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The prevalence and risk factors related to erosive tooth wear in an adult population: a cross-sectional study in Saudi Arabia

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Abstract

This study assessed the prevalence and risk factors associated with erosive tooth wear (ETW) among the adult population. Clinical examinations were conducted using the Basic Erosive Wear Examination index, which assesses the severity of ETW in six sextants of the oral cavity. The risk factors for ETW included: (1) socio-demographic characteristics, (2) general health conditions, (3) vitamin C consumption, (4) beverage consumption, (5) acidic foods and drinks, (6) dairy products, (7) use of fluoridated mouthwashes and toothpastes, and (8) type of toothbrush. A one-way ANOVA test and an independent sample t-test were used; a p-value of 0.05 was considered the threshold for statistical significance. A total of 312 participants were included; 174 (55.8%) were females. In terms of age distribution, the majority of participants were between 23 and 59 years old (n = 261). Regarding education, predominantly (154, 49.4%) held a bachelor's degree. Regarding socioeconomic factors, 214 participants (68.6%) were framed into the lowest socioeconomic status (SES). The highest prevalence of ETW was observed in the maxillary anterior teeth (90.2%), followed by the mandibular anterior teeth (79.8%). Participants who used hard-bristled toothbrushes (teeth abrasion), consumed acidic products, and belonged to high SES groups had significantly higher erosive tooth wear scores. The overall prevalence of ETW among participants was 69%, with the highest prevalence observed in males, older age groups, and those with higher SES. The findings highlight the significant role of dietary habits, oral hygiene practices, and socioeconomic factors in the development of ETW.

Keywords Erosive tooth wear · Diet · Socioeconomic status · Gender · Risk factors

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Introduction

Erosive tooth wear (ETW) is a condition with multiple contributing factors. As defined in a consensus report by the European Federation of Conservative Dentistry, ETW is a "chemical–mechanical process leading to a progressive loss of dental hard tissues not caused by bacterial activity, marked by the degradation of the teeth's natural surface contours" [1]. This condition arises from a complex interplay between dietary and individual patient-related elements. Nutritional contributors include acidic foods and beverages, while patient-specific factors encompass oral hygiene practices, overall health status, and other factors [2].

A review of the global prevalence of dental erosion indicates that dentin involvement occurs in 2% to 45% of ETW cases [3], most commonly affecting the occlusal surfaces of the first permanent mandibular molars. However, some research has also reported erosion on the palatal surfaces of the upper front teeth [4–6]. Evidence suggests that ETW becomes more prevalent with increasing age.

Data from Germany's Fifth Oral Health Survey (DMS V) revealed a correlation between aging and higher rates of erosion: 4% in 12-year-olds, 24% among those aged 35–44, and 40% in the 65–74 age group [7]. Similarly, Vered et al. in Israel observed increasing rates across age groups: 37% in 15–18 years, 42% in 25–28 years, 56% in 35–38 years, 53% in 45–48 years, and 62% in the 55–60 age bracket [8]. Conversely, Smith and Robb reported consistently low rates with minimal variation: 6% in the 15–26-year age range, 4% in the 26–55-year age range, 8% in the 56–66-year age range, and 9% in those over 65 years [9]. In the United States, approximately 41% of the population is affected [10]. In Europe, prevalence rates vary, ranging from 14% in Denmark to between 3 and 100% in the United Kingdom, and 24–40% in Germany [11–13]. In Asia, rates include 26% in Japan [14], 68% in Malaysia [15], and 28% in Saudi Arabia [16]. In the eastern region of Saudi Arabia, older adults (over 36) exhibited a higher rate of dentin exposure (64%) compared to younger adults (45% for those 25 or younger) [17]. In Aljouf, a study by Al-Zarea reported that 90% of adults showed signs of ETW, with 95% displaying a multifactorial etiology [18]. These studies reflect considerable variability in reported ETW rates.

These findings highlight the multifactorial nature and global variability of ETW, influenced by age, gender, diet, and regional health behaviors. Disparities in prevalence rates may also stem from variations in research methodology, sample sizes, and diagnostic criteria. However, there is a lack of global studies focused specifically on adults, making it difficult to draw definitive conclusions. Given that ETW appears to be a growing concern in adults and can result in significant tooth structure loss requiring complex and costly restorative interventions, early detection becomes critical. Prompt diagnosis enables timely behavioral and dietary adjustments, as well as the implementation of effective preventive strategies.

