The condition of cervical tooth wear and association with brushing habits among students of Hue University of Medicine and Pharmacy

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Abstract

Background: Cervical tooth wear is a common oral health issue that often leads to the loss of tooth structure integrity, making the teeth sensitive, prone to plaque buildup, affecting the dental pulp, and causing aesthetic concerns. Assessing the extent of tooth erosion and its correlation with brushing habits is crucial for enhancing the effectiveness of necessary interventions and preventive measures. **Objective**: To determine the prevalence and severity of cervical tooth wear in young individuals aged 18-25 and examine the association between brushing habits and cervical tooth wear. **Methods**: A cross-sectional descriptive study was conducted on 60 undergraduate students from the Hue University of Medicine and Pharmacy, aged 18 - 25, who visited the Odonto-Stomatology Clinic, Family Medicine Center from November 2020 to April 2021. Study participants were interviewed and provided clinical examinations after obtaining their consent. **Results**: The study findings revealed a relatively high prevalence of cervical tooth wear (53.3%). Most cases exhibited a severity score 0 (no tooth wear), and no cases were classified as score 4. The highest prevalence of cervical tooth wear was observed in the left mandibular (65.6%). Regarding the association between cervical tooth wear and brushing habits, there was a significant correlation between horizontal brushing technique and brush hardness with cervical tooth wear ($p < 0.05$). However, there was no significant correlation between brushing frequency, toothbrush replacement time, brushing duration, and force applied during brushing with cervical tooth wear ($p > 0.05$). **Conclusion**: In general, the prevalence of cervical tooth wear is relatively high, and there exists a correlation between horizontal tooth brushing habits and brush hardness with the condition of cervical tooth wear. Therefore, implementing preventive measures against cervical tooth wear is crucial for enhancing oral health for everyone.

***Keywords**: cervical tooth wear, brushing habits, brush hardness, student.*

1. INTRODUCTION

Cervical tooth wear refers to the loss of hard dental tissues (enamel, dentin, cementum) due to mechanical forces or chemical agents unrelated to bacteria or a combination of multiple causes. In some individuals, cervical tooth wear may progress faster, leading to significant changes in tooth morphology and function and potential damage to the dental pulp [1], [2]. The loss of tooth structure at the junction of enamel and cementum (CEJ), not caused by bacteria, is referred to as non-carious cervical tooth lesions or tooth wear [3]. Cervical tooth wear often results in the loss of tooth structure integrity, leading to tooth sensitivity, plaque retention, pulp involvement, and aesthetic concerns [3], [4]. Several studies have assessed the prevalence of tooth erosion, revealing that 68.5% of patients have cervical tooth wear, with the most common occurrence observed in the premolar region (Kolak et al., 2018). In a study by Zuza et al. (2019) involving 738 participants, the prevalence of cervical tooth wear was found to be 52% [5], [6].

The combination of abrasion, erosion, and abstraction is considered a multifactorial cause of cervical tooth wear [1], [7], [3]. Tooth brushing is widely believed to be the leading cause of abrasion. Some studies on the toothbrushing force have discovered that higher brushing forces tend to cause more cervical tooth wear [8]. In 2019, Nguyen Thi Kim Huong conducted a study on 36 patients with cervical tooth wear and found that most patients had a horizontal brushing technique, accounting for 91.7% [9].

The Tooth Wear Index (TWI) by Smith and Knight [10] records the score of wear on all visible surfaces of each tooth (facial, lingual, cervical, and occlusal surfaces). This index does not differentiate the mechanisms of wear or different types of wear, such as attrition, abrasion, or erosion, making it convenient for monitoring the progression of each tooth wear lesion. Moreover, TWI allows the quickly detecting newly developed tooth wear lesions [11].

Medical students are essential in raising

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awareness, disseminating information, and promoting preventive measures. Therefore, surveying the prevalence of cervical tooth wear, as well as the knowledge and brushing habits among this population, is necessary to improve their awareness and ability to care for oral health, prevent diseases among students, and provide proper guidance on brushing habits to prevent and manage cervical tooth wear.

It is crucial to identify and recognize the early stages of tooth wear in young individuals and understand the associated factors for timely prevention and intervention. Hence, we conducted the research project "Study on the prevalence of cervical tooth wear and its correlation with brushing habits among Hue University of Medicine and Pharmacy students".

Objectives:

1. To determine the rate and score of cervical tooth wear in young individuals aged 18 - 25.

2. To investigate the relationship between brushing habits and cervical tooth wear.

2. MATERIALS AND METHODS

The study sample included 60 students at Hue University of Medicine and Pharmacy aged 18-25 who visited the Odonto-Stomatology Clinic, Family Medicine Center from November 2020 to April 2021. The patients did not have orthodontic appliances. Therefore, the minimum sample size was determined to be 60 students, calculated with a 5% margin of error and 95% confidence level. The research subjects were interviewed to complete the questionnaire, and a clinical examination was conducted after obtaining their consent to participate.

