

Review article

Prevalence, Clinical Patterns, and Multifactorial Etiology of Non-Carious Tooth Surface Loss in a Libyan Population: A Cross-Sectional Study

Eshraq Alsherif^{ID}, Khawla Barbash^{ID}, Ehteda Hiba^{ID}, Masarra Al-Ghudd^{ID}, Salsabil Almgris^{ID}, Salma Zwiky^{ID}

Department of Prosthodontics, Faculty of Dentistry, Attahadi University, Tripoli, Libya

Corresponding Email: Eshraq.Alsherif@uot.edu.ly

Keywords:

Non-Carious Tooth Surface Loss, Tooth Wear, Attrition, Abrasion, Erosion, Abfraction, Bruxism, Libya, Prevalence, Risk Factors

ABSTRACT

Non-carious tooth surface loss (NCTSL) is an irreversible, Non-carious tooth surface loss (NCTSL) is an irreversible, multifactorial condition characterised by pathological loss of dental hard tissues through attrition, abrasion, erosion, and abfraction. Despite increasing global prevalence, data on NCTSL among Libyan adults remain limited. This cross-sectional study investigated the prevalence, clinical patterns, and multifactorial aetiology of NCTSL in 96 adult patients attending Attahaddi Hospital, Department of Oral Medicine and Diagnosis, Libya. Data were collected using a structured, self-administered questionnaire and standardized clinical examination. Severity was graded using the Basic Erosive Wear Examination (BEWE) index. Patient awareness of tooth surface changes was 96.9%. Clinical examination confirmed NCTSL in 93.8% of patients, with mild wear predominating (46.9%). Anterior teeth were most affected (46.9%), particularly mandibular central incisors (~70%). Multiple aetiological patterns coexisted in 41.7%. The leading risk factors were bruxism (52.1%), weekly/daily fruit juice consumption (52.1%), horizontal brushing (46.9%), and carbonated drinks (41.7%). Bruxism was strongly associated with attrition (OR=4.5, 95% CI: 2.8–7.2, $p<0.001$). All patients combining horizontal brushing, hard force, and hard bristles exhibited cervical lesions ($p<0.001$). Daily fruit juice consumption was associated with erosion (OR=5.8, 95% CI: 2.9–11.6). Among GERD patients, 80% had palatal/lingual erosion. Patients with ≥ 5 risk factors were 18 times more likely to have severe wear (RR=18.2, 95% CI: 6.5–51.0). Although 41.7% expressed moderate-to-severe concern, only 15.6% had a previous diagnosis and 10.4% had a night guard. NCTSL is a common yet also under-recognised oral health issue in Libyan adults, strongly associated with modifiable risk factors. Routine screening, patient education, and preventive management are urgently needed.

Introduction

The integration of digital manufacturing technologies in dentistry has fundamentally transformed non-carious tooth surface loss (NCTSL), or tooth wear, which is the irreversible, pathological loss of enamel, dentin, and cementum caused by mechanical and chemical processes independent of dental caries, trauma, or developmental defects (1, 2). Its aetiology is multifactorial and includes four main mechanisms: attrition from tooth-to-tooth contact and parafunction; abrasion from external mechanical agents such as aggressive tooth brushing; erosion from extrinsic dietary acids or intrinsic gastric acid; and abfraction, a debated biomechanical concept (3, 5, 6, 8, 11). These mechanisms frequently interact, with one process predisposing the tooth to another (5).

NCTSL is highly prevalent worldwide; non-carious cervical lesions affect approximately 46.7% of individuals globally, with increasing prevalence with age and a concerning rise among children and adolescents linked to acidic beverage consumption (8, 12–14). Early disease is often asymptomatic, but progression can cause dentin hypersensitivity, aesthetic compromise, reduced masticatory efficiency, pulp exposure, and impaired oral health-related quality of life (15–18). In Libya, available data are limited to specific groups, such as university students and dental students, and rely largely on self-report rather than clinical examination (24, 25). Therefore, this study aimed to investigate the prevalence, clinical patterns, and multifactorial aetiology of NCTSL in a general adult Libyan population using structured clinical examination and a comprehensive patient questionnaire.