The population of Saudi Arabia presents a unique profile for the study of ETW. Rapid urbanization and changes in dietary patterns have led to a significant increase in the consumption of carbonated beverages and acidic energy drinks, particularly among young adults. Furthermore, traditional dietary habits, such as frequent consumption of acidic dates and citrus-based coffee (Gahwa), combined with the region's high prevalence of gastroesophageal reflux disease (GERD), suggest a heightened risk of dental erosion. Investigating this specific population is essential for understanding the interplay between regional lifestyle factors and oral health outcomes, ultimately aiding the development of targeted preventive strategies.

To improve awareness and understanding among the public, healthcare providers, and policymakers, there is a need for more comprehensive evidence. The objective of this study was to assess the prevalence and risk factors associated with erosive tooth wear among the adult population. The null hypothesis would state that there is no significant association between tooth erosion and potential risk factors such as demographic factors, oral health behavior, and dietary habits.

Methods

Study design

This observational, descriptive, cross-sectional study was designed in accordance with the Declaration of Helsinki (1964, updated 2024) and was approved by the Standing Committee of Bioethics Research at Prince Sattam bin Abdulaziz University (SCBR-074-2023). After an explanation of the study, the participants who accepted the inclusion signed the informed consent.

Sample size calculation

The sample size was calculated using the following formula: $N = 4pq/l^2$ [19]. For a 5% acceptable margin of error, and an expected prevalence of dental erosion in 18–80 years of 74.31% [18], the minimum required sample size was 312 participants.

Eligibility and selection criteria

For inclusion, adults aged 18 to 80 years, residing in Saudi Arabia for more than 12 months, who had either a full or partial dentition and were not having dental emergencies, who visited general dental practice settings in private clinics in Saudi Arabia (specifically, Riyadh, Makkah, and the Eastern regions), and presented erosive tooth wear. Participants who did not sign the informed consent, were pregnant, had a history of orthognathic surgery, orthodontic treatment, or head trauma, or had any complex medical conditions, were excluded. Additionally, the study excluded individuals with dental abnormalities that affect the quality and quantity of tooth structures, as well as those suffering from dental fluorosis, and patients who exhibit heavy calculus covering more than 30% of the remaining dentition.

Variables

Clinical examinations were conducted in a dental clinic setting using the Basic Erosive Wear Examination (BEWE) index to ensure standardized conditions. The dependent variable was erosive tooth wear, measured according to the BEWE index criteria. The prevalence of ETW was determined by identifying any participant with at least one affected tooth, as indicated by a BEWE score greater than 0. The severity of ETW was assessed if any tooth had the maximum BEWE score. The risk factors for ETW included in this study were: (1) socio-demographic characteristics of study participants (age in years, gender, nationality, education, family income), (2) general health conditions such as gastroesophageal reflux disease (heartburn, vomiting, dry mouth), (3) vitamin C consumption, (4) beverage consumption, (5) acidic foods and drinks, (6) dairy products, (7) use of fluoridated mouthwashes and toothpastes, and (8) type of toothbrush.

Data collection

Administration of the questionnaire

A self-designed, structured questionnaire containing 28 questions was administered to all participants to identify the risk factors for erosive tooth wear. The questionnaire was divided into four sections: (1) demographic details, that included questions about the participants' nationality, gender, age group, educational level, and income level; (2) general health concerns, which focused on health-related issues such as heartburn, vomiting, dry mouth, and bruxism; (3) frequency of acidic food intake, which addressed the consumption of acidic foods and beverages, including citrus fruits, soft drinks, acidic foods, and dairy products; and (4) oral health-related behaviors, that inquired about oral hygiene practices such as the consistency of toothbrush bristles, frequency of tooth brushing, fluoride content in toothpaste, and rinsing after meals.

