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Association Between Occlusal Wear Facets and Undiagnosed Sleep Bruxism in Adult Dental Patients

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ABSTRACT

Background: Teeth grinding can occur during sleep and may remain unknown due to the absence of overt symptoms and lack of conscious awareness. Over time, repetitive actions can subtly alter the physical appearance of the teeth's tops, either in terms of appearance or texture. People might not be aware of these slight variations, but they might allude to other nighttime practices. The study examines the relationship between occlusal wear facets and undiagnosed sleep bruxism in adult dental patients, focusing on how tooth wear can serve as a clinically predictive indicator.

Methods: The cross-sectional study was conducted between May 2025 and January 2026 within the dental clinics of Islamabad, using convenience sampling. A sample of 385 adult patients who completed a self-report Oral Behaviour Checklist (OBC) and a Tooth Wear Index (TWI) were administered the clinical assessments. The statistical analysis of the data was conducted using SPSS Version 26, which included descriptive statistics, t-tests, ANOVA, Pearson correlation, and linear regression to determine the correlations between oral behaviours and occlusal wear.

Results: Out of the 385 respondents, 194 (50%) were male and 191 (50%) were female. Both the Oral Behaviour Checklist (OBC) and the Tooth Wear Index (TWI) showed higher scores in males than in females ($p < 0.01$). There was consequently a significant positive correlation between tooth wear scores and oral behaviour ($r = 0.312$, $p < 0.001$). Another critical variable was age, where older adults showed higher scores in both indices ($p < 0.01$). Linear regression analysis revealed that scores on OBC were highly predictive of scores on TWI ($B = 0.94$, $p < 0.001$). Caffeine use and smoking status had a significant correlation with specific health-related issues, including the presence of TMJ issues and the frequency of headaches ($p < 0.001$).

Conclusion: These results indicate that self-reported oral behaviours are strongly related to occlusal wear, suggesting that tooth wear could be a clinical marker of undiagnosed sleep bruxism. Implementing regular occlusal wear screening during dental facility visits may help identify and treat dental issues at an earlier stage, thereby preventing long-term dental damage.

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Introduction

Sleep bruxism is a central disorder characterised by involuntary jaw muscle strain during sleep, which can lead to tooth damage [1]. The diagnostic prevalence of sleep bruxism is 4.4% in the general population, but as many as 8.2% note they grind their teeth at least once per week during sleep. This emphasises clinical value and possible low diagnosis of the condition [2,3].

There is evidence that sleep bruxism is directly associated with arousal mechanisms, particularly in the cyclic alternating pattern of non-rapid eye movement (NREM) sleep. The majority of bruxism activities are transitory arousals and are associated with a faster heart rate and muscle stress [4]. Recent evidence suggests that oral appliances are the most consistently effective solution for reducing sleep bruxism activity, whereas pharmacological and behavioural methods have mixed outcomes [5].

Occlusal wear has been correlated with functional chewing patterns. Research has also shown that individuals with a grinding type of chewing pattern exhibit significantly higher wear, particularly to the posterior teeth, compared to those with a chopping type of chewing pattern [6]. Although it is commonly assumed that bruxism is a cause of tooth wear, a study conducted on patients with temporomandibular disorders (TMD) did not reveal a significant association between bruxism and tooth loss, muscle pain, or temporomandibular joint (TMJ) pain. This explains the diagnostic inaccuracy of wearing facets as a singular method of detecting sleep bruxism [7].

Occlusal stability also affects tooth wear. Patients with a centric relation and well-coordinated occlusion, especially those with efficient anterior guidance that specifies the position of posterior teeth during eccentric motions, tend to exhibit fewer wear facets [8]. Moreover, particular occlusal movements and morphology of the crown affect wear facet formation, which underlines the possibility of recreating functional occlusion patterns with the help of facet analysis [9]. Lastly, emerging evidence suggests that occlusal design, particularly the relationships between canine guidance and condylar guidance, can influence the magnitude of bruxism. There is also decreased muscle activity during sleep bruxism among people with flatter canine guidance and larger condylar occlusal inclination discrepancies, which suggests that occlusal configuration may have some role in the modulation of the severity of bruxism [10].

Rationale

Sleep bruxism is a common disorder that can be undiagnosed because it occurs during the night and is an asymptomatic disorder. Given that patients are usually unaware of the habit, diagnosis depends heavily on the indirect clinical manifestations observed during a regular dental check-up visit. Among them, one of the most typical is occlusal wear facets, which are flattened, smooth surfaces on the biting edges of teeth. These are frequent, although not necessarily attributed solely to bruxism. This type of wear is often incorrectly attributed to functional behaviour or age, resulting in opportunities for early intervention being lost.