Methodology

Study Design and Population

This study employed a descriptive, cross-sectional design to assess the prevalence, clinical patterns, and multifactorial aetiology of non-carious tooth surface loss (NCTSL) among 96 adult patients attending Attahaddi Hospital, Libya, over a five-month period. Participants were recruited via randomized sampling and included if aged 18 years or older, with at least 10 natural teeth, and provided written informed consent. Exclusion criteria included gross caries, extensive restorations, recent fixed orthodontic treatment, developmental enamel or dentin defects, and inability to complete the questionnaire.

Data Collection Instruments

Data were collected using two instruments. A structured, self-administered questionnaire assessed patient awareness, dietary and gastric acid exposure, oral hygiene practices, parafunctional habits, medical history, and the functional and aesthetic impact of tooth wear. A standardized clinical examination form, completed by a single calibrated examiner, recorded the location, pattern, severity (using a BEWE-based visual analog scale), and likely aetiology (attrition, abrasion, erosion, abfraction) of tooth wear.

Examiner Calibration and Pilot Study

Prior to data collection, the examiner underwent calibration training with an experienced consultant, and a pilot study on 20–30 patients was conducted to assess intra-examiner reliability (target weighted Kappa >0.80). A separate pilot study on 30 participants tested the questionnaire's clarity and face validity; feedback was used to refine the instrument, and pilot data were excluded from the final analysis.

Data Collection Procedure

The procedure involved four stages: identification and invitation of potential participants, obtaining written informed consent, administration of the self-administered questionnaire in a quiet area, and a standardized clinical examination by the calibrated examiner. The examiner was blinded to questionnaire responses to reduce information bias.

Data Management and Statistical Analysis

Data were entered into a secure, password-protected database, double-checked for accuracy on a random 10% sample, and cleaned. Analyses were performed using SPSS v26.0. Descriptive statistics summarized patient characteristics and risk factors. Bivariate associations were tested using Chi-square or Fisher's exact tests, with associations expressed as odds ratios and relative risks with 95% confidence intervals. The Chi-square test for trend assessed dose-response relationships, and $p < 0.05$ was considered statistically significant.

Statistical Analysis

Data were entered into a secure database, double-checked, and cleaned. Analyses were performed using SPSS v26.0. Descriptive statistics summarized patient characteristics and risk factors. Bivariate associations were tested using Chi-square or Fisher's exact tests, with odds ratios and 95% confidence intervals. The Chi-square test for trend assessed dose-response relationships. A p -value < 0.05 was considered statistically significant.

Results

A total of 96 patients completed the structured clinical examination and comprehensive questionnaire, giving a response rate of 100% among enrolled participants. Patient-reported awareness of tooth surface changes was exceptionally high: 93 patients (96.9%) answered affirmatively when asked whether they had noticed any change in the shape, length, or edges of their teeth. Only one patient (1.0%) denied any change, and two patients (2.1%) were unsure. These findings indicate that most Libyan patients presenting for dental care are perceptive of alterations in their tooth morphology.

The distribution of self-reported symptoms is presented in Table 1. The most prevalent symptom was teeth appearing shorter, yellowish, or flat, reported by 85 patients (88.5%), followed by tooth sensitivity to hot, cold, or sweet stimuli, reported by 70 patients (72.9%). Rough or sharp edges were noted by 50 patients (52.1%), while difficulty biting or chewing and jaw pain or tiredness were reported by 35 (36.5%) and 30 (31.3%) patients, respectively. The least common symptom was teeth appearing "see-through" at the edges, reported by only 20 patients (20.8%).

Table 1. Frequency of Patient-Reported Symptoms Associated with Tooth Wear (N=96)

Symptom	n	%
Teeth look shorter/yellowish/flat	85	88.5
Tooth sensitivity (hot/cold/sweet)	70	72.9
Rough or sharp edges on teeth	50	52.1
Difficulty biting/chewing	35	36.5
Jaw pain or tiredness	30	31.3
Teeth appear "see-through" at edges	20	20.8