The questionnaire was self-designed for this study and was available in both Arabic and English to ensure participants understood the questions. The validity of the questionnaire was assessed by administering it to 30 adult patients who were not included in the main study. The internal consistency of the questionnaire was determined using Cronbach's alpha, which yielded a score of 0.86, and the test–retest reliability score was 0.88. Data was collected anonymously after the patient's appointment, ensuring that no personal identifiers were linked to the responses. This approach helped maintain participant confidentiality and reduced potential bias, allowing for more objective and accurate results.

Clinical examination

A clinical examination was carried out by four trained examiners who underwent training in both theoretical and practical sessions to identify erosive teeth. The training materials included study models, photographs, and real patients with erosive tooth. A total of 30 patients were included for training and calibration of examiners. The reliability of their evaluations was measured through inter-examiner and intra-examiner kappa values, which were found to be adequate. After training, both examiners achieved inter-examiner kappa scores exceeding 0.80, indicating strong agreement between their assessments. Additionally, their intra-examiner kappa values were 0.83 and 0.80, demonstrating a high level of consistency in their own evaluations over time.

All the participants underwent erosive tooth examination on the dental chair using diagnostic instruments and a clinical examination form. Initially, the teeth were air-dried and visually examined using a mouth mirror and adequate lighting, without magnification to maintain consistency. The mouth was divided into sextants, and the severity of erosive tooth wear was assessed for each sextant using the BEWE index [20]. The highest score for each sextant was recorded based on the following criteria: Score 0 = no erosive tooth wear; Score 1 = initial loss of surface texture; Score 2 = distinct defect, with hard tissue loss of less than 50% of the surface area; and Score 3 = hard tissue loss of more than 50% of the surface area. In case of doubt between two criteria, the lower criterion was chosen. If the tooth had any extensive restoration (> 1/3 of the surface), the involved surface was excluded. Dry mouth for all participants was assessed using the modified Schirmer test. The test strip was placed on the floor of the mouth, and results were recorded after 1, 2, and 3 min. Wetness of < 25 mm at 3 min was considered dry mouth [21].

Statistical analysis

The statistical analysis was conducted using Statistical Package for Social Sciences (SPSS, version 25.0; IBM SPSS Statistics for Windows, Armonk, NY, U.S.A.). Descriptive statistics in terms of averages and standard deviation (SD) were computed for the continuous variables, such as the number of teeth and the score of the BEWE index. In contrast, the frequency distribution was determined for the categorical variables, including nationality, age, gender, income, education level, oral health behavior, dietary habits, and medical conditions. Since the BEWE data at the subject level were ordinal, mean tooth wear scores were calculated to facilitate comparisons between groups. A one-way ANOVA test was employed to examine the relationship between tooth wear scores and various factors when comparing more than two groups or variables. An independent sample t-test was used to compare tooth wear scores between two groups or variables.

To identify independent predictors of erosive tooth wear (ETW), a multivariate logistic regression analysis was performed. Variables that showed significant associations in the univariate analysis ($p < 0.05$), including gender, socioeconomic status, toothbrush type, and medical conditions (heartburn and dry mouth), were entered into the model. Odds ratios (OR) and 95% confidence intervals (CI) were calculated. A p-value of 0.05 was considered the threshold for statistical significance.

Results

Demographic details

A total of 312 participants were assessed in the study. Among them, 174 (55.8%) were females, and 138 (44.2%) were males. Most participants, 73.4%, were born and raised in Saudi Arabia. In terms of age distribution, 32 participants (10.3%) were in the youngest age group of 18–22 years, while only 2 participants (0.6%) were in the 70–79 years range. Regarding education, all participants were educated, with the majority, 154 (49.4%), holding a bachelor's degree. Regarding socioeconomic factors, 214 participants (68.6%) reported an annual income level below 20,000 Saudi Riyals (SR), approximately equivalent to $ 5,334 (USD) and € 4,688 (EUR) (Table 1).

