



Original article

Oral Health Awareness and Practices among Libyan University Students: Insights into Non-Bacterial Tooth Wear

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ABSTRACT

Background: Tooth substance loss, when unrelated to bacterial activity, encompasses several conditions such as attrition, abrasion, erosion, and resorption. Each of these forms of tooth wear results from different etiological factors, including mechanical forces, dietary acids, and physiological processes. Despite the significance of these conditions, awareness of non-bacterial causes of tooth wear is limited among the general population, especially young adults. University students, who are exposed to various stressors and lifestyle habits, may be at increased risk for these issues. **Objective:** This study investigates oral health awareness and practices among Libyan university students, with a specific focus on their knowledge and understanding of non-bacterial causes of tooth wear, including attrition, abrasion, erosion, and resorption

Methods: A cross-sectional study was conducted using an online Google Forms survey, distributed via social media. A total of 523 responses were collected. The questionnaire gathered demographic data, oral health practices, symptoms of non-bacterial tooth substance loss, and awareness of conditions like attrition, abrasion, erosion, and resorption. Descriptive statistics were used to summarize prevalence and awareness levels. The chi-square test was used to examine associations between demographic factors, oral health habits, and non-bacterial tooth substance loss awareness. Statistical significance was set at $p < 0.05$. The data were analyzed using IBM-SPSS version 28.

Results: The study involved 523 Libyan university students, revealing a significant age skew towards 21-23 years (56.8%), with a majority female population (69.8%). Most participants were from the Dental field (62.9%). In terms of oral health practices, 38.2% visited the dentist every six months, and 57.9% brushed twice daily. Awareness of non-bacterial tooth loss conditions varied, with 68.9% recognizing abrasion and 54.1% erosion. Notably, 45.5% reported experiencing tooth wear symptoms, and 99.2% showed strong interest in learning about non-bacterial causes of tooth wear, with a binomial test confirming this interest as statistically significant ($p < 0.001$).

Conclusion: This study underscores a significant awareness of non-bacterial tooth substance loss among Libyan university students, alongside a marked interest in further education on this subject. Despite the generally proactive oral health practices observed, there is variability in awareness of specific conditions such as erosion and resorption. The overwhelmingly high interest in learning about non-bacterial causes of tooth wear, supported by statistical significance, indicates a critical need for enhanced educational initiatives. Targeted interventions are essential to bridge existing knowledge gaps and promote effective preventative strategies within this demographic.

Keywords: Non-bacterial, loss of tooth substance, Attrition, Abrasion, Erosion, Resorption, Prevalence, Awareness, Libya.

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INTRODUCTION

Non-bacterial loss of tooth substance (NBTLs) represents a significant yet often under-recognized dental health concern worldwide. This condition, which includes attrition, abrasion, erosion, and resorption, involves the progressive loss of tooth structure without the involvement of bacterial activity. The etiology of NBTLs is multifactorial, comprising mechanical,

chemical, and physiological factors. If left unmanaged, NBTLS can lead to long-term dental complications such as hypersensitivity, compromised aesthetics, and impaired function.¹

Attrition refers to tooth wear resulting from direct tooth-to-tooth contact, commonly linked with parafunctional habits such as bruxism. Bruxism is often associated with stress and lifestyle factors, particularly prevalent among university students.^{2,3} On the other hand, it is caused by external mechanical forces, such as aggressive brushing, which is frequently observed in younger adults. When combined with the use of abrasive toothpaste, improper brushing techniques can exacerbate enamel wear.^{4,5} Erosion, the chemical dissolution of dental hard tissues due to acidic substances, has become increasingly prevalent, particularly with the rise in consumption of soft drinks, energy drinks, and fruit juices.^{6,7} Lastly, resorption involves the internal or external degradation of tooth structure, often related to systemic conditions or trauma, although its occurrence is less common compared to other forms of NBTLS.⁸

Recent studies emphasize the increasing prevalence of NBTLS due to lifestyle changes, particularly dietary habits and stress-related behaviors. The rising consumption of acidic beverages has been linked to the acceleration of tooth erosion, particularly among university students.⁹ Additionally, stress-induced bruxism is now recognized as a significant factor contributing to attrition, potentially leading to severe tooth wear, hypersensitivity, and aesthetic concerns if untreated. Furthermore, modern interventions—such as the use of fluoride, potassium nitrate, and other remineralizing agents—have shown promise in mitigating dentinal hypersensitivity, a common outcome of NBTLS.^{10,11}

Globally, university students' awareness of NBTLS remains insufficient, as many engage in high-risk behaviors like frequent consumption of acidic beverages and improper oral hygiene techniques. A study by Young *et al.* (2011),¹² revealed that only 30% of students recognized that acidic drinks could cause erosion, while fewer than 20% identified stress-induced bruxism as a cause of attrition. These findings underscore the necessity for targeted education to reduce the risk factors associated with NBTLS and enhance long-term oral health outcomes.