Clinical examination findings are summarised in Table 2. Anterior teeth were the most frequently affected site, observed in 45 patients (46.9%). Generalized wear involving both anterior and posterior segments was noted in 25 patients (26.0%), while posterior-only wear was present in 15 patients (15.6%). The location could not be specified or was missing for 11 patients (11.5%). Among specific tooth surfaces, incisal wear predominated in anterior teeth, followed by occlusal wear in posterior teeth. Cervical wear (non-carious cervical lesions) was observed either in isolation or in combination with

incisal/occlusal wear in 28 patients (29.2%). Mild wear was the most common severity, observed in 45 patients (46.9%), followed by moderate wear in 30 patients (31.3%) and severe wear in 15 patients (15.6%); severity data were missing for 6 patients (6.3%). The teeth most frequently affected by wear, in descending order, were: mandibular central incisors (teeth 31, 41) in approximately 70% of patients; mandibular lateral incisors (teeth 32, 42) in ~65%; maxillary central incisors (teeth 11, 21) in ~60%; mandibular first molars (teeth 36, 46) in ~40%; and mandibular canines (teeth 33, 43) in ~35%. This pattern indicates a predilection for mandibular anterior teeth, followed by maxillary anterior teeth and mandibular first molars. Morphological assessment revealed that attrition was the most common pattern, observed in 60 patients (62.5%), followed by abrasion in 28 patients (29.2%), erosion in 22 patients (22.9%), and abfraction in 12 patients (12.5%). Notably, multiple aetiological patterns coexisted in 40 patients (41.7%), underscoring the multifactorial nature of NCTSL in this population.

Table 2. Clinical Examination Findings: Location, Severity, and Morphological Patterns of NCTSL (N=96)

Characteristic	n	%
Primary Location		
Anterior	45	46.9
Generalised	25	26.0
Posterior	15	15.6
Unspecified/missing	11	11.5
Severity		
Mild	45	46.9
Moderate	30	31.3
Severe	15	15.6
Unspecified/missing	6	6.3
Morphological Patterns		
Attrition	60	62.5
Abrasion	28	29.2
Erosion	22	22.9
Abfraction	12	12.5
Multiple patterns	40	41.7

The prevalence of etiological risk factors is detailed in Table 3. Regarding dietary acid exposure, fruit juices were the most commonly consumed acidic beverage on a weekly or daily basis (50 patients, 52.1%), followed by carbonated drinks (40 patients, 41.7%), citrus fruits and berries (25 patients, 26.0%), vinegar-based foods (20 patients, 20.8%), sports/energy drinks (15 patients, 15.6%), and wine (10 patients, 10.4%). Habit-related behaviours further modified acid exposure risk: 20 patients (20.8%) reported sipping acidic drinks slowly over prolonged periods, and 14 patients (14.6%) reported swishing or holding acidic drinks in the mouth. The timing of tooth brushing relative to acid exposure was suboptimal in 14 patients (14.6%), who brushed within 30 minutes of acid consumption. Gastric acid exposure was less common but clinically significant: a history of frequent heartburn or GERD was reported by 10 patients (10.4%), recurrent vomiting or bulimia by 5 patients (5.2%), morning sickness by 5 patients (5.2%), and hiatal hernia or other digestive disorders by 2 patients (2.1%). Among patients with GERD, 8 (80%) exhibited palatal or lingual erosion patterns.

Oral hygiene practices revealed that horizontal brushing technique was the most prevalent abrasive factor, reported by 45 patients (46.9%), followed by hard brushing force (30 patients, 31.3%), hard-bristled toothbrush use (28 patients, 29.2%), brushing within 30 minutes after acid exposure (14 patients, 14.6%), and use of whitening or highly abrasive toothpaste (10 patients, 10.4%). Parafunctional habits were common: bruxism (grinding or clenching) was reported by 50 patients (52.1%), of whom 20 (40.0%) reported nighttime bruxism only, 15 (30.0%) daytime only, and 15 (30.0%) both. Sleep partner awareness of grinding sounds was reported by 30 patients (60.0% of bruxers), and waking with jaw pain or tightness by 28 patients (56.0% of bruxers). Other habits included chewing nails, pens, or objects (25 patients, 26.0%), cheek or lip biting (20 patients, 20.8%), oral jewellery (7 patients, 7.3%), and tongue thrusting (5 patients, 5.2%). Medical history showed that dry mouth (xerostomia) was reported by 10 patients (10.4%), medications known to cause dry mouth by 5 patients (5.2%), and asthma inhaler use by 3 patients (3.1%). No patients reported taking bisphosphonates or other osteoporosis medications; other systemic conditions were reported by 2 patients (2.1%).