Table 1 Demographic characteristics of study participants

Variables	n	Percentage (%)
Nationality		
Saudi	229	73.4
Non-Saudi	83	26.6
Gender		
Male	138	44.2
Female	174	55.8
Age		
18–22 yrs	32	10.3
23–29 yrs	53	17
30–39 yrs	100	32.1
40–49 yrs	64	20.5
50–59 yrs	44	14.1
60–69 yrs	17	5.4
70–79 yrs	2	0.6
> 80 yrs	0	0
Education level		
Elementary school	28	9
High school	109	34.9
Bachelor's degree	154	49.4
Masters' degree	14	4.5
Ph.D	7	2.2
Income		
< 20,000	214	68.6
20,000–40,000	49	15.7
40,000–60,000	18	5.8
60,000–80,000	17	5.4
80,000–100,000	8	2.6
> 100,000	6	1.9

yrs years, *Ph.D* doctorate

Prevalence and average score of erosive tooth wear sextant-wise

Table 2 highlights the prevalence and severity of erosive tooth wear across different sextants in the dental arch. The highest prevalence of erosive tooth wear was observed in sextant 2 (n = 267, 90.2%), followed by sextant 5 (n = 245, 79.8%). The lowest prevalence was observed in sextant 3 (upper left posterior region), at 57.58% (n = 148). The maxillary anterior region had the highest mean score for the erosive tooth wear index at 1.64 ± 0.90, indicating greater wear in this area. The mandibular anterior region followed closely with a mean score of 1.53 ± 1.05. The lowest mean scores for the erosive tooth wear index were found in both the maxillary and mandibular posterior regions, suggesting less wear in these areas. The mean differences in the erosive tooth wear index scores between the different sextants were statistically significant ($p = 0.0001$).

Effect of oral hygiene practice, dietary habits and medical conditions on erosive tooth wear

The use of different bristle types of toothbrushes (tooth abrasion) was associated with erosion. A majority of participants used medium-bristled toothbrushes (39.4%,

Table 2 Prevalence and mean BEWE score by sextant

Sextant	BEWE = 0 (SD)	BEWE > 0 (SD)	Mean ± SD	CI at 95%	F	P-value
Sextant 1	98 (37.5)	163 (62.45)	1.00 ± 0.96	0.88—1.12	27.400	< 0.001*
Sextant 2	29 (9.8)	267 (90.20)	1.64 ± 0.90	1.54—1.75		
Sextant 3	109 (42.4)	148 (57.58)	0.93 ± 0.96	0.81—1.05		
Sextant 4	104 (38.1)	169 (61.9)	1.04 ± 1.01	0.92—1.16		
Sextant 5	62 (20.2)	245 (79.8)	1.53 ± 1.05	1.41—1.64		
Sextant 6	115 (41.7)	161 (58.33)	1.01 ± 1.03	0.89—1.13		
Total	517 (31)	1153 (69)	1.21 ± 1.03			

BEWE basic erosive wear examination

* P-value refers to the comparison of mean BEWE scores across all six sextants using a one-way ANOVA

n = 123), followed by those using soft-bristled toothbrushes (35.9%, n = 112). Participants using hard-bristled toothbrushes had the highest mean BEWE index score of 1.85 ± 0.93, while those using ultra-soft bristled toothbrushes had the lowest mean score of 0.97 ± 0.90 (p = 0.0001). Participants who used fluoride mouthwash had a significantly lower mean BEWE index score of 1.09 ± 0.86 compared to those who did not use it. This difference was also statistically significant (p = 0.0001). Participants who consumed acidic products (such as lime juice, hot sauce, or ketchup) three times a day had a higher mean BEWE wear index score of 1.70 ± 1.01. Those who rarely consumed acidic foods had a lower mean score of 1.06 ± 0.80. This finding was also statistically significant (p = 0.0001) (Table 3). Participants with a history of heartburn (gastroesophageal reflux disease, GERD) had a significantly higher mean BEWE score of 1.51 ± 0.87 (p = 0.0001). Those who reported hyposalivation (reduced salivary flow) experienced more erosive tooth wear, with a mean score of 1.67 ± 0.94 (p = 0.0001). All these factors were found to have a statistically significant association with higher BEWE scores (p = 0.0001) (Table 4).

