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Factors influencing cervical abrasion among school going adolescents - An analytical cross-sectional study in Puducherry

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ABSTRACT:
Introduction: Cervical abrasion is wearing out of the tooth caused by external mechanical forces on the tooth surface other than tooth-tooth contact. This non-carious tooth surface loss most commonly occurs due to over brushing. It often leads to sensitivity, plaque trapping, periodontal disease and cavities. **Objectives:** 1. To find out the prevalence of cervical abrasion among school going adolescents. 2. To determine the factors influencing the development of cervical abrasion among school going adolescents**. Materials and methods:** An analytical cross-sectional study was carried out in Presidency Higher Secondary School, Puducherry and Stansford International school, Puducherry was conducted by the team of Laugh and Smile dental clinic, Puducherry. 500 school students from the standards of 8, 9, 10, 11 and 12 were screened in this study. **Results:** Significant association was present between cervical abrasion and factors such as aggressive brushing, nail biting, pica and the use of abrasive toothpastes. Males also show a higher prevalence of cervical abrasion compared to females. The P-value indicates that these associations are statistically significant, suggesting that those behaviors may be risk factors for cervical abrasion. **Conclusion:** Frequent dental check-ups would help in diagnosing these conditions at early stages which in turn would prevent severe complications in the future.

Introduction:

Tooth wear also known as non-carious tooth surface loss (NCTSL) is a physiological process that causes enamel loss, the outermost structure of the teeth, dentin is also affected in advanced cases [1]. When the loss of tooth structure comprises the survival of the tooth and is a concern to the patient or when it is disproportionate to the presenting age of the patient it is referred to as being pathological [2]. Pathological tooth wear also occurs in younger age groups.

The etiology of various forms of tooth wear is commonly overbrushing, diet, grinding of teeth, parafunctional activity etc., which leads to loss of hard tissues because of a combination of mechanical and chemical processes [3]. Tooth surface loss does not include trauma or bacteria or developmental disorders. The management of tooth wear is not very easy because tooth wear if arises is mostly present in at least 3-4 teeth in a single person [4].

Cervical abrasion is wearing away of the tooth which is caused by abrasive external mechanical forces on the tooth surface by any object other than tooth-tooth contact [5]. But the most common cause of cervical abrasion is over brushing or incorrect tooth brushing in horizontal strokes [6]. Acid erosion has also been seen to be associated with the occurrence and progression of the cervical lesion [7]. These abrasive lesions mostly occur in the cervical third of the tooth surface and so is the name cervical abrasion [8]. It often leads to sensitivity, plaque trapping, periodontal disease and cavities [5]. Abrasion mostly occurs in the elderly age groups because of various associated etiological factors.

These lesions are usually V-shaped or have a crescent moon shape present at the cervical margin of the buccal surface of the tooth. It is a little difficult to distinguish between GV blacks' class 5 caries and cervical abrasion. Initially the lesion starts as a small horizontal groove in the cervical lesion [9]. Cervical abrasion looks shiny, worn, yellow/brown in color and does not have any catch because it is caries free. The patient often presents with complaints of hypersensitivity because of the loss of enamel and exposure of dentin. In extreme cases, the pulp might get exposed if these lesions are not properly managed leading to development of pain. Tooth loss is rapid at the cementoenamel junction compared to other areas because the enamel is thin in this region of the tooth. Cervical abrasion commonly occurs in premolars and canines followed by molars.

Some of the common factors influencing cervical abrasion are over Brushing with horizontal strokes, using hard toothbrushes with abrasive toothpastes, denture clasps which exert unwanted pressure on the tooth surface, pipe smoking [3], pen biting or nail biting (habitual abrasion), use of toothpicks and floss in a faulty manner would result in proximal abrasion, in earlier days in a tribe of Africa, the people would willingly chip their tooth to get the appearance of cervical appearance (ritual abrasion) [10].

Objectives:

1. To find out the prevalence of cervical abrasion among school going adolescents
2. To determine the factors influencing the development of cervical abrasion among school going adolescents.

Materials and methods:

Study setting and data collection:

An analytical cross-sectional study was executed in Presidency Higher Secondary School, Puducherry and Stansford International school, Puducherry and was conducted by the team of Laugh and Smile Dental clinic, Puducherry. The study was conducted for a period of 6 months from January 12, 2024 to June 12, 2024. This study included 320 students in the standards of 8, 9, 10, 11 and 12. All children are eligible for the study irrespective of age, gender or socioeconomic status.