Since occlusal wear facets may be a visible sign of sleep bruxism, research into the connection can be valuable in understanding previously unrecognised instances. This connection could increase clinical awareness and promote diagnostic screening of sleep bruxism in patients with unexplained tooth wear. This can ultimately aid in the timely diagnosis, prevent further accumulation of dental harm, and improve patient care through the implementation of effective treatment strategies.

Objectives

Primary Objective

- The primary objective of this research is to establish the relationship between occlusal wear facets and undiagnosed sleep bruxism among adult dental patients.
- Secondary Objectives
- To determine the prevalence of occlusal wear facets among adult dental patients.
- To determine the percentages of undiagnosed patients with clinical evidence of sleep bruxism.
- To assess the feasibility of occlusion wear facets as a clinically applicable marker of early identification of sleep bruxism.

Materials and Methods

Study Design and Methods

This cross-sectional study was to examine the relationship between occlusal wear facets and untreated sleep bruxism among oral patients aged 18 years and older. The information was collected in Islamabad, Pakistan, among individuals who required dental services. The study population was recruited from a combination of dental facilities, including public dental outpatient clinics, private dental practices, and community dental centres. These recruiting sites included university-managed dental clinics and underprivileged dental office settings, allowing for a mixed group of participants in terms of age, gender, education level, and socioeconomic status.

The data were collected using a standardised assessment protocol consisting of two major components. To gather information regarding their demographics and oral behaviours associated with sleep bruxism, participants first completed a self-reported questionnaire. Second, a clinically qualified dental employee performed a clinical oral assessment and rated the patient's dentition using a standardised tooth wear assessment scale, separately by visual inspection. This made it possible to objectively assess occlusal wear facets, which serve as consistent predictors of potential bruxism. This methodology enabled the assessment of potential relationships between clinically observed wear and undiagnosed sleep bruxism in an adult population.

Sample Size and Technique

The study assumed an infinite population because the exact number of locally available adults who have undiagnosed sleep bruxism is not known. The size of a sample was estimated through this formula:

$$n = \frac{Z^2 \cdot p (1 - p)}{d^2}$$

Here, Z is the standard score of the targeted confidence statement, p is the estimated proportion obtained using previous results, and d is the acceptable margin of error. In this experiment, the value of Z was set at 1.96, corresponding to a 95% confidence level. Margin of error (d) was set at 0.05. Because there was no exact local information regarding the number of people with undiagnosed sleep bruxism, p was set at 0.50 to maximise the sample size and make it more reliable.

According to this calculation, the minimum required sample was found to be 385 participants. More people were reached to ensure the desired data was sufficient in case of non-response and missing data. A convenience sampling approach was used to select participants identified in dental outpatient departments of hospitals and private clinics. The study included only respondents who met the inclusion criteria and fell within the specified data collection timeframe [11].

Table 1: Inclusion and Exclusion Criteria for Study Participants The inclusion and exclusion criteria for study participant selection are summarised in Table 1

Inclusion Criteria	Exclusion Criteria
Individuals aged 18 years and older	Patients who had formerly been diagnosed with sleep bruxism
Patients who attend a dental routine check-up or treatment	Patients having active oral infections or having experienced dental trauma
A willingness to participate and offer informed consent	Patients who have a lot of dental prostheses or who lack the posterior teeth
No history of psychiatric and neurological disorders	Those who are already being treated for bruxism

Data Collection Tools
Data were collected through a structured questionnaire, which consisted of three standardised sections: demographic data, oral behaviour patterns, and tooth wear. All of the parts were founded on an established instrument to promote the reliability and uniformity of gauging the variables involved in the study.

Demographic Information Form
The initial part of the research questionnaire was designed to gather general demographic and personal background data. This included the age of the participants, their gender, marital status, the level of education, occupation, and their overall medical history. This was necessary to determine the distribution of sleep bruxism signs among members of various population groups. Knowledge of the demographic profile of participants helped decide whether certain social or lifestyle factors could be used to associate the tooth wear or oral habits reported. The purpose of this section was also to achieve heterogeneity in the study population, thereby promoting the generalizability of the results.

Oral Behaviours Checklist (OBC)
The Oral Behaviours Checklist (OBC) was invented by Dr. Richard Ohrbach, Dr. Michael R. Markiewicz, and Dr. W.D. McCall Jr., who published it in 2014. It is a standardised self-report questionnaire, which aims to measure the presence of awake and sleep-related oral parafunctional behaviours that could lead to the development or progression of temporomandibular disorders and tooth wear. The OBC is composed of 21 items, each of which targets a specific oral behaviour (e.g., jaw clenching, teeth grinding, nail biting, gum chewing, and non-functional use of the oral structures, e.g., tongue pressing, or object chewing). Their responses are scored on a Likert scale (0 to 4) representing the degree to which the parafunctional activity was happening frequently, and perceptions on its frequency are scored on a 5-point Likert scale (0=never, 1=seldom, 2=occasionally, 3=frequently, and 4=very frequently). The internal consistency of the checklist has been demonstrated to be satisfactory, as Cronbach's alpha calculated values ranged from 0.70 to 0.89 across different populations. This study assessed the self-reported oral behaviours of the participants, along with their probable association with occlusal wear facets, especially among those who had not been formally diagnosed with sleep bruxism, using the OBC. The original authors were contacted to formally obtain permission to use the Oral Behaviours Checklist [12].