Table 3 Effect of oral hygiene practice (abrasion) and dietary habits on erosive tooth wear

Variables	Groups	Prevalence (± SD)	BEWE scores (± SD)	Normality	P-value
Type of toothbrush (tooth abrasion)	Ultra soft	23 (7.4)	0.97 ± 0.90	0.081	0.0001
	Soft	112 (35.9)	1.16 ± 0.77	0.054	
	Medium	123 (39.4)	1.29 ± 0.87	0.048	
	Hard	54 (17.3)	1.85 ± 0.93	0.072	
Toothpaste	Fluoridated	152 (48.7)	1.14 ± 0.87	0.043	0.166
	Non-fluoridated	15 (4.8)	1.43 ± 0.69	0.112	
	I do not know	145 (46.5)	1.31 ± 0.89	0.046	
Use of fluoride mouthwash	Yes	215 (69)	1.09 ± 0.86	0.041	0.0001
	No	97 (31)	1.53 ± 0.86	0.058	
Lemon consumption	Never or rarely	177 (56.7)	1.25 ± 0.88	0.044	0.910
	1–3 times/day	13 (4.17)	1.21 ± 0.87	0.121	
	> 3 times/day	5 (1.6)	1.77 ± 0.88	0.154	
Soft drink consumption	Never or rarely	253 (81.1)	1.09 ± 0.72	0.038	0.538
	1–3 times/day	40 (12.8)	1.23 ± 0.89	0.089	
	> 3 times/day	19 (6.1)	1.35 ± 0.85	0.115	
Acidic products	Never or rarely	47 (15.1)	1.06 ± 0.80	0.082	0.0001
	1–3 times/day	90 (28.8)	1.34 ± 0.83	0.063	
	> 3 times/day	175 (56.1)	1.70 ± 1.01	0.039	
Dairy products	Never or rarely	106 (34)	1.39 ± 0.92	0.052	0.103
	1–3 times/day	173 (55.4)	1.16 ± 0.86	0.041	
	> 3 times/day	33 (10.6)	1.16 ± 0.72	0.091	

Table 4 Effect of medical and dental conditions on erosive tooth wear

Variables	Groups	Prevalence (SD)	BEWE scores (±SD)	P-value
Heart burn	Yes	68 (21.8)	1.51 ± 0.87	0.003
	No	244 (78.2)	1.16 ± 0.81	
Vomiting	Yes	7 (2.2)	1.24 ± 0.88	0.704
	No	305 (97.8)	1.11 ± 0.52	
Dry mouth	Yes	37 (11.9)	1.67 ± 0.94	0.001
	No	275 (88.1)	1.18 ± 0.85	

Table 5 Mean erosive tooth wear scores observed in different SES groups and genders

Variables	Groups	Prevalence (SD)	BEWE scores (±SD)	P-value
SES groups	High SES	31 (9.94)	1.97 ± 0.84	0.0001
	Low SES	281 (90.06)	1.16 ± 0.83	
Gender	Male	138 (44.23)	1.49 ± 0.94	0.0001
	Female	174 (55.77)	1.04 ± 0.77	

Table 6 Correlation between missing teeth and tooth wear

Variables	Tooth wear	Clinically missing tooth
Tooth wear	1	0.280*
Clinically missing tooth	0.280*	1

Erosive tooth wear scores across different socioeconomic status (SES) groups and gender

Participants from the high SES group had a higher mean erosive tooth wear score (1.97 ± 0.84) compared to those from the low SES group (1.16 ± 0.83), with a statistically significant difference (p = 0.0001). Males had a higher mean erosive tooth wear score of 1.49 ± 0.94, compared to females, who had a mean score of 1.04 ± 0.77. This difference was also statistically significant (p = 0.0001), suggesting that males may experience more erosive tooth wear than females (Table 5).

Correlation between the erosive tooth wear index and clinically missing teeth

The correlation coefficient (r) value was measured and found to be 0.280, indicating a weak positive relationship between BEWE and clinically missing teeth (p = 0.01) (Table 6).

Multivariate logistic regression analysis

The multivariate logistic regression analysis (Table 7) revealed several independent predictors for ETW. Males were 2.14 times more likely to exhibit ETW than females (p < 0.001). Participants in the high-SES group had a significantly higher risk than those in the low-SES group (OR = 3.05, p < 0.001). Among clinical conditions, heartburn (OR = 2.41, p = 0.005) and dry mouth (OR = 2.67, p = 0.011) remained significantly associated with higher BEWE scores even after adjustment for other factors. Conversely, the use of fluoride mouthwash appeared to be a protective factor, with non-users being 1.76 times more likely to have erosion (p = 0.032).