In Libya, limited data exists on the prevalence and awareness of NBTLS, particularly among university students. Given the stress, poor dietary habits, and inadequate oral health knowledge often observed in this population, understanding the prevalence of NBTLS is crucial. This study aims to bridge the gap in the literature by exploring how prevalent these conditions are, the level of awareness surrounding

them, and the behaviors that contribute most to their development. By assessing the knowledge and prevalence of attrition, abrasion, erosion, and resorption among Libyan university students, this study seeks to identify key areas for intervention to reduce the incidence of NBTLS and improve overall oral health.

Recent evidence highlights the importance of preventive education, focusing on proper brushing techniques, dietary modifications, and stress management to mitigate the risks of NBTLS.^{13,14} In regions like Libya, where awareness and data are limited, targeted educational initiatives could significantly contribute to the reduction of NBTLS and promote better oral health practices among young adults.

MATERIALS AND METHODS

Study Design and Population

This observational cross-sectional study aimed to assess the prevalence and awareness of non-bacterial tooth substance loss (NBTLS) among a sample of 523 Libyan university students, aged 18 to 27+ years. A convenience sampling method was utilized, with participants recruited through an online survey distributed across various social media platforms, including Facebook, Instagram, and WhatsApp. Participation was entirely voluntary, and the randomized nature of the sampling may introduce selection bias.

Survey Design

The survey instrument consisted of questions derived from previously validated questionnaires to ensure both relevance and reliability in assessing NBTLS and awareness levels. The questionnaire was divided into three sections: demographic information, self-reported prevalence of NBTLS (including attrition, abrasion, erosion, and resorption), and awareness of NBTLS.

Data Collection

Data were collected from an initial sample of 550 respondents, of which 523 responses were cleaned and retained for analysis. The survey was administered through a structured Google Form in Arabic, consisting of three sections: demographic information and oral health practices; self-reported prevalence of non-bacterial tooth surface loss and awareness of its types (including attrition, abrasion, erosion, and resorption); and awareness of NBTLS and related causative behaviors. Awareness was measured as a binary response ("Yes" or "No"). The survey remained open for seven months, with periodic reminders to encourage participation.

Responses were automatically recorded and stored in Google Sheets, facilitating efficient data management and analysis. This survey design enabled the collection

of detailed data, providing a comprehensive overview of NBTLS prevalence and awareness within the target population.

Data Management and Analysis

Collected data were imported into Microsoft Excel for analysis. The data were analyzed using IBM-SPSS for Windows version 28 (SPSS Inc., Chicago, IL). Descriptive statistics, including frequencies and percentages, were calculated to summarize the prevalence and awareness of NBTLS. To examine the relationship between awareness and demographic variables, a Chi-square test of independence was performed, with statistical significance set at $p < 0.05$. Additionally, a binomial test was employed to evaluate whether the proportion of participants expressing interest in learning more about non-bacterial causes of tooth wear (99.2%) significantly differed from an assumed proportion of 50%, representing equal interest versus lack of interest. These statistical tests allowed for a rigorous assessment of the key variables in the study.

RESULTS

Demographic Distribution of Survey Participants

Age Distribution: The largest age group among participants was 21-23 years, consisting of 297 individuals (56.8% of the sample). The second largest group was aged 24-26, with 134 participants (25.6%), followed by those aged 27 and above, accounting for 47 individuals (9%). The smallest group, aged 18-20, included 45 participants (8.6%). A chi-square test confirmed a statistically significant deviation from an equal distribution across age groups ($\chi^2 = 321.35$, $p < 0.0001$), indicating a pronounced skew toward the 21-23 age group.