Smith and Knight Tooth Wear Index (TWI)
The Tooth Wear Index (TWI) is a clinical measurement index (or two-dimensional index) designed and developed by Barry G. Smith and John K. Knight (1984) to enable a standardised, comprehensive, and quantitative evaluation of tooth surface wear attributable to tooth attrition, erosion, and abrasion. Each tooth surface (buccal/labial, cervical, occlusal/incisal, and lingual/palatal) is rated by severity of wear (0 = no loss of enamel, 1 = slight loss of enamel, 2 = moderate loss of enamel, 3 = severe loss of enamel and exposure of dentin, 4 = exposure of pulp or emergence of secondary dentin). This index facilitates the systematic analysis of wear patterns in the dentition on a semi-quantitative basis. The TWI has been demonstrated to have good inter- and intra-examiner reliability, with reported kappa values ranging from 0.70 to 0.85, providing reliability in clinical assessments. The TWI has been utilised in this study to enable trained dental examiners to systematically survey the number of occlusal wear facets in adults. Formal approval for the use of the Tooth Wear Index was obtained [13].

Procedure
Recruitment was conducted at public dental hospitals, private clinics, and community oral health centres, with informed written consent obtained from all participants. Data collection was done from May 2025 to January 2025. The participants were initially given a structured questionnaire consisting of two self-administered questions. The first part aimed to collect demographic information, and the second part consisted of the Oral Behaviours Checklist (OBC) to gather self-reported oral behaviours. Support was offered to participants who struggled to read or comprehend the questions.

The third data collection method involved a clinical dental examination conducted by a trained and calibrated dental examiner after the questionnaire was completed. The examiner used the Tooth Wear Index (TWI) to rate the occurrence and extent of occlusal wear facets through visual and manipulative inspection of each tooth, using suitable lighting during examination. This was done with the aid of a dental mirror and explorer. This part of the research was not a subject of self-administration because it requires clinical competence to conduct an efficient examination. Information was obtained in a strictly confidential manner and standardised to ensure uniformity among the vastly varied participants.

Statistical Analysis
The analysis and input of the data were performed using IBM SPSS Statistics version 26 (IBM Corp, Armonk, NY, USA). The data have been analysed using both descriptive and inferential statistical methods. Demographic attributes of the participants were summarised as frequencies, percentages, means, and standard deviations where necessary. The Kolmogorov-Smirnov and Shapiro-Wilk tests were used to verify the normality of continuous variables, enabling the use of parametric tests. To perform an inferential analysis, the Pearson correlation coefficient was used to assess the strength and direction of the association between the Oral Behaviour Checklist (OBC) scores and the Tooth Wear Index (TWI) scores. Independent samples t-tests were utilised to establish the mean differences between male and female subjects on the OBC and TWI scores. Moreover, a one-way ANOVA was applied to determine differences in the means of OBC and TWI scores in different age categories. Additionally, simple linear regression was performed to investigate the predictive relationship between OBC and TWI scores. To test associations between categorical variables — smoking status, medical history, and caffeine consumption —chi-square tests were employed. Statistical tests were all two-tailed, and p-values were set to $p < 0.05$. This method of analysis facilitated a comprehensive understanding of

group differences and relationships among the primary variables of this study.

Ethical Considerations

The study was conducted by the ethical principles of research involving humans. Before collecting data, the study protocol was submitted to the Institutional Review Board (IRB-2025-0034) of the Lumina Research Foundation in Islamabad, which approved the study protocol. This approval ensured that all ethical requirements were adhered to, such as participant autonomy, minimisation of risk, and protection of confidentiality. Each participant was fully informed about the study's goals and methodology, potential risks, and the benefits that might be associated with it. It was a voluntary participation with the participant giving written informed consent before being enrolled in the study. Participants were told that they had the right to quit at any time without facing adverse consequences. All identifiable information was excluded to maintain confidentiality, with anonymous codes used in place of names or contact information. In situations where there was no response, i.e., the questionnaire items were left unanswered or the clinical examinations were not completed, these cases were excluded from the final analysis. The missing data values were ideally checked, and only complete forms were carried forward to preserve the validity and integrity of the research findings.

