

ASSOCIATION OF TOOTH BRUSHING HABITS WITH GINGIVAL RECESSION: A CROSS-SECTIONAL STUDY

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Abstract

Background:

Gingival recession is a common periodontal condition characterized by apical displacement of the gingival margin and exposure of the root surface.

Objective:

To investigate the relationship between gingival recession and toothbrushing habits in adult dental patients.

Methods:

A cross-sectional analytical study was conducted among 152 adults aged 20–65 years attending the dental outpatient department during a six-month study period. Demographic characteristics and toothbrushing habits were assessed using a self-administered questionnaire, while gingival recession was clinically assessed. Data were analyzed using IBM SPSS Statistics version 27.0. Descriptive statistics, chi-square tests, Mann–Whitney U test, and multivariable binary logistic regression were performed. Statistical significance was set at $p < 0.05$.

Results:

A total of 152 participants were included in the analysis. Gingival recession was present in 90 (59.2%) participants. In the bivariate analysis, gingival recession was significantly associated with brushing frequency, brushing technique, toothbrush type, brushing duration, and brushing pressure ($p < 0.001$ for all). In the multivariable logistic regression analysis, age (AOR = 1.123, 95% CI: 1.027–1.228, $p = 0.011$), brushing technique (AOR = 10.673, 95% CI: 1.292–88.158, $p = 0.028$), and brushing pressure (AOR = 16.393, 95% CI: 2.415–111.111, $p = 0.004$) were independently associated with gingival recession.

Conclusion:

Gingival recession was common among the study participants. Age, brushing technique, and brushing pressure were independently associated with gingival recession. These findings highlight the importance of appropriate toothbrushing

INTRODUCTION:

Gingival recession is a common periodontal condition characterized by apical displacement of the gingival margin, resulting in exposure of the root surface. It may be associated with several clinical consequences, including dentin hypersensitivity, root surface exposure, aesthetic concerns, and increased susceptibility to root surface wear and caries.^{1,2} Gingival recession is considered a multifactorial condition influenced by anatomical, periodontal, behavioral, and environmental factors.^{3,4,5,6}

Toothbrushing is an essential component of daily oral hygiene; however, inappropriate toothbrushing practices may contribute to mechanical trauma of the gingival tissues. Previous literature has investigated the relationship between toothbrushing habits and gingival recession, with particular attention to brushing technique, brushing force, and toothbrush characteristics.^{7,8,9,10} Evidence has also suggested that traumatic toothbrushing may contribute to gingival recession and non-carious cervical lesions, particularly when excessive mechanical forces are applied.¹¹

The relationship between toothbrushing habits and gingival recession is therefore clinically important because toothbrushing practices are modifiable through patient education.¹² Characteristics such as brushing frequency, technique, duration, toothbrush bristle type, and brushing pressure may differ considerably between individuals and may have different effects on periodontal tissues.^{7,8,13} However, gingival recession is not attributable to toothbrushing alone, and other factors such as age and individual periodontal characteristics may also contribute to its occurrence.^{3,4,14}

Despite the available evidence regarding toothbrushing and gingival recession, further assessment of these modifiable practices in dental patients may help identify potentially important behavioral factors associated with gingival recession. Therefore, the present study was

conducted to investigate the association between toothbrushing habits and gingival recession among adult patients attending a dental outpatient department, with particular emphasis on brushing frequency, technique, toothbrush type, brushing duration, and brushing pressure.

Materials and Methods:

Study design

A cross-sectional analytical study was conducted among adult patients attending the dental outpatient department during a six-month study period. A non-probability consecutive sampling technique was used. Adults aged 20–65 years who attended the dental outpatient department during the study period and provided written informed consent were eligible for inclusion.

Patients undergoing orthodontic treatment, those with a history of severe periodontitis or periodontal surgery, individuals taking medications that may affect periodontal health, and pregnant women were excluded from the study.

Sample size

The required sample size was calculated using a 95% confidence level, 5% margin of error, an assumed population proportion of 50%, and an estimated study population of 300, resulting in a required sample size of 169 participants. Due to participant availability during the study period, 152 participants with complete data were included in the final analysis.

Data collection

Demographic information and toothbrushing habits were collected using a self-administered questionnaire. The assessed toothbrushing characteristics included brushing frequency, brushing technique, toothbrush type, brushing duration, and brushing pressure. Smoking status was also recorded.

Gingival recession was clinically assessed using a periodontal probe and recorded as present when the gingival margin was located apical to the

cemento-enamel junction (CEJ), and as absent when no apical displacement of the gingival margin relative to the CEJ was observed. Although classification systems such as the Miller classification are available for grading the severity and extent of gingival recession, the present study assessed gingival recession as a binary outcome rather than by severity grade.¹⁵

Statistical analysis

Data were analyzed using IBM SPSS Statistics version 27.0. Descriptive statistics were used to summarize the study variables. Age was summarized using mean and standard deviation, while categorical variables were summarized using frequencies and percentages.