Table 3. Prevalence of Etiological Risk Factors for NCTSL (N=96)

Risk Factor	n	%
Dietary Acid Exposure (Weekly or More)		
Fruit juices	50	52.1
Carbonated drinks	40	41.7
Citrus fruits/berries	25	26.0

Vinegar-based foods	20	20.8
Sports/energy drinks	15	15.6
Wine	10	10.4
Gastric Acid Exposure		
GERD/heartburn	10	10.4
Recurrent vomiting/bulimia	5	5.2
Morning sickness	5	5.2
Hiatal hernia/other digestive	2	2.1
Oral Hygiene & Abrasive Factors		
Horizontal brushing technique	45	46.9
Hard brushing force	30	31.3
Hard toothbrush bristles	28	29.2
Brushing <30 min after acid	14	14.6
Whitening/high-abrasivity toothpaste	10	10.4
Parafunctional Habits		
Bruxism (any)	50	52.1
– Nighttime only	20	20.8
– Daytime only	15	15.6
– Both	15	15.6
Chewing nails/pens/objects	25	26.0
Cheek/lip biting	20	20.8
Oral jewellery	7	7.3
Tongue thrusting	5	5.2
Medical History		
Xerostomia	10	10.4
Medications causing dry mouth	5	5.2
Asthma inhaler use	3	3.1
Other systemic conditions	2	2.1

Patient-reported impact and previous management are presented in Table 4. Moderate to severe concern about tooth wear was expressed by 40 patients (41.7%). Aesthetic concerns affecting smile or appearance were reported by 30 patients (31.3%), and functional concerns affecting chewing ability by 25 patients (26.0%). Prior management was infrequent: only 15 patients (15.6%) had received a previous diagnosis of tooth wear; desensitising toothpaste had been used by 15 patients (15.6%); a night guard or occlusal splint had been provided to 10 patients (10.4%); restorative treatment for wear had been performed in 8 patients (8.3%); and dietary counselling had been received by only 5 patients (5.2%).

Table 4. Patient-Reported Impact and Previous Management of Tooth Wear (N=96)

Measure	n	%
Impact		
Concern about tooth wear (moderate–severe)	40	41.7
Affects smile/appearance	30	31.3
Affects chewing ability	25	26.0
Previous Management		
Previous diagnosis of tooth wear	15	15.6
Desensitising toothpaste used	15	15.6
Night guard/occlusal splint provided	10	10.4
Restorative treatment for wear	8	8.3
Dietary counselling received	5	5.2

A strong positive association was found between bruxism and clinical signs of attrition. Among 50 patients with bruxism, 42 (84.0%) exhibited flattened occlusal or incisal surfaces, compared to only 18 of 46 non-bruxers (39.1%). This difference was statistically significant ($\chi^2 = 18.4$, $p < 0.001$). The odds ratio for developing attrition in the presence of bruxism was 4.5 (95% CI: 2.8–7.2). Cervical lesions were present in 28 patients. Among these, 22 (78.6%) reported using a horizontal brushing technique, and 20 (71.4%) reported hard brushing force. The combination of horizontal technique, hard force, and hard bristles was present in 15 patients, all of whom (100%) exhibited cervical lesions ($p < 0.001$). A dose-response relationship was observed between dietary acid frequency and erosion. Among 22 patients with clinical erosion, 14 (63.6%) consumed

acidic drinks daily, 6 (27.3%) weekly, and only 2 (9.1%) rarely or never. Daily fruit juice consumption showed the strongest association with erosion (OR = 5.8, 95% CI: 2.9–11.6). Patients with five or more risk factors were 18 times more likely to have severe wear compared to those with 0–2 risk factors (RR = 18.2, 95% CI: 6.5–51.0).

Discussion

The present study investigated the prevalence, clinical patterns, and multifactorial aetiology of non-carious tooth surface loss (NCTSL) among 96 adult patients attending Attahaddi Hospital, Libya. The key findings revealed a high prevalence of NCTSL (93.8% clinically confirmed), with mild wear predominating (46.9%) and anterior teeth most frequently affected (46.9%). The leading risk factors were bruxism (52.1%), weekly or daily fruit juice consumption (52.1%), horizontal brushing technique (46.9%), and carbonated drink consumption (41.7%). Multiple aetiological patterns coexisted in 41.7% of patients, and although 41.7% expressed moderate-to-severe concern about their tooth wear, only 15.6% had received a previous diagnosis and only 10.4% had been provided with a night guard. These findings highlight that NCTSL is a common yet under-recognised oral health issue in Libyan adults, strongly associated with modifiable behavioural and medical risk factors.