Table 2: Demographic Characteristics of Participants (N=385)

Variable	f	%
Age	-	-
18–25 years	62	16
26–35 years	68	18
36–45 years	75	19
46–55 years	92	24
56 years or above	88	23
Gender	-	-
male	191	50
female	194	50
Marital status	-	-
Single	88	23
Married	95	25
Divorced	98	25
Widowed	104	27
Educational Level	-	-
No formal education	61	16
Primary school	72	19
Secondary school	64	17
Bachelor's degree	96	25
Master's or above	92	24
Occupation	-	-
Student	88	23
Employed	96	25
Unemployed	81	21
Retired	120	31
Medical History	-	-
Temporomandibular joint (TMJ) problems	103	27
Frequent headaches	89	23
Anxiety or stress disorder	94	24
None of the above	99	26
Smoking status	-	-
Non-smoker	126	33
Current smoker	124	32
Former smoker	135	35
Caffeine use	-	-
Never	90	23
Occasionally (1–2 times/week)	86	22
Frequently (daily)	104	27
Very frequently (>2 times/day)	105	27
Teeth Grinding	-	-
Yes	134	35
No	128	33
I don't know	123	32

Note. f=frequency, %=percentage

Table 2 contains the demographics of the study population (N = 385). Most of the participants were between the ages of 46-55 years (N = 92, 24%) and 56 years and above (N = 88, 23) with smaller percentages 36-45 years old (N = 75, 19%), 26-35 years old l (N = 68, 18%), and 18-25 years old (N = 62, 16%). There was gender equality, with 191 males (50%) and 194 females (50%). Concerning the marital status, 104 (27%) participants were widowed, 98 (25%) participants were divorced, 95 (25%) participants were married, and 88 (23%) participants were single. About education, 96 were bachelors (25%), 92 were master's degree or above (24%), 72 completed primary school (19%), 64 completed secondary school (17%), and 61 had no education (16%). Of the occupations, 120 were retired (31%), 96 were employed (25%), 88 were students (23%), and 81 were unemployed (21%). In medical history, 103 (27%) said they had temporomandibular joint (TMJ) problems, 94 (24%) experienced anxiety or stress disorder, 89 (23%) had frequent headaches, and 99 (26%) said they had none. The smoking status was nearly equal, where there were 135 former smokers (35%), 126 non-smokers (33%), and 124 current smokers (32%). As to the consumption of caffeine, it was reported that 105 (27%) participants have used it very frequently (more than 2 times a day), 104 (27%) often (every day), 90 (23%) never, and 86 (22%) occasionally (12 times a week). Finally, 134 (35%) participants reported experiencing teeth grinding, 128 (33%) reported no teeth grinding, and 123 (32%) became uncertain.

Table 3: Results of the Kolmogorov–Smirnov and Shapiro–Wilk Tests Indicate Normal Distribution of the Oral Behaviour Checklist and Tooth Wear Index variables (p > .05)

Variable	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
The Oral Behaviour Checklist	0.043	385	0.087	0.995	385	0.124
Tooth Wear Index	0.036	385	0.092	0.987	385	0.068

Note: df=degree of freedom; parametric test=p>0.05; non-parametric test=p<0.05

Table 3 presents the results of the normality tests on the Oral Behaviour Checklist and Tooth Wear Index variables, conducted using the Kolmogorov-Smirnov and Shapiro-Wilk tests (N = 385). According to the Oral Behaviour Checklist, the two test statistics were 0.043 (df = 385, p = 0.087) and 0.995 (df = 385, p = 0.124), as determined by the Kolmogorov-Smirnov and Shapiro-Wilk tests, respectively. In case of Tooth Wear Index, the Kolmogorov-Smirnov statistic became 0.036 (df = 385, p = 0.092), and a Shapiro-Wilk statistic was 0.987 (df = 385, p = 0.068). As the p-values of all the calculations are above 0.05, the data regarding both variables are normally distributed, which allows parametric statistical tests to be applied in further testing.

Table 4: Intercorrelation Between the Study Variables

Variable	r	p
The Oral Behaviour Checklist & Tooth Wear Index	0.312	<0.001**

Note: r=correlation coefficient; *=p<0.05, **=p<0.01 considered significant; correlation= Pearson Correlation

Table 4 indicates a positive correlation (r = 0.312, p < 0.001) using Pearson correlation analysis, showing a statistically significant relationship between the Oral Behaviour Checklist and the Tooth Wear Index. It implies that more cases of oral actions are associated with more tooth wear. The p-value, which is less than 0.01, shows that this correlation is highly significant.