Associations between categorical variables and gingival recession were assessed using the Pearson chi-square test. The Mann-Whitney U test was used to compare age between participants with and without gingival recession because the distribution of age did not meet the assumption of normality required for an independent-samples *t*-test.

A multivariable binary logistic regression analysis was performed to identify factors independently associated with gingival recession. Adjusted odds ratios (AORs) with 95% confidence intervals (CIs) were reported. Statistical significance was set at $p < 0.05$.

Ethical considerations

The study was conducted after obtaining ethical approval from?? Written informed consent was obtained from all participants before data collection.

Results:

A total of 152 participants were included in the final analysis, with no missing cases among the analyzed records. The mean age of the participants was 38.95 ± 13.07 years, with an age range of 20–64 years. Of the participants, 81 (53.3%) were male and 71 (46.7%) were female. The demographic characteristics of the study participants are presented in Table 1.

Regarding toothbrushing habits, horizontal brushing was the most commonly reported technique (91, 59.9%). Medium-bristled toothbrushes were used by 63 (41.4%) participants, while 43 (28.3%) used hard-bristled toothbrushes. Most participants reported brushing for 1 minute (66, 43.4%), and moderate brushing pressure was the most commonly reported pressure level (62, 40.8%). The distribution of toothbrushing habits is presented in Table 2. The distribution of brushing techniques and toothbrush bristle hardness is also illustrated in Figure 1 and Figure 2, respectively.

Gingival recession was present in 90 (59.2%) participants, while 62 (40.8%) had no gingival recession (Table 3). The prevalence of gingival recession is illustrated in Figure 3.

In the bivariate analysis, gingival recession was significantly associated with brushing frequency, brushing technique, toothbrush type, brushing duration, and brushing pressure ($p < 0.001$ for all). The prevalence of gingival recession was particularly high among participants using horizontal brushing, hard-bristled toothbrushes, and moderate or hard brushing pressure. The associations between toothbrushing characteristics and gingival recession are presented in Table 4.

Age was also significantly associated with gingival recession. Participants with gingival recession had significantly higher age ranks than those without recession (Mann-Whitney $U = 574.50$, $Z = -8.310$, $p < 0.001$). The prevalence of gingival recession across age groups is illustrated in Figure 4.

A multivariable binary logistic regression model was performed to identify factors independently associated with gingival recession. The model was statistically significant ($\chi^2(8) = 154.862$, $p < 0.001$) and demonstrated a Nagelkerke R^2 of 0.862. The Hosmer-Lemeshow test was non-significant ($\chi^2(8) = 13.786$, $p = 0.088$), indicating no evidence of significant lack of model fit. The model correctly classified 94.7% of participants.

After adjustment for the other variables, age, brushing technique, and brushing pressure were independently associated with gingival recession. Each one-year increase in age was associated with

a 12.3% increase in the odds of gingival recession (AOR = 1.123, 95% CI: 1.027–1.228, $p = 0.011$). Participants using horizontal/vertical brushing had approximately 10.7 times higher adjusted odds of gingival recession compared with those using circular/modified Bass techniques (AOR = 10.673, 95% CI: 1.292–88.158, $p = 0.028$). Similarly, participants reporting moderate/hard brushing pressure had approximately 16.4 times higher adjusted odds of gingival recession compared with those using light pressure (AOR =

16.393, 95% CI: 2.415–111.111, $p = 0.004$). The complete multivariable regression results are presented in Table 5, and the corresponding adjusted odds ratios and 95% confidence intervals are illustrated in Figure 5.

Gender, brushing frequency, toothbrush type, brushing duration, and smoking were not statistically significant factors independently associated with gingival recession in the multivariable model ($p > 0.05$).

Table 1. Demographic characteristics of participants (n = 152)

Variable	Frequency, n	Percentage, %
Age (years), mean $\pm$ SD	38.95 $\pm$ 13.07	—
Age group		
20-30 years	53	34.9
31-45 years	54	35.5
46-60 years	33	21.7
61-64 years	12	7.9
Gender		
Male	81	53.3
Female	71	46.7
Smoking status		
No	113	74.3
Yes	39	25.7

SD = standard deviation.

Table 2. Toothbrushing habits of participants (n = 152)

Variable	Frequency, n	Percentage, %
Brushing frequency		
Once daily	99	65.1
Twice daily	52	34.2
More than twice daily	1	0.7
Brushing technique		
Horizontal	91	59.9
Vertical	20	13.2
Circular	16	10.5
Modified Bass	25	16.4
Toothbrush type		
Soft	46	30.3
Medium	63	41.4
Hard	43	28.3
Brushing duration		
Less than 1 minute	57	37.5
1 minute	66	43.4

2 minutes	29	19.1
Brushing pressure		
Light	59	38.8
Moderate	62	40.8
Hard	31	20.4

Percentages are based on the total sample (n = 152).

Table 3. Prevalence of gingival recession among participants (n = 152)

Gingival Recession	Frequency, n	Percentage, %
Present	90	59.2
Absent	62	40.8
Total	152	100.0

Gingival recession was coded as 0 = absent and 1 = present.

