



Original Article

Severity of Dental Abrasion and Its Association with Oral Hygiene Behaviors

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ABSTRACT

Dental abrasion (DA) is an erosive activity that wears away the surface of teeth. Due to the use of abrasive dentifrices and incorrect brushing techniques, it is a multifactorial phenomenon.

Objective: To assess the severity of dental abrasion in association with oral hygiene behaviors.**Methods:** A total of 278 undergraduate students aged 18 to 25 years were enrolled in this study who were having abrasion of permanent dentitions. Mouth mirror and CPITN probe were used to detect abrasion on the labial surface of front teeth and conducted a questionnaire. The Smith and Knight's Tooth Wear Index was used to measure the severity and frequency of dental abrasion in the patients. SPSS version-22 was used to analyze the data. **Results:** From 278 participants, females were 163 (58.6%) and males were 115 (41.4%). Majority 132 (47.5%) were using medium type of brush, most of the cases 122 (43.9%) brushing twice a day. About 107 (38.5%) using brushing methods in combination, 137 (49.3%) were using brush for 1-2 minutes. Tooth sensitivity was reported in 133 (47.8%) of the cases. Out of all, DA was found in 160 (58%) of the cases. According to severity, minimum loss of surface characteristics was in 220 (79.1%). A highly significant association ($p < 0.001$) was found between the type of brush and dental abrasion. A non-significant association ($p = 0.816$) was found between both frequency of brushing and dental abrasion. **Conclusions:** Brushing parameters did not affect abrasive lesions. Further study and long-term follow-up are required to distinguish oral hygiene routines from tooth abrasion.

INTRODUCTION

Attrition, erosion, and abrasion are the three types of tooth wear. Dental abrasion may happen anywhere, even between teeth, and is most often observed at the cervical necks of teeth, although it can also happen by using dental floss incorrectly or vigorously. While tooth-brush abrasion has long been believed to be the main cause of cervical abrasion, acid erosion has been linked to the beginning and progression of the cervical lesion. It is obvious that identifying the risk factors is crucial for changing any behaviors and offering the right guidance [1]. Clinical survey-based research has showed that dental abrasion is

by far the most common etiological variable for the onset of non-cervical lesions (NCCL), and is most typically caused by improper tooth-brushing technique [2]. TSL (tooth surface loss) is a complicated damaging process. It is a term that mostly refers to non-carious TSL, which has no association with bacteria, and it is defined by non-carious loss of dental tissues around the cement-o-enamel junction, where enamel is thinnest [3]. There are many recorded causes of hard tooth structure loss; some could be reversible and others are irreversible. The TSL can influence tooth sensitivity, caries incidence, plaque

retention, pulp vitality, structural integrity, and esthetic problems [4]. Aside from dental caries in the cervical region of the tooth, the variables responsible for tooth structure loss are complicated and have not been fully characterized [5]. Dental abrasion is one of the factors associated with TSL. It is the mechanical wear of the tooth structure caused by recurrent physical contact, primarily by abrasive dentifrices and/or toothbrushes [6]. It generally manifests as a wedge-shaped or V-shaped ditch on the cement-enamel junction of teeth and root surfaces [7]. Oral hygiene comprises the process of brushing one's teeth frequently (dental hygiene) and keeping one's mouth clean, disease-free, and free of other concerns (such as bad breath or halitosis)[8]. Regular oral hygiene is vital for preventing dental infection and halitosis. Brushing the teeth should take no more than 2 minutes and should be done twice a day. Brushing the teeth too forcefully can cause dental sensitivity, receding gums, and loose teeth in the long run. Excessive pressure during teeth brushing, hard toothbrushes, abrasive toothpaste, and abrasive tooth powders are the most common causes of dental abrasion [9]. Other causes of dental abrasion include incorrect toothpick use, abrasive diets, and touching rough or hard dental surfaces, such as rough porcelain crowns. Dental abrasion has a complex etiology that occurs from the additive effects of several variables [10]. According to the literature, tooth brushing habit has a crucial impact in the development of TSL. The source of the increase in TSL occurrence is unknown; it could be owing to developments in restorative and preventative dentistry, or it could be due to improved awareness among dental and patient care professionals [11]. People can protect their teeth; however, this contributes to additional concerns, TSL being one of them. Patients who cleaned their teeth more frequently had higher rates of tooth surface loss than patients who brushed once a day. Abrasive TSL on the occlusal surface can also be caused by diet, chewing abrasive substances such as cigarettes, or frequent exposure to grit and dust [12]. Eating unwashed veggies that still contain trace amounts of soil may also be caused. Thread chewing, pipe smoking, and grasping hair pins in between the teeth can all produce abrasion on the tooth surface. Consuming dried sunflower seeds may cause abrasion sores [13]. It has been discovered that tooth surface loss becomes more common as one gets older. This is not surprising given that older patients, along with their teeth, are exposed to the key etiological variables for a longer length of time than younger patients, and so are expected to have higher tooth structure loss [14]. Furthermore, older people are more likely to have gingival recession as well as bone loss, which increases the susceptibility of the cementum and root surfaces, putting