Table 5: Comparison Among Variables (Gender)

Variable	Male (N=189); M±S.D	Female (N=196); M±S.D	t	p	Cl 95% LL	UL	Cohen's D
The Oral Behaviour Checklist	70.31±5.40	67.90±5.62	4.513	<0.001**	1.37	3.46	0.44
Tooth Wear Index	238.91±30.12	230.11±24.87	3.107	0.002**	3.26	14.34	0.35

Note: M=mean, SD=standard deviation, LL=Lower limit, UL=Upper limit; Cl=confidence interval; Independent t-test; **=p<0.001 considered significant

Table 5 presents comparisons of the mean scores of the Oral Behaviour Checklist and Tooth Wear Index across males (N = 189) and females (N = 196) using independent t-tests. The male scores on the Oral Behaviour Checklist were significantly higher (M = 70.31, SD = 5.40) than those of the females (M = 67.90, SD = 5.62), as indicated by a t-value of 4.513 and a probability of < 0.001. The result yielded a confidence interval between 1.37 and 3.46, and a Cohen's d effect size (effect size), which was 0.44 with a moderate effect size. The Tooth Wear Index also scored considerably higher in males (M = 238.91, SD = 30.12) than in females (M = 230.11, SD = 24.87), with a t-value of 3.107 and a p-value of 0.002. The Confidence interval (95%) was between 3.26 and 14.34 with a small-to-moderate effect size (Cohen d = 0.35). These findings suggest that oral behaviours, as well as tooth wear, are more prevalent or severe in males compared to females.

Table 6: Comparison of Variables (Age)

Variable	18-25 years (N=30); M±S.D	26-35 years (N=18); M±S.D	36-45 years (N=88); M±S.D	46-55 years (N=168); M±S.D	56 years or above (N=81); M±S.D	p	F (4,380)	η2
The Oral Behaviour Checklist	63.93±3.92	68.0±6.37	67.65±5.03	69.29±5.12	68.34±6.53	<0.001**	6.634	0.065
Tooth Wear Index	222.50±15.22	252.83±53.73	235.64±33.11	230.28±20.85	231.18±28.07	0.003**	4.050	0.041

Note: M=mean, S. D=standard deviation, F=ratio of variance between groups to within groups, η2=effect size; One-way ANOVA; **=p<0.01 considered significant

Table 6 presents a comparison of Oral Behaviour Checklist and Tooth Wear Index scores across five age groups using one-way ANOVA (N = 385). The significance of the variation in Oral Behaviour Checklist scores across age groups was statistically significant ($F(4, 380) = 6.634$, $p < 0.001$), indicating an overall level of 0.065. The lowest mean score was obtained in the 18-25 years group (M = 63.93, SD = 3.92), and the highest in the 46-55 years group (M = 69.29, SD = 5.12), which suggests that the frequency of oral behaviour increases with age. Equally, the scores of the Tooth Wear Index were also more significant upon grouping by age ($F(4, 380) = 4.050$, $p = 0.003$, $\eta^2 = 0.041$). An important trend in tooth wear severity was observed, with the highest mean in the 26-35 years group (M = 252.83, SD = 53.73) and the lowest mean in the 18-25 years group (M = 222.50, SD = 15.22). These two results suggest that age has a moderate to significant effect on oral behaviour and tooth wear.

Table 7: Comparison of Variables (Medical History)

Variable	Temporomandibular joint (TMJ)problems (N=125); M±S.D	Frequent headaches (N=83); M±S.D	Anxiety or stress disorder (N=73); M±S.D	None of the above (N=104); M±S.D	p	F (3,381)	η2
The Oral Behaviour Checklist	68.27±5.23	67.34±6.02	67.26±5.66	69.61±5.31	<0.012*	3.672	0.028
Tooth Wear Index	231.89±20.77	235.23±40.64	230.51±27.32	230.51±27.32	0.704	0.469	0.004

Note: M=mean, S. D=standard deviation, F=ratio of variance between groups to within groups, η2=effect size; One-way ANOVA; **=p<0.01 considered significant

Table 7 presents a comparison of the Oral Behaviour Checklist and Tooth Wear Index mean scores using one-way ANOVA, with a focus on medical history (N = 385). The Oral Behavior Checklist scores differed statistically between the four groups ($F(3, 381) = 3.672$, $p = 0.012$, $2 = 0.028$), with the highest mean score belonging to the participants who did not report any medical problems (M = 69.61, SD = 5.31) and the lowest to the participants with various forms of anxiety or stress disorders (M = 67.26, SD = 5.66). This implies that oral behaviour patterns are slightly dependent on medical history, with a small effect size. Conversely, although there was a clear trend towards randomness in terms of Tooth Wear Index scores across the groups ($p = 0.704$), the probability that the given F-value occurred due to chance variability was relatively low (0.004). It thus remains questionable to what extent the severity of tooth wear is directly linked to the specified medical conditions across the sample.