Table 4. Association between toothbrushing habits and gingival recession

Variable	Recession present, n (%)	Recession absent, n (%)	χ^2	p-value
Brushing frequency			32.188	<0.001
Once daily	75 (75.8)	24 (24.2)		
≥2 times/day	15 (28.3)	38 (71.7)		
Brushing technique			65.829	<0.001
Horizontal	74 (81.3)	17 (18.7)		
Vertical	13 (65.0)	7 (35.0)		
Circular	3 (18.8)	13 (81.3)		
Modified Bass	0 (0.0)	25 (100.0)		
Toothbrush type			75.581	<0.001
Soft	5 (10.9)	41 (89.1)		
Medium	42 (66.7)	21 (33.3)		
Hard	43 (100.0)	0 (0.0)		
Brushing duration			27.502	<0.001
<1 minute	49 (86.0)	8 (14.0)		
1 minute	30 (45.5)	36 (54.5)		
2 minutes	11 (37.9)	18 (62.1)		
Brushing pressure			84.634	<0.001
Light	8 (13.6)	51 (86.4)		
Moderate	52 (83.9)	10 (16.1)		
Hard	30 (96.8)	1 (3.2)		

χ^2 = Pearson's chi-square. $p < 0.05$ was considered statistically significant. Brushing frequency was grouped as once daily versus ≥2 times/day for inferential analysis because the original >2 times/day category contained only one participant.

Table 5. Multivariable logistic regression analysis of factors associated with gingival recession (n = 152)

Predictor	Comparison	Adjusted OR (AOR)	95% CI	p-value
Age	Per 1-year increase	1.123	1.027–1.228	0.011
Gender	Male vs Female	7.331	0.885–60.728	0.065

Brushing frequency	Once daily vs ≥ 2 times/day	0.371	0.051–2.718	0.329
Brushing technique	Horizontal/Vertical vs Circular/Modified Bass	10.673	1.292–88.158	0.028
Toothbrush type	Medium/Hard vs Soft	8.197	0.921–71.429	0.059
Brushing duration	<1 minute vs ≥ 1 minute	3.635	0.445–29.707	0.229
Brushing pressure	Moderate/Hard vs Light	16.393	2.415–111.111	0.004
Smoking	Yes vs No	12.500	0.747–200.000	0.079

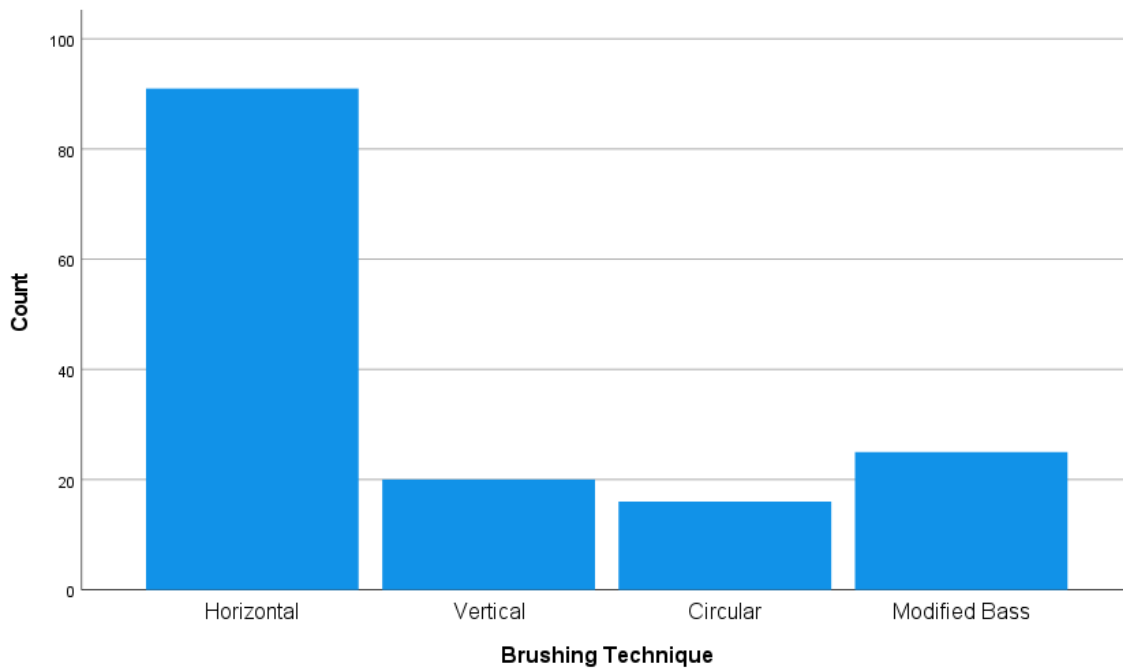


Figure 1. Distribution of toothbrushing techniques among study participants (n = 152).