them at a higher risk of tooth surface loss (TSL)[15]. Tooth brushing is much more common in current times, which enhances the community's oral hygiene conditions while also making the harm inflicted more visible in severity and occurrence [16]. Early identification of tooth surface loss (TSL) is critical because tooth wear can result in dental hypersensitivity, loss of tooth shape and function, or even an underlying abscess. This study could be beneficial to arrange the awareness programs for the population to teach correct tooth brushing techniques and other oral hygiene behaviors to prevent this issue from becoming even worse and a burden on dental professionals and our society.

METHODS

This Cross-Sectional study with non-probability convenience sampling was conducted at Liaquat University of Medical and Health Sciences, Jamshoro. Study participants were students of BDS, MBBS, Bachelor in Nursing and Doctorate in Physiotherapy. The sample size was calculated by using the Open Epi online calculator and it was set as 278 in total. This study was conducted for six months after approval of synopsis from 12-12-2018 to 15-7-2019. Patients of either gender having age range of 18-25 years and permanent dentition with presence of dental abrasion were included in the study. Whereas, partially dentulous (anterior teeth) having restored or carious tooth surface, developmental anomalies or syndromes associated to dental hard tissues, class V restoration done on the buccal surface, patients wearing orthodontic braces were excluded from study. All the students fulfilling inclusion criteria were selected in the study. All the students were examined clinically using mouth mirror and probe in day light. A questionnaire was completed and a single examiner recorded abrasion on the buccal surface of teeth. The participants underwent an assessment to determine the frequency and severity of dental abrasion, utilizing the tooth wear index (TWI) developed by Smith and Knight [13]. Data were analyzed using statistical package for social sciences (SPSS) version 22.0 for windows. Frequencies and percentages of categorical variables like gender, course, year of study, types of brush, frequency of tooth brushing, methods of tooth brushing, cleaning agents, use of tooth picks, teeth sensitivity, pan Chaila chewing, biting hard objects, tooth abrasion were generated. The mean and standard deviation of continuous variables like age were computed. Chi-square test was used to test association between categorical variables like tooth abrasion and gender and (types of brush, frequency of tooth brushing, methods of tooth brushing). The level of significance was considered as ≤ 0.05 .

RESULTS

A total 278 participants were included in the study, among them females were 163 (58.6%) and males were 115 (41.4%). Most of the participants were from rural areas 148 (53.2%) and 130 (46.8%) belongs to urban areas. Cumulatively while incorporating all undergraduates' programs related to selected disciplines, the 130 (46.8%) of the study participants were studying in 2nd year, 48 (17.3%) were in first year, 50 (18%) in fourth year, 34 (12.2%) were in final year and 16 (5.8%) were in third year. In term of discipline the ration of participants from MBBS was 73 (26.3%), BDS 81 (29.1%), Nursing 84 (30.2%) and physiotherapy 40 (14.4%) shown in Table 1.

Table 1: Distribution of study participants on the basis of Demographics

Variables	Frequency (%)
Gender	
Male	115(41.4)
Female	163(58.6)
Residence	
Urban	130(46.8)
Rural	148(53.25)
Year of Education	
1st Year	48(17.3)
2nd Year	130(46.85)
3rd Year	16(5.8)
4th Year	50(18)
Final Year	34(12.25)
Discipline	
MBBS	73(26.25)
BDS	81(29.1)
Nursing	84(30.2)
Physiotherapy	40(14.4)

According to brush types, 132 (47.5%) using medium type of brush, 125 (45%) using soft type and 21 (7.6%) using hard type brush. Most of the cases 122 (43.9%) brushing twice a day, 109 (39.2%) brushing once a day, 27 (9.7%) occasionally using brushing, 15 (5.4%) not brushing continuously and only 5 (1.8%) cases brushing thrice a day. According to methods of brushing, 61 (21.9%) using brushing horizontally, 26 (9.4%) using vertically, 84 (30.2%) brushing circular and 107 (38.5%) using brushing methods in combination. Majority of the participants 137 (49.3%) were using brush for 1-2 minutes, followed by 100 (36%) for more than 2 minutes, and 41 (14.7%) for only one minute. Tooth sensitivity was reported in 133 (47.8%) of the cases, while 118 (42.4%) had not any sensitivity and 27 (9.7%) do not know regarding it shown in Table 2.