Table 8: Linear Regression Analysis Predicting Tooth Wear Index (TWI) Scores Using The Oral Behaviour Checklist (TOBC)

Variable	B	95% Cl LL	UL	S.E	β	Constant
Constant	212.887	190.33	235.44	11.472	-	<0.001**
The Oral Behaviour Checklist	0.94	0.527	1.353	0.21	0.312	<0.001**

Note: B=coefficient, S. E=standard error, β =standardized coefficient, LL=Lower limit, UL=Upper limit; Cl=confidence interval, **=p<0.01 considered significant

Table 8 presents the outcomes of a linear regression analysis to determine whether scores obtained using the Oral Behaviour Checklist can predict scores obtained using the Tooth Wear Index in participants (N = 385). The two variables are positively correlated with each other, with a significant level of the relationship as suggested by the model. The regression coefficient (B) of the Oral Behaviour Checklist was 0.94 (95% CI: 0.52731353, SE = 0.021), with a standardised coefficient (β) of 0.312 and a p-value less than 0.001. This implies that every point increment in the Oral Behaviour Checklist generates an approximate 0.94-unit increment in the Tooth Wear Index. The high p-value and medium effect size indicate that the predictiveness of oral behaviour on tooth wear severity is meaningful.

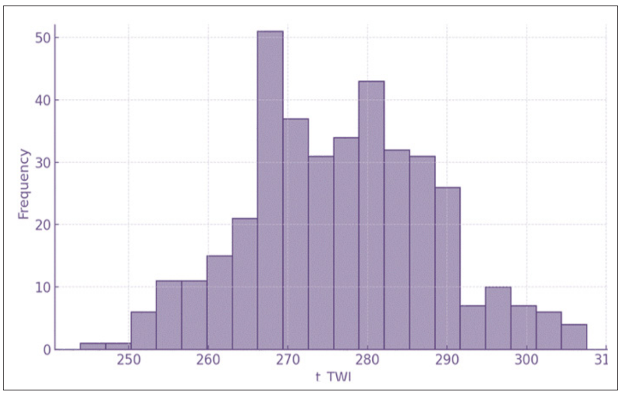

Figure 1: Histogram of Regression Residuals for the Tooth Wear Index (TWI)

Figure 1 presents the histogram of regression residuals on the Tooth Wear Index (TWI). The data appears to be approximately symmetrical, with a peak near 270 TWI, suggesting that the residuals are skewed towards this value. It is noteworthy that the frequency decreases at both ends of the TWI, as well as once the frequency reaches its maximum. However, there is an observation that the data in these ranges is less abundant. The fact that the residuals show moderate variability is also confirmed by the spread of the residuals, with the majority of the residuals ranging from 260 to 290 TWI.

Table 9: Descriptive Statistics of Demographic Variables (Medical History, Smoking Status, Caffeine Consumption)

Variables	*f*	Non-smoker	Smoking status Current smoker	Former smoker	df	p	x^2	never	Caffeine consumption Occasionally (1–2 times/week)	frequently (daily)	Very frequently (More than 2 times/day)	df	p	x^2
Medical history	-	-	-	-	6	<0.001**	107.5	-	-	-	-	9	<0.001**	35.3
Temporomandibular joint (TMJ) problems	125	5	31	89	-	-	-	33	26	29	37	-	-	-
Frequent headaches	83	11	10	62	-	-	-	33	12	14	24	-	-	-
Anxiety or stress disorder	73	27	21	25	-	-	-	22	21	10	20	-	-	-
None of the above	104	35	51	18	-	-	-	12	19	42	31	-	-	-

Note: f=frequency; df=degree of freedom; x^2=effect size; %=percentage; p=level of significance; p-values calculated using the chi-square test; the significance level is set at $p < 0.05$

Table 9 shows a strong relationship between medical history and smoking status ($R^2 = 0.13$, 26.5, $p < 0.001$) and caffeine consumption ($R^2 = 0.05$, 27.3, $p < 0.001$) among the participants (N = 385). Former smokers (N = 89) were mainly represented in the group with temporomandibular joint (TMJ) issues, whereas the group with no medical conditions presented a larger proportion of current smokers (N = 51). Likewise, participants who had TMJ issues and regular headaches represented an increased incidence of very frequent caffeine (N = 37 and N = 24, respectively), compared to those that did not have any medical conditions who were more inclined to use caffeine daily (N = 42) or even multiple times per day (N = 31). The results indicate that the behaviour associated with smoking and consuming caffeine is significantly related to specific health issues, especially those associated with TMJ disorders, headache, and anxiety or stress-related problems.