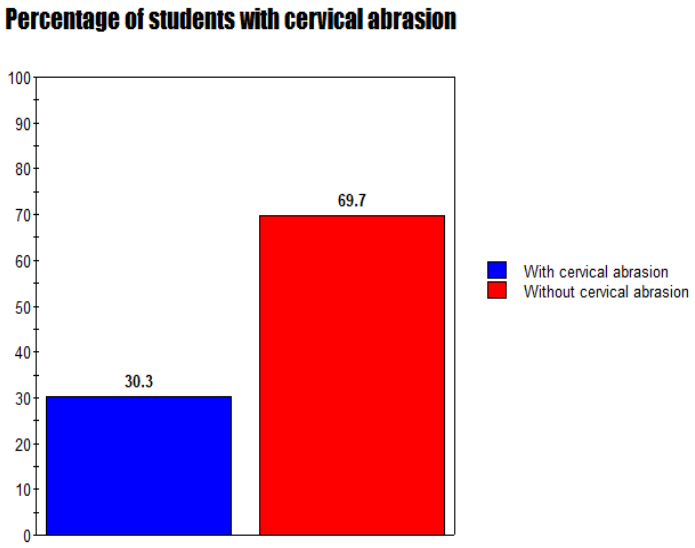
For each participant, the dentist examined the oral cavity using an ice cream stick after drying the tooth surface with cotton balls or gauze squares and torch light for illumination. Visual full mouth oral examination was done for cervical abrasion, attrition, decayed, missing, filled tooth and any pain, swelling or abscess was also examined. Once used the ice-cream sticks were disposed of in the waste bin.

Data analysis:

Data entry done and analyzed in SPSS software (version 24). Bivariate and multivariate analysis used to determine the factors associated with cervical abrasion. Multiple coefficient of determination (R employed as the goodness-of-fit statistic for the model. Statistical significance fixed at 5% ($p > 0.05$)

Results:

Figure 1: Percentage of school-going adolescents with cervical abrasion (N – 320)



The total number of participants in this study was N - 500. A total of 7 dentists examined the school children. Among the children examined for the presence of cervical abrasion, 30.3% (N – 320) of the children had cervical abrasion (Figure 1).

Table 1: Determinants of cervical abrasion among school-going adolescents in Bivariate analysis (N – 320)

	Total N	Cervical abrasion n	unadjusted	P-value
Sex				
Male	160	60 (37.5)	**1.99 (1.22 – 3.25)***	**0.005***
Female	160	37 (23.1)	1	
Aggressive brushing				
Yes	182	80 (44.0)	**5.58 (3.11 – 10.03)***	**0.001***
No	138	17 (12.3)	1	
Nail biting				
Yes	140	55 (39.3)	**2.00 (1.24 – 3.23)***	**0.046***
No	180	44 (24.4)	1	
Pica				
Yes	19	15 (78.9)	**10.01 (3.23 – 31.06)***	**0.001***
No	301	82 (27.2)	1	
Usage of abrasive toothpaste				
Yes	56	38 (67.9)	**7.33 (3.40 – 13.79)***	**0.001***
No	264	59 (22.3)	1	
Acid peptic disorders				
Yes	16	10 (62.5)	**4.16 (1.47 – 11.79)***	**0.007***
No	304	87 (28.6)	1	
Regular dental checkup				
Yes	238	82 (34.4)	**2.35 (1.26 – 4.37)***	**0.007***
No	82	15 (19.0)	1	

Table 2: Determinants of cervical abrasion among school-going adolescents in Multivariate analysis [N=320]

Variables	Total N	Cervical abrasion n	unadjusted	P-value
Aggressive brushing				
Yes	182	80 (44.0)	**5.58 (3.11 – 10.03)***	**0.001***
No	138	17 (12.3)	1	
Pica				
Yes	19	15 (78.9)	**10.01 (3.23 – 31.06)***	**0.001***
No	301	82 (27.2)	1	
Usage of abrasive toothpaste				
Yes	56	38 (67.9)	**7.33 (3.40 – 13.79)***	**0.001***
No	264	59 (22.3)	1	
Acid peptic disorders				
Yes	16	10 (62.5)	**4.16 (1.47 – 11.79)***	**0.007***
No	304	87 (28.6)	1	

In our study 60 out of 160 (37.5%) of males had cervical abrasion, with an odds ratio of 1.99 (indicating nearly double the odds compared to females). 37 out of 160 (23.1%) of females had cervical abrasion. The difference in prevalence between males and females was found to be statistically significant ($p<0.05$)

Among those who reported aggressive brushing (182 participants), 80 (44%) had cervical abrasion, with a high odds ratio of 5.58, indicating a strong association and a very significant P-value (0.001). Those who did not report aggressive brushing (138 participants), only 17 (12.3%) had cervical abrasion.

Nail biters (140 participants), 55 (39.3%) had cervical abrasion, with an odds ratio of 2.00 and a P-value of 0.046, indicating a significant association. Among non-nail biters (180 participants), 44 (24.4%) had cervical abrasion.