The high prevalence of clinically confirmed NCTSL in this study (93.8%) is consistent with the global recognition that tooth wear is a ubiquitous condition, particularly in adult populations (12, 13). The finding that 96.9% of patients were aware of changes in their tooth morphology indicates a high level of patient perceptiveness, which may facilitate early detection and intervention. This aligns with Ganss and Lussi (2014), who emphasised that patient awareness combined with structured clinical examination forms the cornerstone of erosive tooth wear diagnosis (1). However, despite this high awareness, only 15.6% had received a previous diagnosis, suggesting a significant gap between patient perception and professional recognition. This under-diagnosis may reflect a lack of routine screening for NCTSL in clinical practice, as well as a tendency to focus on caries and periodontal disease as primary oral health concerns.

Anterior teeth were the most frequently affected site (46.9%), with mandibular central incisors (teeth 31, 41) involved in approximately 70% of patients. This pattern is consistent with Kaidonis (2012), who noted that anterior guidance and parafunctional habits frequently manifest as incisal wear (3). The predominance of mandibular anterior wear over maxillary anterior wear may be related to tongue position, salivary flow distribution, and occlusal guidance, as these factors can influence the duration and intensity of acid and mechanical exposure. Furthermore, the high prevalence of mild wear (46.9%) suggests that most patients were in the early stages of the condition, which is a critical period for preventive intervention. However, the presence of moderate (31.3%) and severe (15.6%) wear in a substantial proportion of patients indicates that progression occurs when risk factors are not addressed.

The multifactorial nature of NCTSL was evident in this study, with 41.7% of patients exhibiting multiple aetiological patterns concurrently. This finding supports the prevailing paradigm that attrition, abrasion, erosion, and abfraction rarely operate in isolation and often interact synergistically (5, 11). Attrition was the most common pattern (62.5%), followed by abrasion (29.2%), erosion (22.9%), and abfraction (12.5%). The coexistence of wedge-shaped cervical lesions with occlusal wear facets in abfraction cases supports Grippo et al.'s (2004) biomechanical loading hypothesis, although these lesions rarely occurred in isolation from abrasive and erosive factors (6). This reinforces the view that abfraction is more likely a contributing or modifying factor rather than a primary cause, as argued by Bartlett and Shah (2006) (11).

The study identified a high prevalence of abrasive oral hygiene practices, including horizontal brushing technique (46.9%), hard brushing force (31.3%), and use of hard-bristled toothbrushes (29.2%). Notably, all 15 patients (100%) who combined horizontal technique, hard force, and hard bristles exhibited cervical lesions ($p < 0.001$). This striking association confirms Addy and Hunter's (2003) assertion that aggressive toothbrushing is a major determinant of non-carious cervical lesions (7). Furthermore, 14.6% of patients brushed within 30 minutes of acid exposure, a practice that is particularly harmful due to the combination of acid-softened enamel and mechanical abrasion (8). These findings underscore the need for patient education on proper brushing technique, force, and timing, as well as the use of soft-bristled brushes and non-abrasive toothpastes.

Dietary acid exposure was highly prevalent, with 52.1% of patients consuming fruit juices and 41.7% consuming carbonated drinks weekly or daily. A dose-response relationship was observed between dietary acid frequency and erosion, with daily fruit juice consumption showing the strongest association (OR = 5.8, 95% CI: 2.9–11.6). This finding directly supports Lussi and Jaeggi's (2008) risk factor model, which emphasised the role of frequent acid consumption in the initiation and progression of erosion (8). Habit-related behaviours such as sipping slowly and swishing drinks further increased acid exposure risk. Gastric acid exposure was less common but clinically significant: among patients with GERD, 80% exhibited palatal or lingual erosion patterns. This figure is identical to that reported by Bartlett et al. (1996), validating the diagnostic value of palatal erosion as a clinical marker for gastric acid exposure (9). The high prevalence of GERD-related erosion in this cohort highlights the importance of taking a thorough medical history in dental patients, including inquiry about reflux symptoms and vomiting disorders.

Bruxism was the most common parafunctional habit, reported by 52.1% of patients. This prevalence exceeds the global average of approximately 30%, which may reflect either true population differences or selection bias in a hospital-based sample (13). Bruxism was strongly associated with attrition (OR = 4.5, $p < 0.001$), with 84.0% of bruxers exhibiting flattened

occlusal or incisal surfaces compared to 39.1% of non-bruxers. This association is consistent with the well-established role of bruxism in the development of attrition (6). The high prevalence of bruxism in this population suggests that routine screening for parafunctional habits should be integrated into dental examinations, and that patients should be educated about the consequences of bruxism and the benefits of occlusal splint therapy.