Discussion

This study aimed to investigate the relationship between occlusal wear facets and unrecognised sleep bruxism, as assessed by the Tooth Wear Index (TWI) and the Oral Behaviour Checklist (OBC). Our research revealed a significant positive association between oral behaviours and tooth wear, indicating that certain everyday oral habits contribute to tooth wear. This is consistent with prior reporting, in which observing unusual wear patterns and relating oral lesions have been viewed as indicators of habitual tooth use [14].

We observed a significant difference between males and females in their oral behaviour scores, with males having significantly higher scores, indicating higher incidences of more harmful oral habits. Likewise, in another study, it was reported that oral hygiene practices were poorer in males, including fewer dental visits and shorter brushing periods, and that this evidence supports the existence of gender variability in oral practices [15]. We found that males scored much higher on tooth wear than the female group, suggesting that men are at a higher risk of experiencing tooth wear. This finding is consistent with the results of another population-based study, which also indicated a higher incidence of tooth wear in men. The same trend in the studies suggests that gender might be a contributing factor in the causation of tooth wear [16].

We found that the oral behaviour scores were influenced by age, with scores tending to rise in older groups, signifying a greater behavioural risk. In a population-wide study of a different population, it was found that younger adults were more indulgent in certain habits, such as daily brushing and sweet intake, and that preventive dental care and awareness were relatively low among both age groups. These findings indicate that age has a different impact on oral behaviour across populations and cultures [17]. In our study, a significant increase in tooth wear was observed with age advancement. This finding is consistent with the results of another population, where a strong correlation was observed between age and overall tooth wear. These findings favour the influence of age as a factor in tooth wear development [18].

We found that there were minor differences in oral behaviour scores between participants with no medical conditions and those with anxiety or stress-related disorders, indicating a relatively weak effect of medical background on oral behaviour development. This finding is consistent with other studies that have shown people with systemic health conditions tend to face more challenges with oral health, resulting in a greater need for oral care [19]. In our study, we did not find any significant differences in oral health behaviours between individuals with medical conditions and those without. Conversely, a different research suggested a close connection between oral health degradation and certain medical conditions, which may be an indicator of disparities in the perception or acceptance of health problems among different people [20].

We found a significant positive correlation between oral behaviour patterns and wear severity, indicating that wear contributes to frequent oral habits. The same trend was observed in a different research, where repetitive use of teeth was associated with abnormal wear and other oral disorders, further solidifying the influence of repetitive behaviours on oral health [14].

We discovered that there is a pronounced correlation between smoking and temporomandibular joint (TMJ) related health problems. This is in line with other studies that have also found that the relationship between smoking activities and facial pain, as well as TMJ pain, is quite strong. The results bring into view the importance of dental professionals having to incorporate the issue of tobacco use when handling TMD patients [21]. In our research, a strong relationship has been noted between high caffeine intake and the temporomandibular joint (TMJ). This observation is backed by an earlier study that indicated there was a correlation between the use of caffeine and elevated perception of pain by patients with TMD. Both studies raise the importance of addressing caffeine intake in treating TMD-related symptoms [22].

Limitations

Although this study presents valuable information on the correlation between occlusal wear facets and undiagnosed sleep bruxism, it has several limitations. To begin with, cross-sectional research prevents the establishment of a causal system of understanding the relationship between parafunctional oral behaviours and tooth wear, as it is limited to the identification of associations at a specific moment in time. Secondly, the symptomatic assessment relies on self-reported data using the Oral Behaviour Checklist (OBC), which subjects it to a risk of recall bias, especially regarding nocturnal behaviours such as sleep bruxism, which many people might not be familiar with. Additionally, the convenience selection of clinical sites can only enhance the study because it restricts the overall applicability of the results to represent the general population. The lack of objective diagnostic methods, such as polysomnography or electromyography, which are considered the gold standard for diagnosing bruxism during sleep, is another critical limitation, as it would have yielded a more certain diagnosis. Finally, other confounding factors, including diet, stress levels, medications used, and genetic inclinations, were not taken into consideration; these factors have the potential to affect both oral behaviours and the extent of tooth wear as observed.

Future Directions

Future studies should aim to mitigate these limitations by employing more robust study designs and diagnostic procedures. Longitudinal studies would be instrumental in determining a temporal cause-and-effect relationship between oral behaviours and the tooth wear progression with time. The accuracy of detecting sleep bruxism would be significantly enhanced by introducing objective diagnostic tools and measures, such as polysomnography or EMG wearable devices. To improve the generalizability of the findings, it would be desirable to increase the sample size to cover participants across various geographical areas and apply probability sampling procedures. Besides, the possibility of early intervention treatments, including occlusal splints, cognitive-behavioural therapy, or stress management programs, to eliminate the damages caused by bruxism should be investigated in future research. Lastly, the combination of psychosocial and lifestyle factors, such as quality of sleep, industrial stress, and anxiety, might represent a more complete explanation of the multifactorial characteristics of sleep bruxism and clinical description.