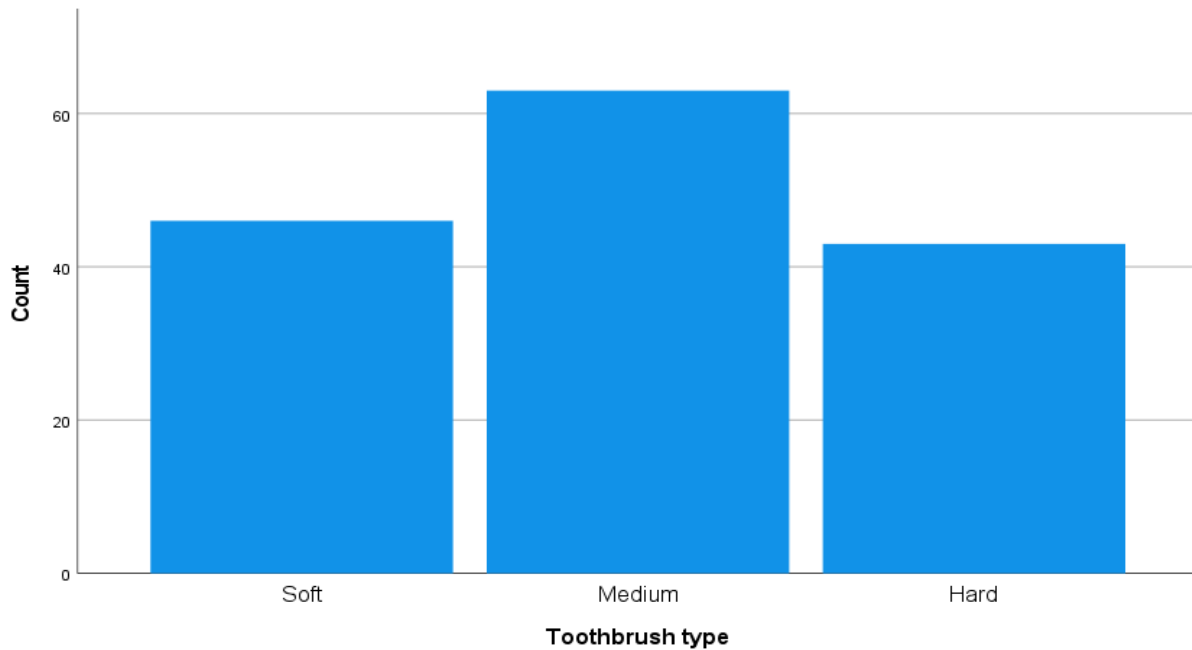


Figure 2. Distribution of toothbrush bristle hardness among study participants (n = 152).

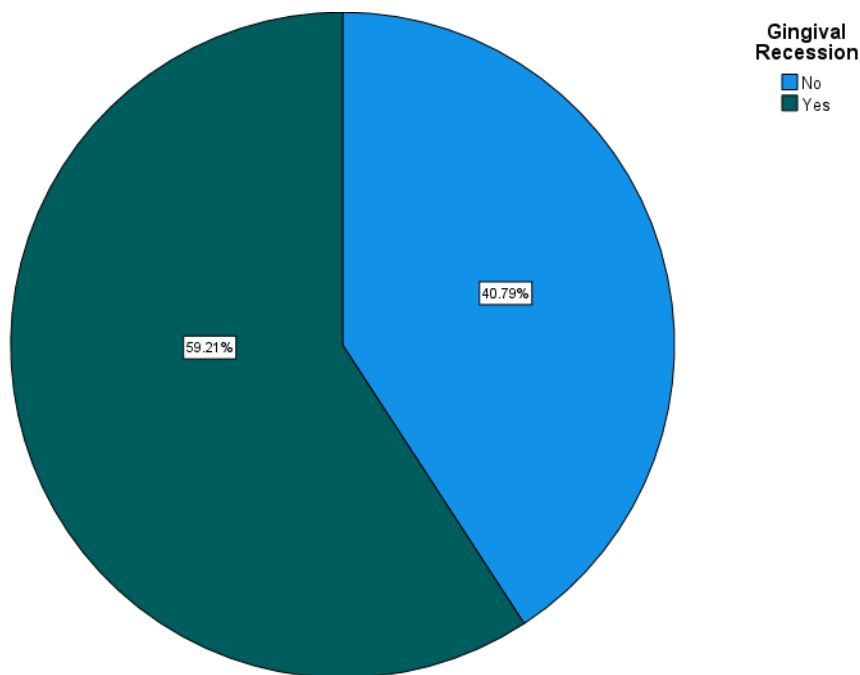


Figure 3. Prevalence of gingival recession among study participants (n = 152).