Individuals with pica (19 participants); 15 (78.9%) had cervical abrasion, showing a strong association with an odds ratio of 10.01 and a highly significant P-value (0.001). Individuals without pica (301 participants); 82 (27.2%) had cervical abrasion

Users of abrasive toothpaste (56 participants); 38 (67.9%) had cervical abrasion, with an odds ratio of 7.33 and a very significant P-value (0.001). Non-users (264 participants); 59 (22.3%) had cervical abrasion.

Significant association was present between cervical abrasion and factors such as aggressive brushing, nail biting, pica and the use of abrasive toothpastes. Males also show a higher prevalence of cervical abrasion compared to females. The P-value indicates that these associations are statistically significant, suggesting that those behaviors may be risk factors for cervical abrasion.

Discussion

In this study, we screened 500 school participants. We wanted to explore the risks associated with tooth wear. The most common cause associated with cervical abrasion was over brushing and use of hard toothbrushes. The most common area for abrasion was second premolars in the lower arch followed by canines.

This study aimed to assess the prevalence and factors influencing cervical abrasion among school-going adolescents in Puducherry. The findings reveal a concerning prevalence of cervical abrasion, particularly linked to preventable habits such as aggressive brushing, the use of hard toothbrushes, and the consumption of abrasive toothpaste. This aligns with existing literature that suggests that improper brushing techniques significantly contribute to dental wear, particularly in young populations.

The results indicate that males are more affected by cervical abrasion than females, which is consistent with previous studies that highlight gender differences in oral hygiene practices and habits. The higher prevalence of cervical abrasion in participants who reported aggressive brushing techniques underscores the need for educational interventions that emphasize proper oral hygiene practices. The V-shaped lesions characteristic of cervical abrasion were predominantly observed in the premolar and canine regions, which are more susceptible due to their anatomical features and the common brushing patterns adopted by adolescents.

Moreover, factors such as nail-biting and the use of pica were found to be significantly associated with cervical abrasion. These habits not only pose risks to dental health but also reflect underlying behavioral issues that may require psychological or behavioral intervention. The high prevalence of cervical abrasion among those using abrasive toothpaste further emphasizes the necessity for informed choices in dental care products, highlighting the role of dental professionals in patient education.

Our study's findings also suggest that regular dental check-ups are crucial. Participants who engaged in routine dental visits showed a significantly lower incidence of cervical abrasion, reinforcing the importance of preventive dentistry. This highlights the need for schools and communities to facilitate access to dental care, ensuring that adolescents can receive timely interventions.

According to a study done by an author with 80 individuals 40 exhibited evidence of cervical abrasion. Males were mostly affected when compared to females. The most common tooth to exhibit cervical abrasion was maxillary first molars. And it was observed that cervical abrasion was associated with factors such as quantity of dentifrice and the type of toothbrushes used similar to the results of our study [11].

In another cross-sectional study done, overall prevalence of cervical abrasion among the participants was found to be 37.2%. 97.7% of subjects with abrasion had tooth sensitivity. Cervical abrasion was higher in participants brushing their teeth horizontally and in participants using fluoride dentifrices and hard toothbrushes [12]. Similar to the results of our study, the use of abrasive toothpastes is a major cause for the development of cervical abrasion. In an in vitro study done to establish the relationship between toothbrush stiffness and toothbrushing force on the abrasive wear of tooth, it was observed that soft bristled toothbrushes are less abrasive even with increasing brushing force when compared to medium stiffness toothbrushes [13].

In another survey conducted by an author, it was seen that increase in the frequency of toothbrushing increases cervical abrasion, and it was also seen that horizontal toothbrushing technique increases cervical abrasion [14]. In a systematic review done , it was seen that there is a significant difference in prevalence of cervical abrasion in relation to age, toothbrushing frequency, type of bristles and technique used for toothbrushing [15]. In another study a computational toothbrush model was used to simulate cervical abrasion, and it was seen that brushing force had a greater effect on tooth abrasion than the brushing speed and the cervical abrasion was mainly concentrated in the interproximal areas [16].

The strengths of the current study are triangulation done in the data collection (survey observation) to improve the internal validity of the study and questionnaire is in alignment with the standard guidelines. Limitations of this study include the reliance on self-reported data regarding oral hygiene practices, which may introduce bias. Additionally, the cross-sectional design limits the ability to establish causality. Future longitudinal studies are warranted to better understand the progression of cervical abrasion and its long-term effects on dental health.

Conclusion:

Cervical abrasion was influenced by many preventable habits in school going adolescents like aggressive brushing, nail biting, pica, teeth grinding at night, usage of abrasive toothpaste and consumption of sweet beverages. Further, frequent dental check-ups would help in diagnosing these conditions at early stages which in turn would prevent severe complications in the future. Innovative context-specific behavior change

communication strategies in consultation with the parents, teachers and healthcare professionals are needed to change the negative oral habits.

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