress management programs and dietary counseling in dental education settings.

**Keywords:** dental students, dietary triggers, self-medication, prevalence, recurrent aphthous stomatitis

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## INTRODUCTION

Recurrent aphthous stomatitis (RAS) is the most common noninfectious ulcerative disorder of the oral mucosa and is clinically classified into minor, major, and herpetiform variants. RAS typically presents as painful, shallow ulcers on keratinized and nonkeratinized mucosa and can substantially impair daily function.<sup>1</sup> Population-level estimates generally place RAS prevalence between ~5% and 25%, which reflects true epidemiologic heterogeneity across settings.<sup>2</sup> The minor variant, which represents the most common form of the disease, typically manifests as small lesions that heal within<sup>7-14</sup> days without scarring. By contrast, major variants may persist longer, contribute to more severe functional impairment, and induce chronic discomfort.<sup>1,3</sup> Beyond physical symptoms, multiple studies have documented a substantial negative effect on quality of life, including increased psychological distress, reduced oral function (speaking and eating), and social withdrawal.<sup>4,5</sup> Multiple interacting triggers have been described in contemporary reviews: psychological stress, local mucosal trauma, smoking cessation, hematinic and nutritional deficiencies, gastrointestinal comorbidity, and hormonal influences.<sup>1</sup> Psychological stress has been identified as a primary trigger for mouth ulcers, and studies have indicated a strong relationship between stress and the development of ulcer episodes.<sup>6</sup> Student-based work has consistently ranked clinical/operational trauma, stress, and nutritional issues among the leading correlates of ulcer episodes.<sup>7</sup> Sleep quantity and quality have shown independent associations with minor RAS activity, which reinforces the role of circadian-behavioral factors.<sup>8,9</sup> Dietary exposures also matter; observational data link fruit/water intake to lower RAS risk and suggest diet as a complementary management target.<sup>10</sup> Moreover, a meta-analysis has reported a significant association between vitamin D deficiency and RAS, which highlights a biologically plausible, correctable factor.<sup>11</sup>

Management recommendations continue to prioritize symptom control and episode mitigation, and topical corticosteroids are the mainstay, supported by antiseptic rinses, mucoadhesive/barrier agents, and topical anesthetics; systemic or immunomodulatory options are reserved for severe or refractory disease.<sup>12,13</sup> Recent narrative syntheses reviewing the past decade also evaluate adjuncts and delivery systems and emphasize individualized, trig-

ger-focused care pathways.<sup>3</sup> In parallel, self-care and self-medication are common among dental students for oral conditions, which underscores the importance of mapping real-world management behaviors alongside clinical characteristics.<sup>14,15</sup>

University students and dental students carry a notable burden of recurrent oral ulcers, and cross-sectional surveys report substantial occurrence and tangible effects on student well-being and performance.<sup>16</sup> In an Afghan dental-student cohort, a 30% prevalence was recorded alongside significant associations with family history, specific foods, and local trauma.<sup>17</sup> Recent student-focused investigations also implicate sleep-related factors in RAS activity, which suggest modifiable behavioral contributors in young adult populations.<sup>8,9</sup>

Regional data from Yemen remain limited, and most available work concerns patient populations rather than healthy students.<sup>18</sup> A recent cross-sectional study from Aden reported a high prevalence of recurrent oral ulcers among dental patients and sex-related differences, but these findings may not generalize to student cohorts or capture training-related triggers such as clinical trauma and academic stress.<sup>18</sup> Earlier Yemeni research likewise focused on oral mucosal lesions in clinical samples, which underscores the scarcity of multicenter, student-focused epidemiology.<sup>19</sup> Against this backdrop, estimating prevalence and delineating characteristics of aphthous ulcers in Yemeni dental schools can fill a clear evidence gap and inform tailored prevention within academic clinics.

Accordingly, the primary objective of the present multicenter cross-sectional study is to determine the prevalence of aphthous-type oral ulcers among Yemeni dental students and to describe their self-reported sites, symptoms, and perceived triggers. An additional objective is to document the self-management practices employed by students. The null hypothesis is that no significant association exists between stress, dietary habits, and the prevalence of aphthous-type oral ulcers among Yemeni dental students.

## METHODS

**Study Design and Participants:** A multicenter cross-sectional study was conducted between 10 September and 25 December 2025 among dental students from seven universities in Yemen: The University of Science and Technology (Aden and

Taiz branches), Aden University, National University, German University in Yemen, Al-Janad University, and Al-Reyada University. Participation was voluntary, and informed written consent was obtained from all respondents prior to inclusion. Confidentiality and anonymity of the data were assured. This study was conducted in accordance with the principles of the Declaration of Helsinki. Ethical approval was obtained from the University of Science and Technology, Aden, Yemen [No. (MEC /AD0128)].