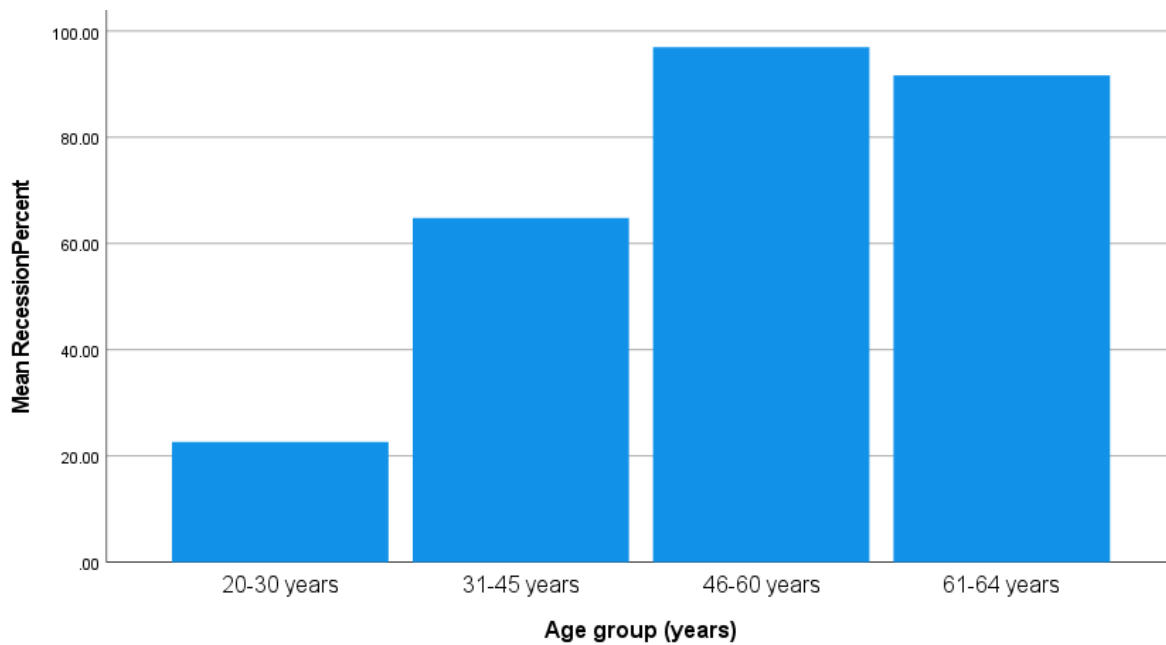


Figure 4. Prevalence of gingival recession according to age group.

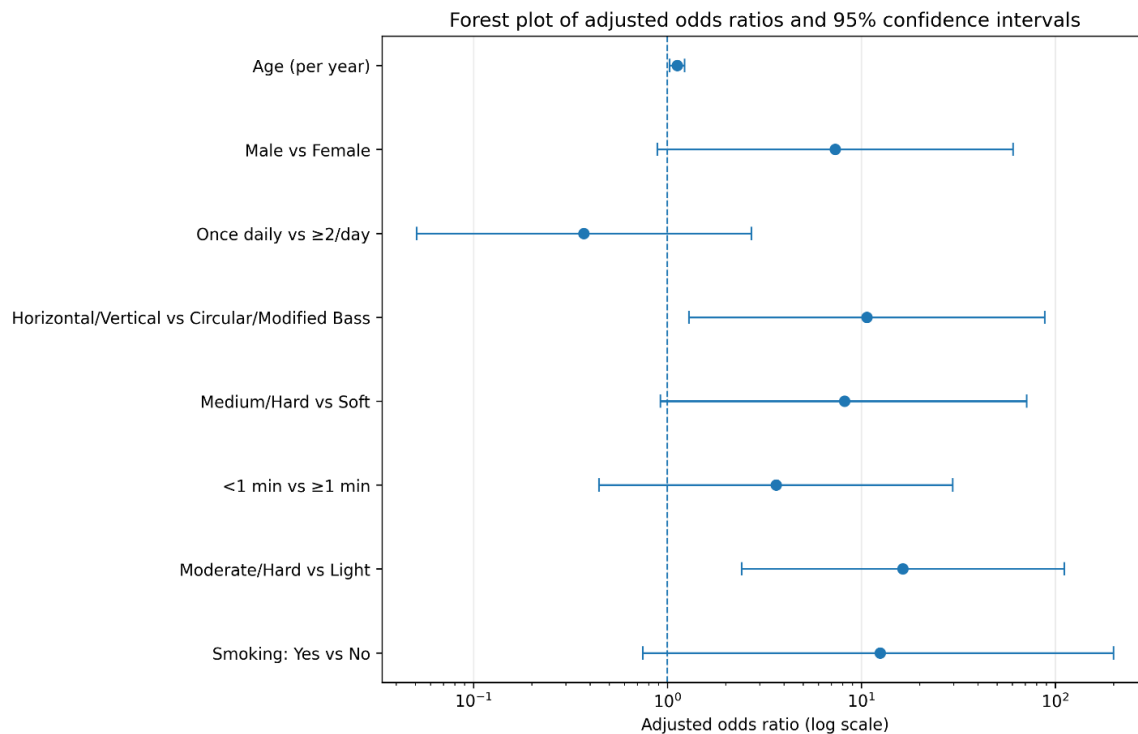


Figure 5. Forest plot of adjusted odds ratios (AORs) and 95% confidence intervals (CIs) for factors independently associated with gingival recession (n = 152).