Gender Distribution: Females comprised the majority of the sample, with 365 participants (69.8%), while males made up a smaller proportion, with 158 participants (30.2%). This gender disparity shows that females were more than twice as numerous as males in the study population. **Table. 1**

Field of Study: The distribution of participants by field of study revealed that a significant majority (62.9%) were from the Dental field, totaling 329 individuals. This was followed by 80 participants (15.3%) from the Sciences, and 57 participants each from the Medical field and the “Other” category, representing 10.9% each. This concentration of dental students highlights a notable focus within the participant pool, with smaller but relatively equal representation in the Sciences, Medical, and other fields.

Oral Health Practices

Frequency of Dental Visits

The chart illustrates participants' frequency of dental visits, shedding light on their oral health practices. The largest group, 38.2% (200 respondents), reported visiting a dentist every six months, reflecting a proactive approach to oral health. However, 33.1% (173 respondents) only seek dental care when faced with a problem, indicating a more reactive approach. Additionally, 25% (131 respondents) visit a dentist annually, while a small proportion of participants (3.6%, 19 respondents) have never visited a dentist. These results suggest that while some individuals prioritize regular check-ups, a considerable portion only seek dental care when necessary, potentially delaying early intervention. **Figure.1**

Tooth Brushing Frequency Among the Population

The chart illustrates the frequency of regular tooth brushing among the population. A significant portion, 57.9% (303 individuals), reported brushing their teeth twice a day. This is followed by 22.6% (118 individuals) who brush once a day. A smaller group, 18% (94 individuals), indicated that they brush only occasionally. Notably, a very small percentage of the population, 1.5% (8 individuals), reported never brushing their teeth. These results demonstrate that while the majority of individuals maintain a regular brushing routine, there is a notable fraction that practices less frequent oral hygiene habits. As shown in **Figure.2**

Table 1. Demographic distribution of participants

Demographic Category	Group	Number of Participants	Percentage (%)	Statistical Test
Age	18-20	45	8.6%	$\chi^2 = 321.35$, $p < 0.0001$ *
	21-23	297	56.8%	
	24-26	134	25.6%	
	27+	47	9%	
Gender	Female	365	69.8%	N/A
	Male	158	30.2%	

The age distribution shows a statistically significant skew towards the 21-23 age group ($\chi^2 = 321.35$, $p < 0.0001$). Regarding gender distribution, females comprise the majority at 69.8% of the participants, compared to 30.2% of males.

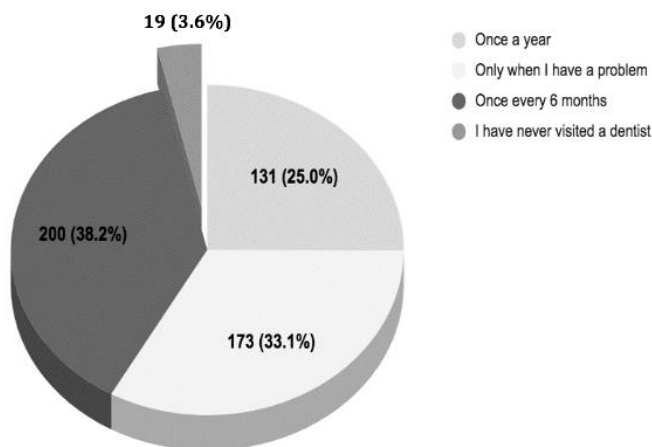


Figure 1: Frequency of dental visits, with most participants visiting every six months (38.2%), followed by visits only for problems (33.1%) and annual visits (25%). A small percentage (3.6%) have never visited a dentist.

Use of Additional Oral Hygiene Methods

The chart illustrates the use of additional oral hygiene methods, such as mouthwash and dental floss. A majority of participants, 58.1% (304 individuals), reported not using any supplementary oral hygiene methods, while 41.9% (219 individuals) indicated that they do incorporate such methods into their routine. To assess whether this difference is statistically significant, a chi-square test was conducted. The results revealed a statistically significant difference between the two groups ($\chi^2 = 26.98$, $p < 0.0001$), indicating that the majority of the population relies solely on basic oral hygiene practices, with a notable minority utilizing additional methods like mouthwash or flossing. This significant difference underscores the need for increased awareness of the benefits of supplementary oral hygiene practices. As shown in **Figure.3**