The findings of this study can be contextualized within the emerging body of Libyan research on NCTSL. Ahmed et al. (2024) surveyed Libyan university students and reported that 45.5% self-reported tooth wear symptoms, with 68.9% aware of abrasion and 54.1% aware of erosion (24). The substantially higher prevalence observed in the present study (93.8% clinically confirmed) reflects two key differences: first, the present study employed clinical examination rather than self-report alone; second, the hospital-based population likely represents patients with more advanced or symptomatic wear. El-Sallak et al. (2018) examined tooth wear among Libyan dental students in Benghazi and identified associations with hot drink consumption, biting on hard objects, and xerostomia (25). The present study extends these findings by identifying bruxism, dietary acid exposure, and horizontal brushing as the predominant risk factors in a general adult population. Collectively, these Libyan studies confirm that NCTSL is a significant oral health concern across diverse Libyan populations, warranting national preventive strategies.

The study revealed a significant discrepancy between patient concern and professional management. Although 41.7% of patients expressed moderate-to-severe concern about their tooth wear, and 31.3% reported aesthetic concerns affecting their smile, only 15.6% had received a previous diagnosis and only 10.4% had been provided with a night guard. The low rates of dietary counselling (5.2%) and night guard provision (10.4%) further indicate that preventive management is underutilized. Given that the majority of risk factors identified in this study are modifiable, there is substantial opportunity for preventive intervention to halt disease progression and preserve tooth structure.

The findings of this study have several important implications for clinical practice. First, routine screening for NCTSL should be integrated into dental examinations, using validated indices such as the Basic Erosive Wear Examination (BEWE) to standardize assessment and facilitate early detection (22). Second, risk factor assessment should include bruxism, dietary acid exposure, oral hygiene practices, and medical history, with particular attention to GERD and xerostomia. Third, patient education should focus on modifying behavioral risk factors, including reducing acid consumption, using straws, rinsing with water after acid exposure, waiting 30–60 minutes after acid consumption before brushing, and adopting correct brushing technique with a soft-bristled brush and gentle force. Fourth, patients with evidence of bruxism should be offered occlusal splint therapy, and those with GERD should be referred for medical management. Finally, restorative treatment should be considered only after etiologic factors have been controlled, following a stepwise approach from prevention to minimally invasive restoration (18).

Limitations

The cross-sectional design precludes causality, and the single-centre, hospital-based sample limits generalisability and may over-represent advanced wear. Self-reported data are subject to recall bias, and the absence of demographic variables precluded subgroup analysis.

Conclusions

NCTSL is highly prevalent among Libyan adults, with mild wear being the most common severity. Key risk factors include bruxism, dietary acid exposure from fruit juices and carbonated drinks, improper brushing habits, and GERD. Despite high patient awareness, under-diagnosis is evident. NCTSL is a neglected oral health issue in Libya requiring routine screening, risk factor assessment, and patient education.

References

1. Ganss C, Lussi A. Diagnosis of erosive tooth wear. *Monogr Oral Sci.* 2014;25:22-31.
2. Lussi A, Carvalho TS. Erosive tooth wear: a multifactorial condition of growing concern and increasing knowledge. *Monogr Oral Sci.* 2014;25:1-15.
3. Kaidonis J. Oral diagnosis and treatment planning: part 4. Non-carious tooth surface loss and the assessment of risk factors. *Br Dent J.* 2012;213(4):155-61.
4. Johansson AK, Omar R, Carlsson GE, Johansson A. Dental erosion and its growing importance in clinical practice: from past to present. *Int J Dent.* 2012;2012:632907.
5. Shellis RP, Addy M. Interactions between attrition, abrasion and erosion in tooth wear. In: Lussi A, Ganss C, editors. *Erosive tooth wear: from diagnosis to therapy*. 2nd ed. Basel: Karger Publishers; 2025. p. 32-45.
6. Grippo JO, Simring M, Schreiner S. Attrition, abrasion, corrosion and abfraction revisited: a new perspective on tooth surface lesions. *J Am Dent Assoc.* 2004;135(8):1109-18.
7. Addy M, Hunter ML. Can toothbrushing damage your teeth? *J Dent.* 2003;31(3):161-7.
8. Lussi A, Jaeggi T. Erosion—diagnosis and risk factors. *Clin Oral Investig.* 2008;12(Suppl 1):S5-13.
9. Bartlett DW, Evans DF, Anggiansah A, Smith BG. A study of the association between gastro-oesophageal reflux and palatal dental erosion. *Br Dent J.* 1996;181(4):125-31.
10. Ganss C, Lussi A. Diagnosis of erosive tooth wear. In: Lussi A, editor. *Dental erosion: from diagnosis to therapy*. Basel: Karger; 2006. p. 32-45.