Table 2: Distribution of study participants on the basis of Oral Hygiene Behaviors

Variables	Frequency (%)
Brush Type	
Soft	125(45)

Medium	132(47.5)
Hard	21(7.5)
Frequency of Brushing	
No Brushing	15(5.4)
Occasionally	27(9.7)
Once a day	109(39.2)
Twice a day	122(43.9)
Thrice a day	5(1.8)
Method of Brushing	
Horizontal	61(21.9)
Vertical	26(9.4)
Circular	84(30.2)
Combination	107(38.5)
Duration of Brushing	
1 minute	41(14.7)
1-2 minutes	137(49.3)
More than 2 minutes	100(36)
Teeth Sensitivity	
Present	133(47.8)
Absent	118(42.4)
Don't Know	27(9.7)

Out of all, dental abrasion was found in 160 (58%) of the cases while 118 (42%) of the cases reported no dental abrasion shown in Figure 1.

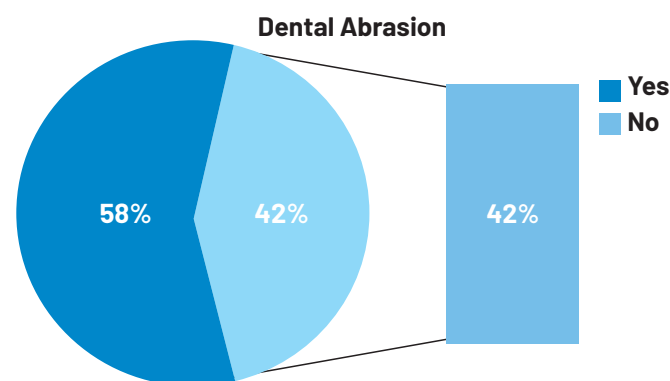


Figure 1: Distribution of Study Participants According to Dental Abrasion (n=278)

According to severity, minimum loss of surface characteristics was in 220 (79.1%) and loss of enamel exposing dentin for < 1/3 of surface was seen in 58 (20.9%) of the cases shown in Figure 2.

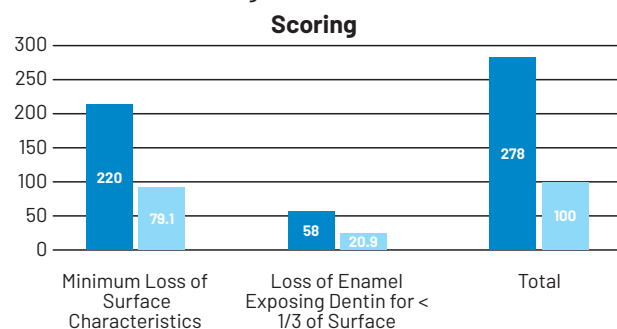


Figure 2: Distribution of Study Participants According to its Severity (n=278)

A non-significant association ($p=0.432$) was found between both genders, frequency of brushing, methods of brushing and brushing time with dental abrasion. While a highly significant association ($p<0.001$) was found between the type of brush (soft, medium and hard) and dental abrasion shown in Table 3.

Table 3: Association of study variables with Dental Abrasion

Variables		Dental abrasion		p-value
		Yes	No	
Brush type	Soft	46 (16.50%)	79 (28.40%)	<0.001*
	Medium	100 (36.00%)	32 (11.50%)	
	Hard	14 (5.00%)	7 (2.50%)	
Frequency of Brushing	No brushing	8 (2.90%)	7 (2.50%)	0.816
	Occasionally	16 (5.80%)	11 (4.00%)	
	Once a day	60 (21.60%)	49 (17.60%)	
	Twice a day	72 (25.90%)	50 (18.00%)	
	Thrice a day	4 (1.40%)	1 (0.40%)	
Method of Brushing	Horizontal	35 (12.60%)	26 (9.40%)	0.735
	Vertical	17 (6.10%)	9 (3.20%)	
	Circular	45 (16.20%)	39 (14.00%)	
	Combination	63 (22.70%)	44 (15.80%)	
Brushing Time	1 Minute	25 (9.00%)	16 (5.80%)	0.891
	1-2 Minute	78 (28.10%)	59 (21.20%)	
	More than 2 Minutes	57 (20.50%)	43 (15.50%)	