Discussion

The present study aimed to comprehensively assess the prevalence of erosive tooth wear and its etiological factors among the adult population. The findings of the present research reject the null hypothesis and support the alternative hypothesis. In the present study, males exhibited more erosive tooth wear than females, which may be attributed to various behavioral or lifestyle factors; greater consumption of acidic or abrasive foods, as well as carbonated drinks, could also contribute to the higher prevalence of erosive tooth wear among males; in addition, participants with high

Table 7 The multivariate logistic regression analysis

Variable	Odds ratio (OR)	95% confidence interval (CI)	P-value
Gender (male vs. female)	2.14	1.45 – 3.16	< 0.001*
SES group (high vs. low)	3.05	1.82 – 5.10	< 0.001*
Type of toothbrush (hard vs. soft)	1.88	1.12 – 3.15	0.018*
Heartburn (yes vs. no)	2.41	1.30 – 4.45	0.005*
Dry mouth (yes vs. no)	2.67	1.25 – 5.72	0.011*
Fluoride mouthwash (no vs. yes)	1.76	1.05 – 2.94	0.032*

*Model adjusted for all variables listed. *OR* odds ratio, *CI* confidence interval

Significant at p < 0.05

socioeconomic status (SES) had higher erosive tooth wear scores compared to those in the low-SES group. High-SES individuals may have greater access to dental care and might be more aware of their oral health, leading to longer retention of teeth, especially anterior teeth, which are more prone to wear. Additionally, high-SES groups may have dietary patterns that contribute to erosive tooth wear, such as higher consumption of acidic beverages, sugary foods, or carbonated drinks, which could increase their risk of dental erosion. Another factor could be the greater emphasis on aesthetics and cosmetic dental treatments in higher SES groups, which may lead to more frequent dental visits where wear is noticed and recorded.

The overall prevalence of erosive tooth wear recorded in this study was 69%, indicating that a substantial proportion of the population experiences some degree of erosive tooth wear. Globally, the prevalence of erosive tooth wear shows considerable variation. Wei et al. [22] reported the highest prevalence of 84%, while Oginni and Olusile [23] reported the lowest at 7%. This wide variation can likely be attributed to differences in geographic location, dietary patterns, and lifestyle factors across populations. Environmental influences, such as oral hygiene practices, dietary habits, and cultural customs, may all contribute to variations in both the prevalence and severity of erosive tooth wear across different regions. Additionally, factors such as access to dental care and socio-economic status could further influence these discrepancies in reported prevalence rates.

In Saudi Arabia, studies have reported high rates of erosive tooth wear. A study conducted in Makkah city by Elmarsafy et al. [24] found a prevalence of 74%, while another study by Al-Khalifa et al. [25] in the Eastern Province reported a prevalence of 83.5%. These findings align closely with the results of the present study, reinforcing the high prevalence of erosive tooth wear among the Saudi adult population. Such consistency in findings across different regions of Saudi Arabia suggests that tooth wear may be a significant concern nationwide.

According to the etiology of dental erosion, which involves both exogenous and endogenous acid sources, risk groups for dental erosion development can be identified based on dietary habits and lifestyle factors [26]. In the current study, consumption of acidic products, such as lemons, hot sauce, and carbonated drinks, was associated with higher mean tooth wear scores. Citrus fruits, such as lemons and oranges, as well as the presence of vinegar in hot sauces and ketchup, can contribute to enamel erosion when consumed frequently due to their acidic nature. A considerable body of evidence from various studies supports the idea that the acidic content of these foods can soften tooth enamel, making it more susceptible to wear or erosion. Carbonated soft drinks typically have a pH range of 2.3–3.4, while acidic fruit juices and alcoholic beverages have pH levels ranging from 2.1 to 3.6 and 2.8 to 3.9, respectively. These pH levels are low enough to contribute to enamel demineralization, especially with frequent exposure [27–30].