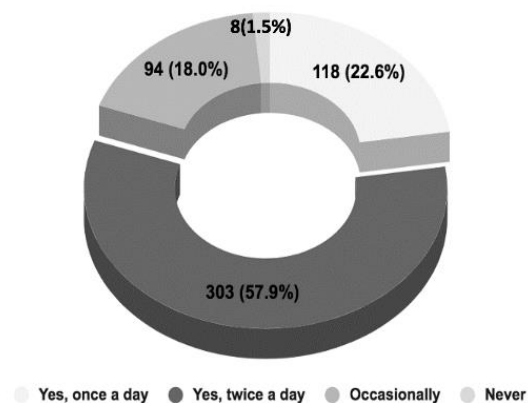


Figure 2: Tooth brushing frequency among participants, with 57.9% brushing twice a day, 22.6% brushing once a day, 18% brushing occasionally, and 1.5% never brushing.

Non-Bacterial Loss of Tooth Substance Awareness of the presence of different types of NBTLs

The bar chart illustrates participants' awareness of conditions related to tooth wear. The majority, 68.9% (350 individuals), are familiar with abrasion (tooth wear from brushing or external factors). Erosion, due to acid exposure, is known by 54.1% (283 individuals), while attrition (tooth-to-tooth grinding or clenching) is recognized by 41.1% (215 individuals). Fewer participants, 10.7% (56 individuals), have heard of resorption (loss of tooth structure due to internal or external causes). A small group, 7.1% (37 individuals), indicated they were unfamiliar with any of the listed conditions. This suggests a higher awareness of common forms of tooth wear, such as abrasion and erosion, compared to more complex conditions like resorption. As shown in **Figure.4**

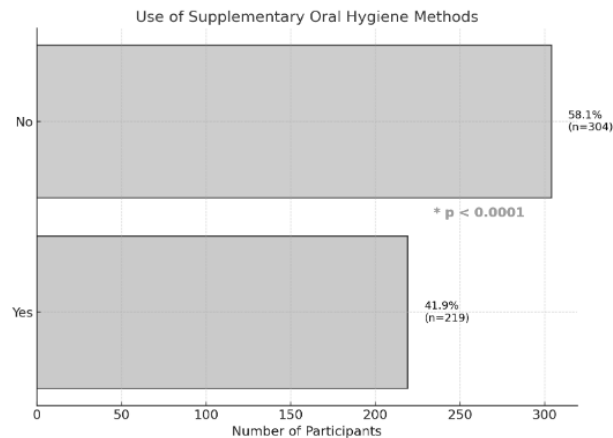


Figure 3: Use of additional oral hygiene methods, showing 58.1% of participants not using any, while 41.9% incorporate extra methods such as mouthwash or dental floss

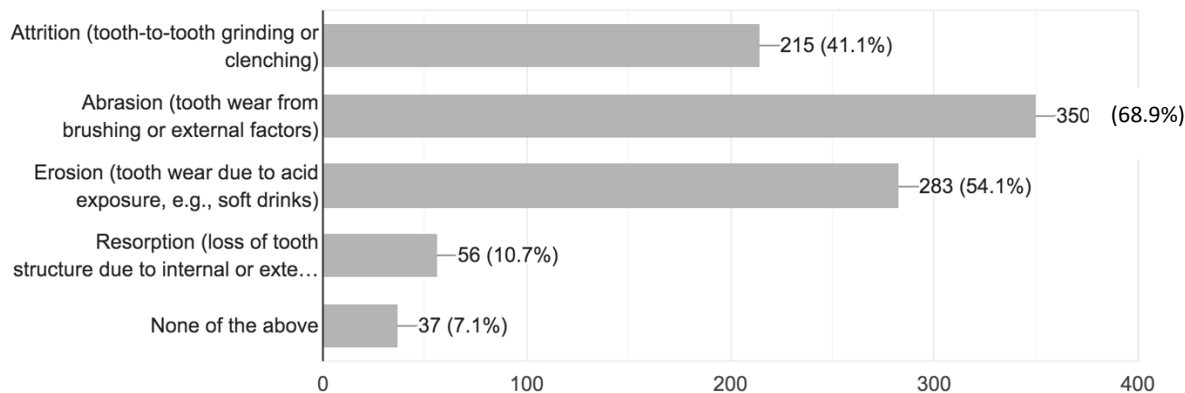


Figure 4: Awareness of tooth wear conditions among participants, with the highest familiarity for abrasion (68.9%), followed by erosion (54.1%), attrition (41.1%), and resorption (10.7%). A small portion (7.1%) is unfamiliar with any condition