The Tooth Wear Index (TWI) by Smith and Knight (Table 1) recorded the score of wear on all visible surfaces of each tooth (outer surface, inner surface, cervical area, occlusal surface). Each tooth's surface was scored from 0 to 4 based on specific criteria outlined in Table 1. In case of doubt, a lower score was given. This index does not differentiate between the mechanisms of wear or distinguish between types of wear, such as attrition, erosion, or abrasion. Additionally, TWI facilitates quickly detecting newly developed tooth wear lesions [11].

Table 1. Smith and Knight Tooth Wear Index [10]

Score	All teeth/ surface	Description
0	- B/ L/ O/ I	- No loss of enamel surface characteristics
	- C	- No loss of contour
1	- B/ L/ O/ I	- Loss of enamel surface characteristics
	- C	- Minimal loss of contour
2	- B/ L/ O	- Loss of enamel exposing dentine for less than one third of surface
	- I	- Loss of enamel just exposing dentin
	- C	- Defect less than 1 mm deep
3	- B/ L/ O	- Loss of enamel exposing dentin for more than one third of surface
	- I	- Loss of enamel and substantial loss of dentin
	- C	- Defect less than 1 - 2 mm deep
4	- B/ L/ O	- Complete enamel loss, pulp exposure, secondary dentin exposure
	- I	- Pulp exposure or exposure of secondary dentin
	- C	- Defect more than 2 mm deep, pulp exposure, secondary dentin exposure

(B: buccal; L: lingual; O: occlusal; I: incisal; C: cervical)

However, specific issues have been identified with the Smith and Knight index, including the time frame for developing lesions, the data obtained, and the comparison with threshold levels for each age group. The proposed thresholds are high, while the encountered error is the underestimation of pathological tooth wear. Therefore, these indices have been adjusted, and the tooth wear index system, according to Smith and Knight, has been modified to classify lesions as mild, moderate, or severe (Table 2 and Figure 1). This system establishes a direct correlation between the degree of wear and the clinical progression of lesions during follow-up visits [12].

Table 2. Modified Smith and Knight tooth wear index [12]

Score	Cervical wear depth	Rating level
0	< 1 mm	Shallow
1	1 - 2 mm	Moderate
2	> 2 mm	Depth

a. Shallow level b. Moderate c. Depth level

Figure 1. Levels of tooth wear

The data were processed and analyzed using SPSS 20 software. The Chi-square test was used to compare proportions between different groups, and the values were evaluated with a significance level of $p < 0.05$. In addition, the correlation between variables was examined using the simple logistic regression method. The results were presented in tabular form using Microsoft Office Word 2013 software and in graphical form using Microsoft Office Excel 2013 software.

The conduct of the study was approved by the Board of Directors of the Department of Odonto-Stomatology, Center for Family Medicine. Patients were informed and explained about the purpose of the study and participated voluntarily. All information about the study subjects was kept confidential and only reported in aggregate form.

3. RESULT

The study sample comprised 60 students aged 18 to 25, including 14 males (23.3%) and 46 females (76.7%). The average age of the sample population was 21.05 + 2.045. All participants in the study used toothpaste containing abrasive agents and fluoride.

3.1. Determining the rate and score of cervical tooth wear in young individuals aged 18 - 25

Table 3. Overall rate of cervical tooth wear and breakdown by gender

Object	Cervical tooth wear	
	Quantity	Ratio %
Female (n = 46)	25	54.3
Male (n = 14)	7	50.0
p - value	0.775 (p > 0.05)	
Total (n = 60)	32	53.3

Among the 60 examined students, 32 had at least one tooth with cervical tooth wear (score 1). The current prevalence of cervical tooth wear in the study sample was 53.3%. The rate of cervical tooth wear in female students accounted for 54.3%, while in male students, it accounted for 50.0%.

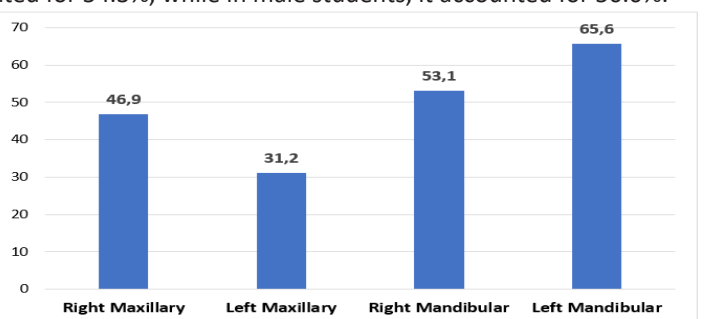

Chart 1. Cervical tooth wear rate by jaw part (%)

The left mandibular has the highest rate of cervical tooth wear at 65.6%. Conversely, the left maxillary has the lowest rate of cervical tooth wear at 31.2%.