Discussion

Gingival recession is a multifactorial periodontal condition characterized by apical displacement of the gingival margin and exposure of the root surface. Several local and behavioral factors have been implicated in its occurrence, including toothbrushing practices and mechanical trauma. Previous literature has specifically examined the relationship between toothbrushing and gingival recession, including the potential effects of brushing technique and traumatic toothbrushing.^{7,8,9,11}

In the present study, gingival recession was observed in 59.2% of participants. The prevalence of gingival recession varies considerably across populations and study settings, reflecting differences in age distribution, periodontal status, clinical assessment methods, and other risk indicators. Previous epidemiological studies have reported gingival recession in diverse adult and dental-patient populations, supporting the multifactorial nature of the condition.^{3,4,16,17,18,19} Large epidemiological surveys and recent systematic reviews and meta-analyses have similarly reported considerable variation in the prevalence of gingival recession according to population, age structure, and study methodology.^{20,21,22,23,24}

The present study found significant associations between gingival recession and all assessed toothbrushing characteristics in the bivariate analysis, including brushing frequency, technique, toothbrush type, duration, and brushing pressure. These findings are consistent with previous literature highlighting toothbrushing practices as potentially relevant factors in gingival recession and emphasizing the possibility of mechanical trauma associated with toothbrushing.^{7,8,9,11,25}

Brushing technique demonstrated a particularly strong association with gingival recession. In the present study, recession was more frequently observed among participants using horizontal and vertical brushing techniques, whereas no recession was observed among participants reporting the modified Bass technique. In the multivariable analysis, horizontal/vertical brushing remained independently associated with gingival recession,

with approximately 10.7-fold higher adjusted odds compared with circular/modified Bass techniques (AOR = 10.673, 95% CI: 1.292–88.158, $p = 0.028$). Previous literature has discussed the potential relationship between toothbrushing technique and gingival recession, particularly in the context of traumatic toothbrushing.^{7,9,11}

Brushing pressure was another important finding. Participants reporting moderate or hard brushing pressure had a substantially higher prevalence of gingival recession than those reporting light pressure. After adjustment for the other variables, moderate/hard brushing pressure remained independently associated with gingival recession (AOR = 16.393, 95% CI: 2.415–111.111, $p = 0.004$). This finding is clinically relevant because mechanical trauma from toothbrushing has been proposed as one potential contributor to gingival recession.^{9,11,26} However, the cross-sectional design of the present study does not allow a causal relationship between brushing pressure and gingival recession to be established.

Toothbrush type was significantly associated with gingival recession in the bivariate analysis ($\chi^2 = 75.581$, $p < 0.001$). All participants using hard-bristled toothbrushes had gingival recession, whereas recession was less frequently observed among participants using soft-bristled toothbrushes. However, toothbrush type was no longer statistically significant after adjustment in the multivariable model (AOR = 8.197, 95% CI: 0.921–71.429, $p = 0.059$). This difference between the bivariate and multivariable findings suggests that the observed association between toothbrush type and recession may overlap with other toothbrushing characteristics included in the model. Previous reviews have also considered toothbrush characteristics and mechanical effects as part of the broader relationship between toothbrushing and oral tissues.^{8,26}

Brushing frequency and duration were significantly associated with gingival recession in the bivariate analysis but were not independently associated after adjustment. Once-daily brushing was associated with a higher prevalence of recession than brushing at least twice daily, while recession was also more frequent among

participants reporting brushing for less than one minute. However, neither brushing frequency (AOR = 0.371, $p = 0.329$) nor brushing duration (AOR = 3.635, $p = 0.229$) remained statistically significant in the multivariable model. These findings indicate that crude associations between individual brushing behaviors should be interpreted cautiously when multiple related behavioral factors are considered simultaneously. The direction of the association observed for brushing frequency should also be interpreted cautiously, as evidence regarding brushing frequency and gingival recession is not consistent across studies. Professional toothbrushing recommendations emphasize appropriate technique and effective plaque removal rather than simply increasing brushing frequency or duration.²⁷

Age was significantly associated with gingival recession in the present study. Participants with gingival recession had significantly higher age ranks than those without recession (Mann-Whitney $U = 574.50$, $Z = -8.310$, $p < 0.001$), and the prevalence of recession was higher in the older age groups, with the highest prevalence observed among participants aged 46–60 years. Age also remained independently associated with gingival recession in the multivariable model, with each one-year increase in age associated with a 12.3% increase in the odds of recession (AOR = 1.123, 95% CI: 1.027–1.228, $p = 0.011$). Age has been recognized as an important epidemiological factor in studies of gingival recession and other periodontal conditions.^{4,16,17,19,28}

Smoking was not statistically significant in the multivariable model (AOR = 12.500, 95% CI: 0.747–200.000, $p = 0.079$). Although the estimated odds ratio was relatively large, the confidence interval was wide and included 1, indicating considerable uncertainty around the estimate. Therefore, the present study does not provide sufficient evidence to identify smoking as an independent factor associated with gingival recession in this sample.