Prevalence of Tooth Wear Symptoms

The chart illustrates participants' experiences with symptoms of tooth wear, such as sensitivity, flat teeth, or notching near the gum line. A total of 45.5% (238 individuals) reported experiencing these symptoms, while the majority, 54.5% (285 individuals), indicated that they had not experienced any such symptoms. This suggests that nearly half of the population has encountered some form of tooth wear symptoms. As shown in **Figure.5**

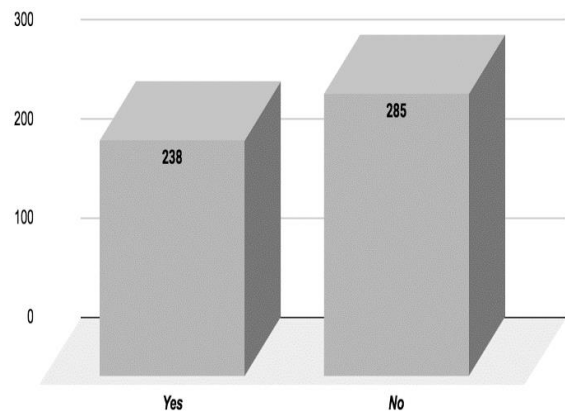


Figure 5: Prevalence of tooth wear symptoms, with 45.5% of participants experiencing symptoms such as sensitivity or flat teeth, while 54.5% reported no symptom

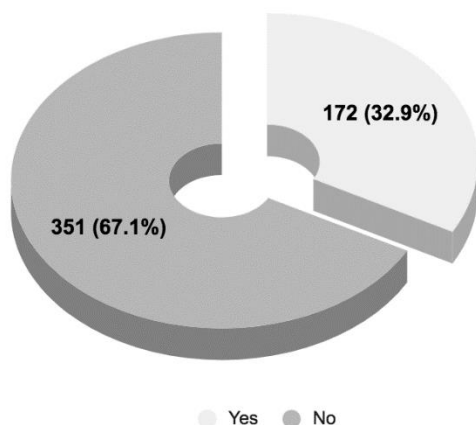
Awareness and Prevention

Awareness of Non-Bacterial Tooth Substance Loss

The chart presents responses to the question: "Were you aware that tooth substance can be lost due to non-bacterial factors such as grinding, abrasion, or acid erosion?" Out of the total respondents, 67.1% (351 individuals) were unaware of this fact, while 32.9% (172 individuals) were aware before participating in the study. **Figure.6**

A chi-square test was performed to evaluate whether the observed difference between the two groups (aware and unaware of non-bacterial factors causing tooth substance loss) was statistically significant. The test yielded a chi-square statistic of 61.26 and a p-value < 0.0001.

The results also revealed that bruxism was reported by 30% of participants and 58.3% of participants consumed acidic beverages occasionally, 18.4% several times a week, and 18.9% daily. This finding highlights a considerable gap in awareness regarding non-bacterial factors that contribute to tooth damage. It emphasizes the need for enhanced education on these causes, including grinding, abrasion, and acid erosion, in order to prevent further dental damage.



Figur.6. Awareness of Non-Bacterial Tooth Substance Loss Before the Study: 32.9% (172 individuals) were aware. The difference is statistically significant ($\chi^2 = 61.26$, $p < 0.001$)

DISCUSSION:

The increasing prevalence of non-bacterial tooth substance loss (NBTL) among younger populations, particularly university students, is an emerging concern in oral health. Despite a general rise in oral health awareness, many remain unfamiliar with the specific non-bacterial factors that contribute to tooth loss. This study underscores the need for targeted interventions that address both knowledge gaps and preventive

strategies. The demographic distribution in this research, with a higher representation of younger participants (aged 21–23) and female students (69.8%), mirrors findings from previous studies.^{15,16} While the predominance of dental students in the sample may explain the higher awareness and engagement with oral health topics, this skew limits the generalizability of results to non-dental and male students. Gender disparities in health research, as seen in similar studies,¹⁷ suggest that future research should employ stratified sampling to ensure a balanced representation across demographic groups.