**Sample Size Calculation:** The sample size was calculated using Cochran's formula with a 95% confidence interval ( $Z = 1.96$ ), a 5.5% margin of error ( $e = 0.055$ ), and an expected prevalence ( $p$ ) of 30%, based on a previously published study on a similar population.<sup>17</sup> This approach yielded a minimum sample size of 267. To compensate for possible nonresponse or incomplete questionnaires, 10% was added, which resulted in an adjusted target of approximately 300 participants.

**Inclusion and Exclusion Criteria:** Students were eligible for inclusion if they were  $\geq 17$  years of age (able to provide informed consent), currently enrolled in a dental undergraduate and postgraduate program, and willing to participate. Students were excluded if they had systemic diseases, were taking medications causing immunosuppression, or had drug-induced ulcers (e.g., due to NSAIDs).

**Operational Definition of the Outcome:** For this questionnaire-based study, the outcome was defined as self-reported aphthous-type oral ulcer experience. No intraoral clinical examination, lesion measurement, or laboratory testing was performed; therefore, in this study, a formal clinical diagnosis of RAS was not established, minor was not differentiated from major or herpetiform ulcers, and recurrence interval, episode duration, or healing with scarring were not assessed.

**Questionnaire Development:** A self-administered questionnaire was developed based on a comprehensive review of published literature on RAS and oral ulcer epidemiology.<sup>2,7,17,20</sup> A panel of three oral medicine consultant and two oral pathology consultants was selected to review the questionnaire items.

**Validity, Reliability, and Pilot Testing:** The Content Validity Index was calculated at 0.89, which indicated excellent content validity. Internal consistency reliability was assessed using Cronbach's  $\alpha = 0.85$ , which demonstrated good internal reliability. The final instrument was pilot-

tested on a small sample of dental students (excluded from the main study) to confirm face validity and refine ambiguous or unclear items before formal administration.

**Sampling and Data Collection Procedure:** A convenience, nonprobability, time-location sampling approach was adopted. On predetermined data-collection days at each university, eligible students present on campus were approached and informed about the study objectives and procedures. A total of 300 questionnaires were distributed to dental students either in lecture halls (with prior permission from course instructors) or during clinical sessions in dental clinics in the different selected universities. Completed questionnaires were collected immediately on the same day to ensure completeness and prevent data loss.

**Questionnaire Structure and Content:** The final instrument contained four sections. The first collected demographic and behavioral data, including age, sex, smoking status, and family history of aphthous-type ulcers. The second documented self-reported oral ulcer experience and reported sites. The third recorded pain, interference with eating/drinking/speaking, and other associated symptoms such as fever, fatigue, or swollen lymph nodes. The fourth addressed perceived triggers (stress, certain foods, hormonal changes, trauma, and nutritional deficiencies) and added a supplementary question to evaluate aphthous ulcer self-management practices. Multiple responses were allowed for site and management items when applicable.

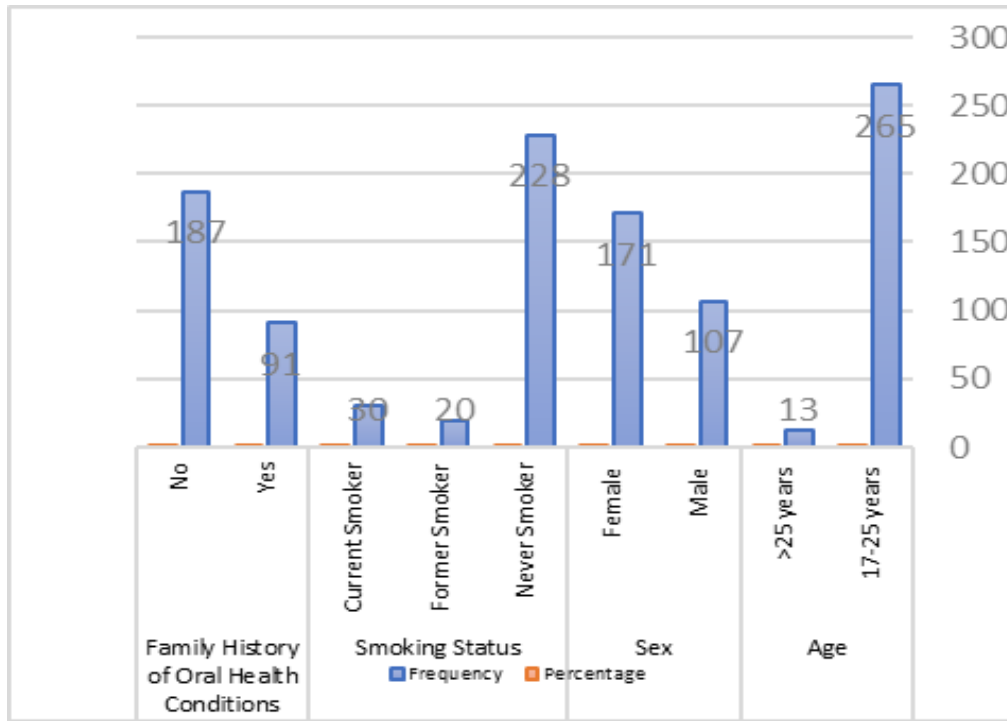
**Statistical Analysis:** Data were analyzed using IBM SPSS Statistics (Version 25). Descriptive statistics (frequencies and percentages) were computed for categorical variables. Associations between demographic variables and ulcer characteristics were examined using the Chi-square test of independence; Fisher's exact test was applied where expected cross-tabulation cell counts were  $< 5$ . A two-tailed  $p$ -value  $< 0.05$  was considered statistically significant.