Conclusion

The present study reveals a statistically significant correlation between oral parafunctional habits and occlusal wear facets in the adult dental population, suggesting that self-reported oral parafunction may serve as a clinical screening tool for identifying undiagnosed sleep bruxism. These results underscore the importance of prior identification and habitual evaluation of tooth wear through dental examinations, as well as in patients who do not exhibit any apparent signs. Although occlusal wear should not be attributed as an independent diagnostic sign, it is essential to identify behaviours associated with bruxism to allow for early treatment and prevent the future development of dental problems.

References

1. Beddis H, Pemberton M, Davies S (2018) Sleep bruxism: an overview for clinicians. Br Dent J 225: 497-501.
2. Ohayon MM, Li KK, Guilleminault C (2001) Risk factors for sleep bruxism in the general population. Chest 119: 53-61.
3. Lavigne GJ, Kato T, Kolta A, Sessle BJ (2003) Neurobiological mechanisms involved in sleep bruxism. Crit Rev Oral Biol Med 14: 30-46.
4. Macaluso GM, Guerra P, Di Giovanni G (1998) Sleep bruxism is a disorder related to periodic arousals during sleep. J Dent Res 77: 565-573.
5. Manfredini D, Ahlberg J, Winocur E, Lobbezoo F (2015) Management of sleep bruxism in adults: a qualitative systematic literature review. J Oral Rehabil 42: 862-874.
6. Kim SK, Kim KN, Chang IT, Heo SJ (2001) A study of the effects of chewing patterns on occlusal wear. J Oral Rehabil 28: 1048-1055.
7. Pergamalian A, Rudy TE, Zaki HS, Greco CM (2003) The association between wear facets, bruxism, and severity of facial pain in patients with temporomandibular disorders. J Prosthet Dent 90: 194-200.
8. Reynolds JM (1970) Occlusal wear facets. J Prosthet Dent 24: 367-372.
9. Kullmer O, Schulz D, Benazzi S (2012) An experimental approach to evaluate the correspondence between wear facet position and occlusal movements. Anat Rec 295: 846-852.
10. Sugimoto K, Yoshimi H, Sasaguri K, Sato S (2011) Occlusion factors influencing the magnitude of sleep bruxism activity. Cranio 29: 127-137.
11. Naing L, Nordin RB, Abdul Rahman H, Naing YT (2022) Sample size calculation for prevalence studies using Scalex and ScalaR calculators. BMC Med Res Methodol 22: 1-8.
12. Markiewicz MR, Ohrbach R, McCall WD Jr (2006) Oral Behaviors Checklist: Reliability of Performance in Targeted Waking-State Behaviors. Journal of Oral & Facial Pain and Headache 20: 306-316.
13. Smith BG, Knight JK (1984) An index for measuring the wear of teeth. Br Dent J 156: 435-438.
14. Molnar P (2008) Dental wear and oral pathology: possible evidence and consequences of habitual use of teeth in a Swedish Neolithic sample. Am J Phys Anthropol 136: 423-431.
15. Fukai K, Takaesu Y, Maki Y (1999) Gender differences in oral health behavior and general health habits in an adult population. Bull Tokyo Dent Coll 40: 187-193.
16. Wetselaar P, Vermaire JH, Visscher CM, Lobbezoo F, Schuller AA (2016) The prevalence of tooth wear in the Dutch adult population. Caries Res 50: 543-550.
17. Zhu L, Petersen PE, Wang HY, Bian JY, Zhang BX (2005) Oral health knowledge, attitudes and behaviour of adults in China. Int Dent J 55: 231-241.
18. Tomenchuk J, Mayhall JT (1979) A correlation of tooth wear and age among modern Igloolik Eskimos. Am J Phys Anthropol 51: 67-77.
19. Miller CS, Epstein JB, Hall EH, Sirois D (2001) Changing oral care needs in the United States: the continuing need for oral medicine. Oral Surg Oral Med Oral Pathol Oral Radiol

Endod 91: 34-44.
20. Moazzez R, Austin R (2018) Medical conditions and erosive tooth wear. Br Dent J 224: 326-332.
21. Miettinen O, Anttonen V, Patinen P (2017) Prevalence of temporomandibular disorder symptoms and their association with alcohol and smoking habits. J Oral Facial Pain Headache 31: 30-36.
22. May W Al-Khudhairy, Ghadah Bandar Alkhamsi Alqahtani, Abeer Mohammad A Altwijri, Reem Abdullah Aladwani, Daad Hosam AlYousof, et al. (2024) Sleep, caffeine, BMI, and pressure pain threshold in temporomandibular disorder patients: an observational study. Cureus 16: e57703.