The multivariable logistic regression model was statistically significant ($\chi^2(8) = 154.862$, $p < 0.001$), with a Nagelkerke R^2 of 0.862 and an overall

classification accuracy of 94.7%. The Hosmer-Lemeshow test was non-significant ($p = 0.088$), indicating no evidence of significant lack of fit. Nevertheless, the wide confidence intervals observed for several predictors, particularly gender, smoking, toothbrush type, and brushing pressure, indicate uncertainty in some of the estimates and warrant cautious interpretation.

From a clinical perspective, these findings highlight the importance of assessing toothbrushing technique and brushing pressure during routine dental examinations. Patient education should emphasize gentle, effective toothbrushing using an appropriate technique and suitable oral-hygiene aids. Professional recommendations similarly emphasize evidence-based toothbrushing practices and appropriate oral-hygiene instruction.^{27,29} However, gingival recession is multifactorial, and toothbrushing habits should be considered alongside other patient-related, anatomical, periodontal, and behavioral factors.^{3,8,30}

Limitations

This study has several limitations. First, its cross-sectional design prevents determination of temporal or causal relationships between toothbrushing habits and gingival recession. Second, toothbrushing habits were self-reported and may therefore be subject to recall and reporting bias. Third, the participants were recruited from a dental outpatient department, which may limit the generalizability of the findings to the wider population. Finally, the relatively small sample size and wide confidence intervals for several regression estimates warrant cautious interpretation of the observed associations.

Conclusion

Gingival recession was common among the study participants, affecting 59.2% of the sample. Although brushing frequency, brushing technique, toothbrush type, brushing duration, and brushing pressure were significantly associated with gingival recession in the bivariate analysis, age, brushing technique, and brushing pressure remained independently associated with gingival

recession after multivariable adjustment. These findings emphasize the importance of appropriate toothbrushing technique and controlled brushing pressure as components of individualized oral-hygiene education. Further longitudinal studies involving larger and more representative populations are needed to clarify the temporal and causal relationships between toothbrushing practices and gingival recession.

Conflict of Interest

The authors declare that they have no conflicts of interest related to this study.

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REFERENCES

- Madi M, Aljoghaiman E, Alameer ST, Albander M, Alahmed M, Almuallim M, Elakel A, Abdelsalam M. Awareness of Gingival Recession and Its Causes and Consequences Among Adults in Saudi Arabia. *Dentistry Journal*. 2025 Oct 28;13(11):501.
- West NX, Davies M, Sculean A, Jepsen S, Faria-Almeida R, Harding M, Graziani F, Newcombe RG, Creeth JE, Herrera D. Prevalence of dentine hypersensitivity, erosive tooth wear, gingival recession and periodontal health in seven European countries. *Journal of dentistry*. 2024 Nov 1;150:105364.
- Mythri S, Arunkumar SM, Hegde S, Rajesh SK, Munaz M, Ashwin D. Etiology and occurrence of gingival recession-An epidemiological study. *Journal of Indian Society of Periodontology*. 2015 Nov;19(6):671.
- Joshipura KJ, Kent RL, DePaola PF. Gingival recession: intra-oral distribution and associated factors. *Journal of periodontology*. 1994 Sep;65(9):864-71.
- Albandar JM. Epidemiology and risk factors of periodontal diseases. *Dent Clin North Am*. 2005;49(3):517-32. doi: 10.1016/j.cden.2005.03.003.
- Dodwad V. Aetiology and severity of gingival recession among young individuals in Belgaum district in India. *Annals of Dentistry University of Malaya*. 2001;8(1):1-6.
- Hashem AS, Patil SR, Issrani R, Prabhu N, Albalawi AS, Alam MK. Relationship between gingival recession and tooth brushing habits. *Bangladesh Journal of Medical Science*. 2024 Jul 29;23(3):846-50.
- Kumar S, Gopalkrishna P, Syed AK, Sathiyabalan A. The impact of toothbrushing on oral health, gingival recession, and tooth wear—a narrative review. In *Healthcare* 2025 May 14 (Vol. 13, No. 10, p. 1138). MDPI.
- Litonjua LA, Andreana S, Bush PJ, Cohen RE. Toothbrushing and gingival recession. *International dental journal*. 2003 Apr 1;53(2):67-72.
- Rajapakse PS, McCracken GI, Gwynnett E, Steen ND, Guentsch A, Heasman PA. Does tooth brushing influence the development and progression of non-inflammatory gingival recession? A systematic review. *Journal of Clinical Periodontology*. 2007 Dec;34(12):1046-61.
- Heasman PA, Holliday R, Bryant A, Preshaw PM. Evidence for the occurrence of gingival recession and non-carious cervical lesions as a consequence of traumatic toothbrushing. *Journal of clinical periodontology*. 2015 Apr;42:S237-55.
- Damle SG, Patil A, Jain S, Damle D, Chopal N. Effectiveness of supervised tooth brushing and oral health education in improving oral hygiene status and practices of urban and rural school children: A comparative study. *J Int Soc Prev Community Dent*. 2014 Sep;4(3):175-81. doi: 10.4103/2231-0762.142021.