In terms of oral health practices, 57.9% of participants reported brushing their teeth twice daily, and 38.2% visited the dentist every six months, aligning with global recommendations.^{18,19} However, 3.6% of participants indicated they never visited a dentist, signaling an important gap in dental care access. Similar disparities have been identified by Brown *et al.* (2021),²⁰ particularly in underserved populations. Addressing these gaps through community-based health programs or subsidized dental services could help mitigate long-term consequences resulting from neglected dental care. Awareness of NBTL conditions, such as abrasion (68.9%) and erosion (54.1%), points to a stronger understanding of visible and more common forms of tooth wear. However, lower awareness of less frequent conditions like attrition (41.1%) and resorption (10.7%) highlights significant knowledge gaps. This aligns with findings from previous studies,^{21,22} suggesting the need for targeted educational campaigns, especially among dental students. By integrating comprehensive NBTL education into both public health initiatives and dental curricula, these knowledge gaps can be effectively bridged, ensuring future oral health professionals are equipped to address these lesser-known conditions.

The prevalence of tooth wear symptoms, such as sensitivity and flat teeth (45.5%), reflects findings from similar studies.^{13,17} This highlights the importance of early diagnosis and intervention, as many individuals may not seek dental care until they are made aware of NBTL. Public health efforts should focus on raising awareness about early symptom recognition and promoting timely dental check-ups to prevent further progression of tooth loss.

Behavioral factors such as bruxism (30%) and daily acidic beverage consumption (18.9%) emerged as significant contributors to tooth loss in this study. These findings are consistent with existing literature on the role of lifestyle factors in tooth wear.^{8,21} However, a deeper exploration into why these behaviors are prevalent among university students is necessary. Stress, a well-documented aspect of university life, is likely a key factor driving bruxism, as students often face academic pressure, financial concerns, and lifestyle

changes that elevate anxiety levels.²³ The psychological impact of stress is known to manifest physically in oral habits like bruxism, often as a coping mechanism.²⁴ In contrast, the frequent consumption of acidic beverages may not only reflect personal choices but also be culturally ingrained, influenced by social trends, peer pressure, and the easy accessibility of these drinks in university environments.²⁵ In some cultures, sugary and acidic beverages are aggressively marketed to young adults, who incorporate them into their daily routines.²⁶ Additionally, these drinks are often associated with convenience, energy boosts, and socialization, likely exacerbating their consumption among students. The varied prevalence of these behaviors across different studies suggests that personal awareness and lifestyle choices may differ by region and cultural norms. This underscores the importance of incorporating lifestyle-focused oral health education into broader preventive strategies. By addressing the stress-related causes of bruxism and the social and cultural factors driving the consumption of acidic beverages, more effective interventions can be developed. Educating students on how stress-induced bruxism and excessive acidic beverage intake contribute to tooth wear could play a crucial role in reducing the prevalence of these harmful behaviors.

Limitations of Self-Reported Data and Online Surveys

A key limitation of this study is the reliance on self-reported data, which is susceptible to various biases, including recall bias and social desirability bias. Participants may have overreported positive behaviors, such as brushing frequency, while underreporting negative behaviors, such as acidic beverage consumption. Additionally, the use of online surveys may have introduced selection bias, as health-conscious individuals are more likely to participate. Despite efforts to maintain anonymity and encourage honest responses, these biases pose significant challenges, as highlighted in similar studies.²⁷ Furthermore, the self-reported nature of the data may lead to inaccuracies in the assessment of tooth loss symptoms, as participants might not accurately recall or interpret their experiences. Incorporating clinical assessments or objective measures could enhance the accuracy and reliability of future studies, providing a more comprehensive understanding of tooth wear.

Opportunities for Future Research and Practical Applications

This study provides a valuable foundation for further research into the prevalence and awareness of NBTLS. However, future studies should consider employing a more diverse sampling method to include a broader range of participants, especially those who may be less likely to engage in online surveys. Additionally,

longitudinal studies could provide insights into the progression of NBTLS over time and the effectiveness of preventive measures. Practical applications of this research include developing targeted public health campaigns that address the gaps in awareness, particularly regarding lesser-known conditions like resorption. Dental professionals could also benefit from continued education on the non-bacterial causes of tooth wear, ensuring they provide comprehensive care and prevention strategies to patients.

CONCLUSION

The findings of this study provide important insights into the awareness and prevalence of non-bacterial tooth substance loss (NBTLS) among Libyan university students. It is clear that while many individuals are aware of common conditions like abrasion and erosion, there is a significant gap in understanding fewer familiar conditions such as attrition and resorption.

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