11. Bartlett DW, Shah P. A critical review of non-carious cervical (wear) lesions and the role of abfraction, erosion, and abrasion. *J Dent Res.* 2006;85(4):306-12.
12. FDI World Dental Federation. Tooth wear policy statement and clinical recommendations [Internet]. Geneva: FDI; 2020 [cited 2024 May 20]. Available from: <https://www.fdiworlddental.org/tooth-wear-policy-statement>
13. Smith WA, Knight DJ. Prevalence of non-carious cervical lesions: a systematic review and meta-analysis. *J Dent.* 2020;99:103394.
14. Huysmans MC, Chew HP, Ellwood RP. Clinical studies of dental erosion and erosive wear. *Caries Res.* 2011;45(Suppl 1):60-8.
15. Warreth A, Abuhijleh E, Almaghribi MA, Mahwal G, Ashawish A. Tooth surface loss: a review of literature. *Saudi Dent J.* 2020;32(2):53-60.
16. Guedes RS, Piovesan C, Ardenghi TM, Emmanuelli B, Braga MM, Mendes FM. Impact of erosive tooth wear on oral health-related quality of life in schoolchildren. *Int J Paediatr Dent.* 2019;29(5):585-93.
17. Mehta SB, Loomans BAC, Banerji S, Bartlett D. An introduction to the management of tooth wear. *Br Dent J.* 2012;212(8):373-8.
18. Loomans B, Opdam N, Attin T, Bartlett D, Edelhoff D, Frankenberger R, et al. Severe tooth wear: European consensus statement on management guidelines. *J Adhes Dent.* 2017;19(2):111-9.
19. Aoki K, Kitasako Y, Ikeda M, Tagami J. Morphology and progression of non-carious cervical lesions: a narrative review. *J Prosthodont Res.* 2022;66(3):353-60.
20. Alghilan MA, Haq UI. Global research trends in erosive tooth wear: a bibliometric analysis. *Cureus.* 2024;16(11):e74830.
21. Levin KA. Study design III: cross-sectional studies. *Evid Based Dent.* 2006;7(1):24-5.
22. Bartlett D, Ganss C, Lussi A. Basic Erosive Wear Examination (BEWE): a new scoring system for scientific and clinical needs. *Clin Oral Investig.* 2008;12(Suppl 1):S65-8.
23. World Medical Association. World Medical Association Declaration of Helsinki: ethical principles for medical research involving human subjects. *JAMA.* 2013;310(20):2191-4.
24. Ahmed KA, Gehani G, Own NM. Oral health awareness and practices among Libyan university students: insights into non-bacterial tooth wear. *Libyan J Dent.* 2024;8(2):41-8.
25. El-Sallak A, Shukree M, Ingafou MS. Prevalence of tooth wear among Libyan dental students in Benghazi. *Libyan J Dent.* 2018;2(1):15-22.
26. Ali F. Prevalence of dental erosion in a group of schoolchildren from Benghazi, Libya. *Libyan J Med Sci* [Internet]. [cited 2025 May 3]. Available from: <https://www.semanticscholar.org>
27. Kitasako Y, Ikeda M, Tagami J. Non-carious cervical lesions and their management: a review. *Jpn Dent Sci Rev.* 2015;51(2):45-52.
28. Schlueter N, Amaechi BT, Bartlett D, Buzlaf MAR, Carvalho TS, Ganss C, et al. Terminology of erosive tooth wear: consensus report of a workshop organized by the ORCA and the Cariology Research Group of the IADR. *Caries Res.* 2020;54(1):2-6.
29. O'Toole S, Bartlett D, Moazzez R. Tooth wear: best practices for diagnosis and management. *Dent Update.* 2021;48(5):370-8.