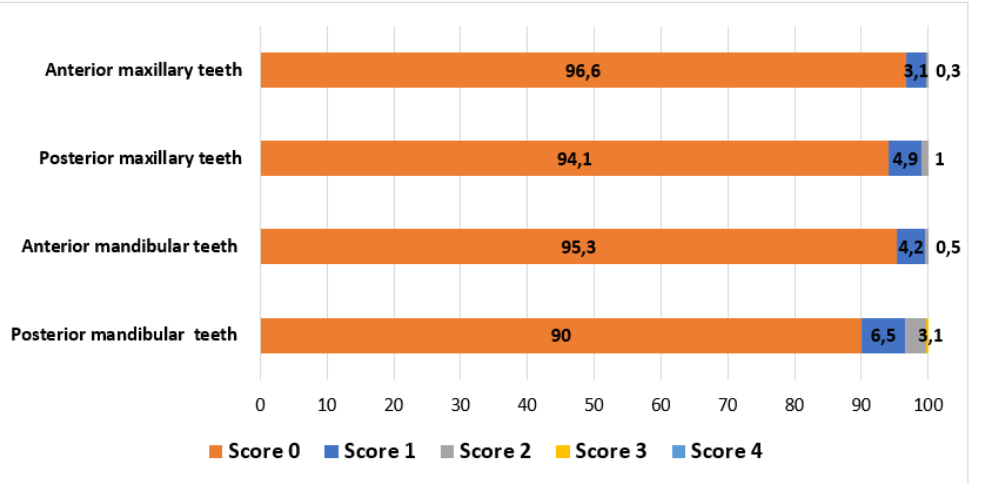

Chart 2. Percentage of wear by tooth group (%)

In all four groups of teeth, the most common is score 0 (no tooth wear), accounting for more than 90%. Then there is score 1, accounting for 3.1%; 4.9%; 4.2%, and 6.5% in the group of anterior maxillary teeth, posterior maxillary teeth, lower anterior teeth, and mandibular posterior teeth, respectively. Score 2 accounts for 0.3%; 1.0%; 0.5%, and 3.1% in 4 groups of anterior maxillary teeth, posterior maxillary teeth, lower anterior teeth, and mandibular posterior teeth, respectively. Score 3 only appeared in the posterior mandibular teeth, accounting for 0.4% - no score of 4 cervical tooth wear.

3.2. Investigate the relationship between brushing habits and cervical tooth wear

Table 4. Correlation between cervical tooth wear and brushing frequency, brushing method, brush hardness and brush replacement time.

		Total Quantity	Cervical tooth wear		p - value	OR (CI 95%)
			Ratio %			
Daily toothbrushing	Once time a day	3	1	33.3	0.592	2.000 (0.201 - 19.914)
	Twice times a day	44	22	50.0	0.554	2.000 (0.525 - 7.621)
	Three times a day	13	9	69.2	0.310	
Brushing style	Horizontal	24	18	75.0	0.008	4.714 (1.506 - 14.76)
	Vertical/Other	36	14	38.9		
Type of bristles	Soft	35	23	65.7	0.025	3.407 (1.164 - 9.976)
	Hard	25	9	36.0		
Brush change time	3 months	41	25	61.0	0.086	2.679 (0.871 - 8.240)
	> 3 months	19	7	36.8		

The study's results showed no relationship between the frequency of daily brushing and the presence of cervical tooth wear. Horizontal brushing habits were associated with the company of cervical tooth wear ($p < 0.05$). People who have the habit of brushing horizontally have a higher rate of cervical tooth wear than those who brush their teeth vertically or in other directions. The use of soft toothbrushes was associated with the presence of cervical tooth wear ($p < 0.05$). Soft brush users are 3.407 times more likely to have cervical tooth wear than demanding ones. And there was no association between brush replacement time and the presence of cervical tooth wear.

Table 5. Relationship between impact force when brushing teeth and cervical tooth wear

Force applied during toothbrushing	Total	Cervical tooth wear		p - value
		Quantity	Ratio %	
No force	1	0	0	
Little force	51	26	51	0.175
A lot of force	8	6	75	

There was no association between brushing force and the presence of cervical tooth wear.

4. DISCUSSION

With the desire to evaluate the rate of cervical tooth wear and the relationship with brushing habits in young people aged 18-25, we randomly selected students from Hue University of Medicine and Pharmacy to visit the Odonto-Stomatology Clinic, Family Medicine Center. The study sample included 60 patients aged 18 to 25, 14 men and 46 women. The mean age of the sample population is 21.05.