## RESULTS

**Demographic and Behavioral Data:** Out of the 300 questionnaires distributed, 278 (response rate 92.7%) fully completed questionnaires meeting the inclusion criteria were retained for the final analysis after screening for incomplete or ineligible responses. The largest portion of the respondents consisted of adults (17–25 years old) that made up

95.32% of the sample, and 4.68% represented individuals older than 25 years. Females accounted for a greater proportion of the group at 61.51% in comparison to males at 38.49%. The majority of respondents were never smokers, comprising 82.01%, whereas 10.79% were current smokers

and 7.19% previously smoked. In terms of family health history, around one-third or 32.73% indicated a family history of aphthous-type ulcers, whereas 67.27% did not report such history, as shown in Figure 1.



**Figure 1.** Demographic characteristics of the study participants

**Table 1.** Oral Ulcer Prevalence and Characteristics

Variable	Category	Frequency	Percentage
Oral Ulcer Experience	Yes	186	66.91
	No	92	33.09
	Total	278	100
Ulcer Location*	Labial mucosa	90	37.5
	Buccal mucosa	45	18.75
	Gingiva	45	18.75
	Ventral surface of the tongue	30	12.5
	Floor of the mouth	5	2.08
	Soft palate	20	8.33
	Oral commissure	2	0.83
	Another specified site	3	1.25
	Total site responses	240	100

\*Multiple site responses were allowed

**Oral Ulcer Characteristics:** Two-thirds of participants (66.91%) had experienced oral ulcers” or “reported experiencing oral ulcers, whereas one-

third (33.09%) had not. The most common locations for these ulcers were the labial mucosa (37.50%), followed by buccal mucosa (18.8%),

and gingiva (18.8%). Less common sites included the floor of the mouth (2.08%) and the soft palate (8.33%) (Table 1). Two-thirds of participants (66.91%) had experienced oral ulcers” or “reported experiencing oral ulcers.

**Symptoms and Effect:** Among respondents with

complete symptom items (n = 250), 180 (72%) reported that ulcers were painful, and 190 (76%) reported interference with eating, drinking, or speaking. Other associated symptoms, such as fever, fatigue, or swollen lymph nodes, were reported by 70 respondents (28%), as shown in Table 2.

**Table 2.** Ulcer Symptoms and Impact

Variable	Category	Frequency	Percentage	p-value
Pain	Yes	180	72	< 0.0001
	No	70	28	
Interference with Eating/Drinking/Speaking	Yes	190	76	< 0.0001
	No	60	24	
Other Symptoms*	Yes	70	28	< 0.0001
	No	180	72	

\*Other associated symptoms reflected self-reported fever, fatigue, or swollen lymph nodes. P values represent the results of the Chi-square test comparing the frequency of reported symptoms/triggers against the total study population (N = 278) to determine statistical significance

**Perceived Triggers:** Stress was the most common cause (66.67%), followed by specific foods (22.22%). Less common causes included nutritional shortages, trauma, and hormonal shifts. The current study showed a significant association between

prevalence of ulcers, pain, interference (eating, drinking, or speaking), other symptoms (ulcers, such as fever, fatigue, or swollen lymph nodes), and triggers (stress, certain foods, or hormonal changes), as demonstrated in Tables 2 and 3.