DISCUSSION

The study was performed on 278 participants and among them 58.6% were females and 41.4% were males. Most of the participants were from rural areas 53.2%, medium type of brush was most prevalent 47.5%, brushing twice a day's frequency of brushing was reported in majority 43.9%, around 38% of the participants used combined method of brushing (circular, vertical and horizontal) and majority 49.3% were doing tooth brushing for 1-2 minutes. Those who brushed more often had greater wear rates than patients who brushed once a day, as shown by study conducted by Sangnes and Gjermo [17]. This might be due to abrasives in the tooth paste, extended brushing time, or poor brushing technique. The etiology of cervical abrasion is essentially multifactorial and is a mix of numerous kinds of wear variables that are connected, such as age, diet, gingival recession, periodontal health, dentifrice, speed, and pressure utilized when brushing. This is consistent with the incidence of cervical abrasion reported by Sud, which was 13%, as well as Sexena *et al.*, (68.6%) and Borcic *et al.*, (60-70%), which were both higher than the present research [18- 20]. David and Bhat reported 6.1%, which is lower than the current investigation rate [21]. While investigating the etiologies of tooth surface loss, research in Romania discovered that abrasion (55.7%) affects the natural dentition more often than the other etiologies related with non-cervical tooth surface loss [22]. The variation observed in research findings could potentially be

ascribed to dissimilarities in sample size and methodology. The study did not investigate the potential interaction between non-carious cervical lesions and other degrading processes such as tooth erosion and abfraction, as these lesions are known to arise from factors beyond abrasive phenomena. Furthermore, a review of the literature reveals that the pathogenesis of non-carious cervical lesions is multifactorial, which may also be responsible for the present investigation's low frequency rate [23, 24]. The Smith and Knight Index of tooth surface loss was used in the present investigation to assess the grade 2 abrasive severity score in the sample group. Similar to the results of the present study, Mushtaq and Ahmed found a mean tooth wear index of 1.70 ± 1.22 for the right mandibular lateral incisor [25]. In addition, our research discovered a negligible correlation between characteristics related to tooth brushing behaviour and abrasive cervical lesions. Comparable cross-sectional research looking at tooth surface loss in connection to dental care and soft drink intake among adults was done in Karachi [26]. One-day tooth brushing by females resulted in localized tooth surface loss of 55.0% and generalized tooth surface loss of 60%. 70.4% of those who brush their teeth for a minute reported anterior tooth surface loss of 70.4% 66.7% of men reported tooth surface loss. The comparison study's output contradicts the present one. Dissimilarities in outputs might be attributed to soft drink intake, which was not measured in the current study. The favorable results of the comparative research may have been influenced by elderly participants, while the present study only comprises participants from a small age range who received less stimulus overall. An Indian study by Bhardwaj on the relationship between hard tissue abrasion and teeth brushing practices among Shimla inhabitants was conducted [27]. Similar to our results, the study discovered no significant association between dental abrasions and variables such as tooth brush type and brushing technique. In contrast to the current conclusion, a significant relationship was discovered between frequency of dental brushing and abrasive lesions. This might be because the bulk of the sample group only brushes their teeth once a day for one minute. Brushes are classified as soft (0.2 mm), medium (0.3 mm), or hard based on the diameter of the bristles (0.4 mm). However, in this case, the force employed may have an additional consequence. The above-mentioned findings have been described in research exercises by Borcic *et al.*, and Yadav *et al.*, [20, 28]. Our research indicated no significant connection, which may be because the majority of the sample population used a medium tooth brush, while Mushtaq and Ahmed discovered a significant link between participants using various kinds of tooth brushes and hard tissue abrasive lesions ($p=0.05$)

[25]. Additionally, the force used to brush one's teeth was not measured in the current study, despite the fact that this is a significant factor in the development of cervical lesions. The present research relied only on feedback from study participants about brushing procedures and toothbrush use, which may result in an insignificant connection between dental brushing parameters and non-carious cervical abrasive lesions. Furthermore, due to intrinsic methodological constraints and inconsistent findings, a review of evidence-based literature does not identify any tooth brushing element as the basic etiology behind the cervical lesions [29].

CONCLUSIONS

Within the constraints of the present study, it gives baseline information on abrasive cervical lesions in undergraduate population of medical university. Second, there was no discernible link between the frequency of abrasive lesions and tooth cleaning parameters. However, further research and long-term follow-up are needed in the future to separate characteristics associated to oral hygiene practices and the occurrence of tooth abrasion.

Authors Contribution

Conceptualization: SP, QK

Methodology: ZHC

Formal analysis: SP

Writing-review and editing: ZHC, SE, RB, RK

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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