In vitro and in situ studies have also demonstrated that natural fruit juices and fruit-flavored drinks exhibit increased erosive potential, further highlighting the impact of acidic beverages on dental health [31, 32]. The prolonged contact between acidic substances and tooth enamel allows for more extensive demineralization, contributing to the progression of erosive tooth wear. Therefore, individuals who frequently consume acidic foods and drinks may be at higher risk of dental erosion and should be mindful of their consumption patterns to minimize tooth damage.

In the present study, it was found that the occurrence of tooth erosion was lower among individuals who reported greater consumption of dairy products. This finding is consistent with laboratory studies that have demonstrated the protective effects of milk against tooth erosion, primarily due to its high calcium and other mineral content. Calcium plays a crucial role in demineralizing tooth enamel, which can help counteract the effects of acid-induced demineralization [33].

Additionally, the study revealed that erosive tooth wear scores were higher in individuals with certain medical conditions, such as heartburn, vomiting, and dry mouth. These conditions are often associated with gastric acid, which is a known cause of dental erosion. Gastric acid can reach the oral cavity during episodes of vomiting or acid reflux, contributing to enamel demineralization. Studies have shown that frequent episodes of heartburn or vomiting can significantly increase the risk of tooth erosion, as repeated exposure to stomach acid weakens and softens the enamel, making it more vulnerable to erosive wear [34, 35]. Otherwise, a study evaluated the correlation between dental erosion and asthma medication consumption in pediatric patients; the authors demonstrated that this condition was not a determining factor for the occurrence of erosive lesions in the teeth [36].

This study also found that tooth wear or erosion was more prevalent among individuals who used hard-bristled toothbrushes to clean their teeth. This finding is supported by existing evidence, which shows that hard bristles have a higher potential to cause enamel abrasion compared to softer bristles. The mechanical action of brushing with hard bristles can result in the removal of tooth enamel, particularly if the brushing technique is too vigorous or if excessive pressure is applied. Over time, this abrasion can exacerbate existing tooth erosion, particularly when combined with other factors such as acidic dietary habits or medical conditions that increase gastric acid exposure [25, 37].

Personal habits, such as bruxism, can also influence the progression of erosive tooth wear. This condition leads

to mechanical abrasion of the teeth, particularly during sleep, and tends to impact specific teeth more than others, especially the molars and premolars, which play a primary role in grinding [38]. Notably, our study found that erosive tooth wear was most prevalent in the maxillary anterior teeth, followed by the mandibular anterior teeth. This observation aligns with the findings of Wang et al. [39], who also reported a greater frequency of wear in the anterior teeth compared to the posterior ones. Several factors may contribute to this pattern. Firstly, the upper and lower incisors are positioned at the front of the mouth, making them more susceptible to erosion caused by external acids, such as those found in acidic drinks. Additionally, the lower central incisors are among the first teeth to erupt, meaning they are exposed to erosive conditions for a longer period.

As a study limitation, the study was conducted on patients who visited a dental clinic for dental problems. This introduces a selection bias, as individuals who seek dental care may differ in their oral health behaviors, awareness, and concerns from those who do not visit the dentist regularly. Another important limitation of the present study is its cross-sectional design. While cross-sectional studies can provide valuable information about associations between variables, they are inherently limited in their ability to establish causal relationships. Future research utilizing a longitudinal design can help establish temporal relationships, determine the onset of erosive tooth wear, and identify specific risk factors.

Conclusions

The overall prevalence of erosive tooth wear among the study participants was 69%. Erosive tooth wear was more commonly observed in men, individuals in older age groups, and those with high socioeconomic status (SES). Participants who used hard-bristled toothbrushes, consumed more acidic foods (such as citrus fruits, carbonated drinks, and vinegar-based products), and those who suffered from medical conditions like heartburn, hyposalivation (dry mouth), and vomiting demonstrated higher levels of erosive tooth wear. These findings highlight the multifactorial nature of erosive tooth wear, where both lifestyle choices and medical conditions significantly contribute to determining its prevalence and severity.

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Data availability All data was included in the study.

Declarations

Conflict of interest There is no competing interest to declare.

Ethical approval This study was approved by the Standing Committee of Bioethics Research at Prince Sattam bin Abdulaziz University (SCBR-074-2023).

Informed consent All the participants accepted and signed the informed consent.

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