**Table 3.** Most Common Triggers of Oral Ulcers among Dental Students

Triggers type	Number	Percentage	P value
Stress	120	66.67	< 0.0001
Certain Foods	40	22.22	< 0.0001
Hormonal Changes	10	5.56	< 0.0001
Trauma	5	2.78	< 0.0001
Nutritional Deficiencies	5	2.78	< 0.0001
Total	180	100	< 0.0001

Percentages are based on 180 trigger responses

**Management Practices:** The majority of respondents with oral ulcers reported using antiseptic mouth rinses (31.03%) and topical corticosteroids (18.04%) for symptom control. Moreover, 13.53% reported no treatment or waiting for healing, whereas others reported measures including

topical anesthetics (12.2%), barrier or adhesive paste (9.01%), and systemic analgesic or NSAIDs (7.69%). Only 3.98% sought professional dental or medical care, which indicated a preference for self-management (Table 4).

**Table 4.** Self-Reported Management Practices for Oral Ulcers

Management Option	Frequency	Percentage
Antiseptic mouth rinse	117	31.03
Topical corticosteroid	68	18.04
No treatment/ wait for healing	51	13.53
Topical anesthetic (oral aid)	46	12.2
Barrier/adhesive paste	34	9.01
Systemic analgesic / NSAID	29	7.69
Vitamin / supplement	17	4.51
Seek professional care	15	3.98
Total	377	100

**DISCUSSION**

Aphthous ulcers are a common oral condition that significantly affects daily activities such as eating, speaking, and oral hygiene.<sup>1</sup> Therefore, having evidence on the prevalence and associated factors can assist oral-health educators, university clinic administrators, and student-support or public-health planners in identifying the size of the affected student population and prioritizing preventive services. Hence, the present multicenter cross-sectional study illustrates the prevalence, clinical characteristics, and self-management practices of aphthous-type oral ulcers among dental students in the context of Yemen.

The present study suggests that self-reported aphthous-type oral ulcers are common among Yemeni dental students and are associated with substantial pain, functional interference, perceived stress, and high reliance on self-care. The overall prevalence observed in this study (66.9%) is higher than that reported among Afghan dental students (30%) and Saudi dental students (21.7%).<sup>17,21</sup> However, the results of this study align with the upper range of prevalence reported globally; research from other Middle Eastern contexts suggests higher frequencies: A Libyan study observed a high prevalence (81%) of ulcer among dental undergraduates and concluded that the incidence of ulcers in this group is indeed elevated.<sup>6</sup> Likewise, a Malaysian survey reported an astonishing 90.3% self-reported RAS rate.<sup>20</sup> Such variability is unsurprising and likely reflects differences in study design, wording of questionnaire items, underlying populations, and whether the outcome represented clinically diagnosed RAS or a broader history of self-reported ulcer experience. Nonetheless, oral ulcers are a

common experience for dental students, which indicates that the null hypothesis can be rejected, that is, a significant association exists between student-specific factors and the occurrence of oral ulcers in this cohort.

Females represented a larger share of the sample, and the descriptive predominance of female ulcer reports should therefore be interpreted cautiously rather than as proof of greater biological susceptibility. Nonetheless, female predominance and hormonal influences have been described in the RAS literature.<sup>1,20,22</sup> Females, particularly in high-pressure academic environments like dentistry, often report higher levels of anxiety and depression. Furthermore, an inverse relationship was established between plasma estrogen levels and the incidence of RAS; lower levels of estrogen can reduce the keratinization of the oral mucosa, making it vulnerable to ulceration.<sup>23</sup>

According to smoking status, the majority of individuals (82.01%) had never smoked, whereas 10.79% were now smokers and 7.19% had formerly smoked. Smoking may not be the main risk factor for mouth ulcers in this group, as evidenced by the low prevalence of smoking in this community. This finding is in line with an Iranian study that noted no significant difference between the two groups in terms of smoking.<sup>23</sup> Moreover, 32.73% of participants reported having a family history of oral health issues, which may indicate a genetic or hereditary component to the development of mouth ulcers.