4.1. Rate and score of cervical tooth wear in young people aged 18 - 25

Regarding the rate of cervical tooth wear, the results of our study showed that the overall rate of cervical tooth wear in students was 53.3%. Our results are similar to Zuza's (2019) study but lower than Kolak et al. (2018) study. In 2019, Zuza studied 738 people from 8 towns/municipalities in the Republic of Srpska, Bosnia, and Herzegovina, for a cervical tooth wear rate of 52.0% [6]. Kolak et al. (2018) surveyed 394 patients, showing that 68.5% had cervical tooth wear [5]. There are differences between the results of studies, which can be explained by differences in research subjects (race, age, occupation,...), research area, and research time. However, studies show that the rate of cervical tooth wear is still relatively high, even in young people. Therefore, we must pay more attention to preventing cervical tooth wear to promote dental health for everyone.

According to the results of the rate of cervical tooth wear by jaw segment (chart 1), it was found that cervical tooth wear lesions appeared most in the posterior mandibular area (75%) and the left mandibular (65.6%). This may be because most Vietnamese people are right-handed, so brushing on the left manibular will be more convenient; patients will habitually brush their teeth thoroughly for a longer time than on the right jaw.

Regarding the score of cervical tooth wear, in all four groups of teeth, the most common is score 0 (no tooth wear), accounting for more than 90%. Then there is score 1, accounting for 3.1%, 4.9%, 4.2%, and 6.5% in the group of anterior maxillary teeth, posterior maxillary teeth, anterior mandibular teeth, and posterior mandibular teeth. Score 2 accounts for 0.3%; 1.0%; 0.5%, and 3.1% in the group of anterior maxillary teeth, posterior maxillary teeth, anterior mandibular teeth, and posterior mandibular teeth. Score 3 only appeared in the posterior mandibular teeth, accounting for 0.4%. There is no score 4 wear. This may be due to the young age of the study subjects (18-25 years old); the time of exposure to factors causing cervical tooth wear is not long, so the number of teeth and the score of wear remaining short. Our results are pretty consistent with the study of Nguyen Ho Lan Huong (2017); the rate of score 0 is 83.6%, score 1 is 8.1%, score 2 is 6.5%, score 3 is 1.4%, and score 4 is 0.4% [13]. In Kumar's study (2015), score 1 and score 2 lesions accounted for the most proportion, 59.8%, and 20.7%, respectively [14].

4.2. Investigate the relationship between brushing habits and cervical tooth wear

In 2015, Heasman et al. conducted a systematic review of the effects of toothbrushing (excluding toothpaste) on the development of cervical tooth wear. As a result, they acknowledged that brushing frequency, brushing method, and bristle hardness are related to cervical tooth wear [15].

In our study, we did not observe a significant correlation between daily brushing frequency and the presence of cervical tooth wear ($p > 0.05$) (Table 4). The horizontal brushing technique was found to be associated with the presence of cervical tooth wear ($p < 0.05$). Individuals who practiced horizontal brushing had a 4.714 times higher risk of cervical tooth wear than those who brushed vertically or in other directions.

There was a correlation between the presence of tooth wear and the hardness of toothbrush bristles. Our study showed that using a soft-bristled toothbrush was associated with a 3.407 times higher risk of cervical tooth wear than using a hard-bristled toothbrush. This result aligns with Wiegand's (2009) study, which suggested that tooth wear increases

with decreasing fiber diameter, indicating more flexibility and softness [16]. However, multiple studies have reported contradictory findings. For example, Nguyen Ho Lan Huong's study (2017) found that individuals using hard-bristled toothbrushes had a 3.6 times higher risk of cervical tooth wear and outer surface wear than those using soft-bristled toothbrushes [13].

Our study did not find a correlation between brushing force and tooth wear ($p > 0.05$). This finding is consistent with Tussi's (2019) study, which suggested that brushing power does not affect the amount of tooth tissue loss or the angle of wear. Although increasing brushing force leads to a more significant deviation of bristles and the increased contact area between the strands and tooth surface, these impacts may be diminished because, in this study, the hairs were arranged at different levels and angles. Therefore, some may not contact the tooth surface [17]. However, Zuza's survey in 2019 found that brushing force intensity was associated with the presence of cervical tooth wear ($p < 0.05$) [6].

5. CONCLUSION

The overall rate of cervical tooth wear in patients was relatively high (53.3%), mainly occurring in the posterior mandibular teeth (75.0%) and the left mandibular (65.6%). At the same time, there is a relationship between horizontal brushing habits and brush hardness with cervical tooth wear. Therefore, we must pay more attention to preventing cervical tooth wear to promote dental health for everyone.

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