- Zaborskis A, Kavaliauskienė A, Levi S, Tesler R, Dimitrova E. Adolescent toothbrushing and its association with sociodemographic factors—time trends from 1994 to 2018 in twenty countries. *InHealthcare* 2023 Dec 12 (Vol. 11, No. 24, p. 3148). MDPI.
- Manoharan S, Jeevitha M, Aravind Kumar S. Gingival Recession In Patients With Good Oral Hygiene-A Retrospective Analysis. *Int J Dentistry Oral Sci*. 2021 Jul 15;8(7):3174-8.
- Miller PD Jr. A classification of marginal tissue recession. *The International Journal of Periodontics & Restorative Dentistry*. 1985;5(2):8-13.
- Danish Z, Shah MN, Rehmat S, Hakam FA, Raza HA. Frequency of gingival recession and its severity: a cross sectional study among patients visiting periodontics department, Khyber college of dentistry, Peshawar. *Pakistan Oral & Dental Journal*. 2019 Apr 30;39(1):60-4.
- Imran NK, Al-Sharqi AJ, Abdulkareem AA, Gul SS, Preshaw PM. Prevalence and Risk Factors for Gingival Recession and Abrasion in Periodontally Healthy and Diseased Cohort Referred to Dental Teaching Clinic in Baghdad: A Cross-Sectional Study. *International Journal of Dental Hygiene*. 2026.
- Sarhan S, Ahmed E, Hussein RR, Abou-Bakr A. Prevalence, etiology and clinical characteristics of gingival recession in a sample of adult Egyptian dental patients: a cross sectional study. *BMC Oral Health*. 2025 May 7;25(1):691.
- Yadav VS, Gumber B, Makker K, Gupta V, Tewari N, Khanduja P, Yadav R. Global prevalence of gingival recession: A systematic review and meta-analysis. *Oral Diseases*. 2023 Nov;29(8):2993-3002.
- Shetty A, Bhandary R, Thomas B. Awareness on gingival recession and its association to risk factors: an epidemiological study. *Research*. 2014 Dec 23;1:1268.
- Shrestha E, Singh H, Kafle S, Rai V. Prevalence of gingival recession and risk factors in dental hospital population of Chitwan, Nepal. *Journal of Universal College of Medical Sciences*. 2025 May 12;13(01):30-4.
- Albandar JM, Kingman A. Gingival recession, gingival bleeding, and dental calculus in adults 30 years of age and older in the United States, 1988-1994. *Journal of Periodontology*. 1999 Jan;70(1):30-43.
- Marschner F, Lechte C, Kanzow P, Hráský V, Pfister W. Systematic review and meta-analysis on prevalence and risk factors for gingival recession. *Journal of Dentistry*. 2025 Apr;155:105645.
- Çelik H, Güngörmek HS. Severity, extent, distribution and predisposing factors of gingival recession in Turkish patients: a cross-sectional study. *Medicina Oral, Patología Oral y Cirugía Bucal*. 2025 Mar.
- Kaleem M, Saeed F, Ahmad G, Iftikhar M, Jamil A, Khan N. Assessment of Various Oral Hygiene Practices Leading to Gingival Recession. *Journal of the Pakistan Dental Association*. 2024 Apr 1;33(2):37.
- Addy M, Hunter ML. Can tooth brushing damage your health? Effects on oral and dental tissues. *Int Dent J*. 2003;53 Suppl 3:177-86. doi: 10.1111/j.1875-595x.2003.tb00768.x
- Glenny AM, Walsh T, Iwasaki M, Kateeb E, Braga MM, Riley P, Melo P. Development of tooth brushing recommendations through professional consensus. *International Dental Journal*. 2024 Jun 1;74(3):526-35.
- Toker H, Ozdemir H. Gingival recession: epidemiology and risk indicators in a university dental hospital in Turkey. *Int J Dent Hyg*. 2009;7(2):115-20. doi: 10.1111/j.1601-5037.2008.00348.x.
- Aljasser R, Alsinaidi A, Bawazir N, AlSaleh L, AlOmair A, AlMthen H. Association of oral health awareness and practice of proper oral hygiene measures among Saudi population: a systematic review. *BMC Oral Health*. 2023 Oct 24;23(1):785.

Niemczyk W, Niemczyk S, Prokurat M, Grudnik KE, Migas M, Wągrowka K, Lau K, Kasperczyk J. Etiology of gingival recession-a literature review. *Wiadomości Lekarskie*. 2024 Jul 9;77(5):1080-5.