Regarding the location of oral ulcer, the present study revealed that the most affected sites were the labial mucosa (37.50%) and buccal mucosa

(18.75%), followed by the gingiva (18.75%) and ventral surface of the tongue (12.50%). These findings are similar to prior research that found the labial and buccal mucosa are the most affected areas.<sup>6,21,23</sup> Wan A.K. et al. (2021) reported that the buccal mucosa (64.1%) is the most common site for RAS.<sup>20</sup> RAS occurs in the areas of the mouth where the mucosa is loosely attached and nonkeratinized, especially the labial mucosa, the buccal mucosa floor of the mouth, and the ventral surface of the tongue and the soft palate.<sup>1</sup>

These study data indicate that oral ulcers are not merely an incidental finding but have tangible effects on students' daily lives and well-being. A large majority of those with ulcers described them as painful (72%), and an even greater proportion (76%) reported that they interfered with essential functions such as eating, drinking, or speaking. These findings are notably higher than those reported among Malaysian dental students (61.5%) and Libyan university students (53.9%).<sup>6,20</sup> However, they align with prior descriptions of aphthous ulceration as a painful condition with meaningful oral-function and quality of life consequences.<sup>1,5,16,24,25</sup> Furthermore, a study of dental students in Saudi Arabia found that a significant majority of affected individuals reported that ulcer bouts "always" or "sometimes" interfered with eating and speaking.<sup>21</sup>

The results of this study underscore psychological stress as a pivotal trigger for oral ulcers in dental students. Among those who experienced ulcers, two-thirds (66.67%) identified stress as a precipitating factor, which makes it by far the most common trigger. Studies have reported that dental education induces considerable stress on dental students. Fear of failure, workload, parental expectations, behavior of the faculty, academic load, and fear of unemployment after graduation are some of the many factors contributing to increased stress among dental students.<sup>26</sup> Al-Johani K. (2019) reported that stress is the most frequently reported cause of RAS attacks (44, 53%).<sup>21</sup> Similarly, an Indian study (combining medical and dental students) found a very high prevalence of aphthous ulcers (78.1%) and concluded that stress significantly increases the risk of ulcer development.<sup>27</sup>

Beyond stress, several other triggers and risk factors for oral ulcers were identified, which reflected the multifactorial nature of RAS. About 22.22% of students attributed their ulcer episodes to certain

foods. This outcome agrees with prior studies that documented specific dietary triggers for RAS, such as acidic fruits, nuts, chocolate, coffee, or spicy foods, in susceptible individuals.<sup>20</sup> An Afghan study likewise noted that dietary factors are the most frequently reported risk conditions.<sup>17</sup> Hormonal changes were another reported factor, though by a smaller subset of participants (5.56%). However, only 2.78% identified nutritional deficiencies as a trigger given the established link between vitamin deficiencies and ulcer occurrence. For instance, a recent meta-analysis found vitamin D deficiency is a significant risk factor for RAS, which highlights a biologically plausible, correctable factor.<sup>11</sup> The low self-report of this factor in our study may indicate that students are not fully aware of potential nutritional links, or it might reflect fewer overt deficiencies in the young, healthy population.

In terms of self-reported management strategies, the most prevalent approach is to use antiseptic mouth rinses (31.03%), followed by topical corticosteroids (18.04%), and no therapy or waiting for spontaneous healing (13.53%). This pattern shows an evident preference for self-management and symptomatic relief over seeking professional dental or medical care, as expressed by only 3.98% of respondents. Previous studies among university dental students reported similar findings, which confirm the common use of over-the-counter medications.<sup>14,20,28</sup> The low rate of professional consultation in our sample could be attributed to students' familiarity with common oral lesions and a lack of understanding of the significance of further evaluation for recurring or non-healing cases.

This study has several limitations that should be acknowledged. First, the findings are based on self-reported questionnaire data rather than clinical examination; consequently, misclassification is possible, and definitive RAS diagnosis could not be established. Second, the study did not collect standardized data on ulcer size, episode duration, recurrence interval, or scarring, so clinical subtype classification was not possible. Third, some site entries were reported in nonstandard lay terminology and had to be consolidated for presentation. Fourth, the cross-sectional design precluded causal inference, and perceived triggers such as hormonal change or nutritional deficiency should not be interpreted as proven causes. Finally, convenience sampling may limit generalizability beyond the participating universities.

## CONCLUSION

Within the limitations of this study, the following conclusions are drawn: Self-reported aphthous-type oral ulcers are highly prevalent among Yemeni dental students. A higher prevalence was observed among female students compared with males; however, this finding should be interpreted cautiously in the absence of inferential statistical evidence confirming a significant association. Ulcers most frequently affect the labial and buccal mucosa, which causes substantial pain and functional impairment in daily activities such as eating, drinking, and speaking. The findings underscore the negative effect of oral ulcers on students' quality of life and likely their academic performance. Addressing modifiable risk factors, such as stress through management programs and dietary counseling, is crucial for preventive strategies in dental education settings. These measures could mitigate the burden of oral ulcers and improve overall student well-being.

## Conflict of Interest

The authors declare no conflicts of interest.

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