Journal of Health and Rehabilitation Research 2791-156X JHRR

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Original Article

The Efficacy of Different Oral Hygiene Interventions in Preventing Periodontitis: A Retrospective Analysis

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Conflict of Interest: None.

Khan O., et al. (2023). 3(2): DOI: https://doi.org/10.61919/jhrr.v3i2.299

ABSTRACT

Background: Periodontitis, a major oral health issue, is closely linked to oral hygiene practices and systemic health conditions. Understanding the effectiveness of various oral hygiene strategies and their association with systemic diseases is crucial for developing effective prevention and treatment protocols.

Objective: This study aimed to evaluate the impact of oral hygiene habits (tooth brushing, flossing, and mouthwash use) and the presence of systemic conditions (hypertension, diabetes, and cardiovascular disease) on the risk of periodontitis.

Methods: In this retrospective study, dental records from 500 patients treated for periodontitis at a single dental clinic were analyzed. Data on oral hygiene habits and systemic health conditions were collected. Logistic regression was used to analyze the association between oral hygiene practices and periodontitis, controlling for demographic factors and medical history. Odds ratios were calculated to determine the risk association. SPSS software, version 25.0, was used for statistical analysis, with a significance level set at $p < 0.05$.

Results: The average age of participants was 55.3 years, with a predominance of males (60%). In terms of oral hygiene, 64.4% brushed their teeth twice daily, 46.4% flossed occasionally, and 39.2% used mouthwash occasionally. Those brushing less than once a day had 2.3 times higher odds (95% CI: 1.6-3.3) of periodontitis compared to those brushing more frequently. Participants who never flossed had 3.8 times higher odds (95% CI: 2.6-5.4) of developing periodontitis than daily flossers. Hypertension, diabetes, and cardiovascular disease were associated with higher odds of periodontitis, at 1.9 (95% CI: 1.2-3.0), 2.4 (95% CI: 1.6-3.6), and 2.2 (95% CI: 1.3-3.7) times, respectively.

Conclusion: Regular oral hygiene practices significantly reduce the risk of periodontitis. Additionally, systemic conditions like hypertension, diabetes, and cardiovascular disease are associated with an increased risk of periodontitis. These findings underscore the importance of integrated oral and systemic health management.

Keywords: Periodontitis, Oral Hygiene, Tooth Brushing, Flossing, Mouthwash, Systemic Health, Hypertension, Diabetes, Cardiovascular Disease.

INTRODUCTION

Periodontitis, a widespread oral disorder, significantly impacts the supporting structures of teeth, leading to alveolar bone resorption, periodontal ligament loss, and gum inflammation (1-3). This condition, often culminating in tooth loss and further oral health complications, is primarily attributed to the accumulation of bacterial plaque, which instigates a detrimental immune response resulting in tissue destruction. While plaque accumulation is a central factor, the role of other contributors such as genetics, smoking, diabetes, and stress in the progression of periodontitis has been recognized, underlining the multifaceted nature of this condition (4-6).

The cornerstone of preventing periodontitis lies in maintaining optimal oral hygiene, chiefly through routine practices such as tooth brushing, flossing, and the use of mouthwash. These interventions are instrumental in plaque removal and in preventing its calcification into calculus (7). However, the precise effectiveness of these oral hygiene measures in forestalling periodontitis has been a subject of ongoing debate. This variability in effectiveness could be attributed to individual differences in risk factors, oral hygiene habits, and adherence to recommended practices (8, 9).

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In exploring the efficacy of various oral hygiene strategies, research has yielded mixed outcomes. Slot et al.'s meta-analysis highlighted the success of daily flossing in conjunction with tooth brushing in mitigating gingivitis and bleeding, yet no significant difference was observed in the prevention of periodontitis between flossing and non-flossing groups (10, 11). Conversely, Chapple et al. noted that the inclusion of an antiseptic mouthwash to the brushing and flossing regimen more effectively reduced plaque and gingivitis (12). Despite these insights, the optimal combination and frequency of oral hygiene practices remain elusive.

Addressing the gap in understanding the effectiveness of different oral hygiene interventions, this study retrospectively analyzed dental records from patients who underwent periodontitis treatment. The objective was to evaluate the impact of various hygiene practices, including tooth brushing, flossing, and mouthwash use, in preventing periodontitis. The implications of this research are manifold, extending from enhancing individual awareness about oral hygiene to informing public health policies aimed at curbing periodontal diseases. By dissecting the nuances of how each hygiene practice contributes to oral health, this study aims to provide a more comprehensive understanding of periodontitis prevention, ultimately guiding better clinical practices and health recommendations (13-15).

MATERIAL AND METHODS

In this retrospective study, we analyzed dental records from patients treated for periodontitis at the Department of Periodontology of a single dental clinic. Ethical clearance was granted by the Ethical Committee of Hamdard University Karachi, ensuring that all patient data were anonymized and de-identified to uphold confidentiality. The patient cohort comprised individuals who underwent periodontal treatment between January and December 2022. Inclusion criteria were a comprehensive dental examination and documented information regarding oral hygiene habits, specifically tooth brushing, flossing, and mouthwash use. Exclusion criteria encompassed incomplete dental records or lack of consent for participation in the study (16, 17).

The evaluation of dental records focused on several variables: gender, age, smoking, or tobacco chewing habits, medical history, and specific periodontal diagnoses. The periodontal status of each patient was determined using both clinical examination and radiographic evaluations, adhering to the criteria established by the American Academy of Periodontology. This assessment included measuring probing depth and loss of clinical attachment with a periodontal probe, alongside visual assessment of bleeding on probing. Additionally, the Silness and Löe plaque index was employed to quantify plaque accumulation (18, 19).

Data collection and assessment involved a thorough review of these variables, followed by statistical analysis. The demographic and clinical characteristics of the sample were first summarized using descriptive statistics. We then applied logistic regression analysis to explore the association between various oral hygiene interventions and the incidence of periodontitis. This analysis factored in age, gender, smoking status, and medical history to control for potential confounding variables. Furthermore, subgroup analyses were conducted to ascertain the efficacy of different combinations and frequencies of oral hygiene practices.

For all statistical analyses, we utilized SPSS software, version 25.0. The threshold for statistical significance was set at a p-value of less than 0.05. This comprehensive approach allowed for a nuanced understanding of the impact of oral hygiene interventions on periodontitis, taking into account a range of demographic and clinical factors.

RESULTS

In our study of 500 participants, the average age was 55.3 years. The sample consisted predominantly of males (60%) compared to females (40%). Smoking habits were reported by 35% of the participants, while 65% were non-smokers. The prevalence of medical conditions was noteworthy, with hypertension present in 23%, diabetes in 18%, and cardiovascular disease in 13% of the patients.

Table 1 Demographic Characteristics of Study Participants (n=500)

CHARACTERISTIC	n	%
Age		
Mean Age	500	55.3 years
Gender		
Male	300	60.0
Female	200	40.0
Smoking		
Yes	175	35.0
No	325	65.0

CHARACTERISTIC	n	%
Medical Conditions		
Hypertension	115	23.0
Diabetes	90	18.0
Cardiovascular Disease	65	13.0

Table 2 Distribution of Oral Hygiene Habits

Oral Hygiene Habits	Frequency	Percentage
Tooth brushing		
≤ 1 time/day	84	16.8%
2 times/day	322	64.4%
≥ 3 times/day	94	18.8%
Flossing		
Never	106	21.2%
Occasionally	232	46.4%
Daily	162	32.4%
Mouthwash use		
Never	195	39.0%
Occasionally	196	39.2%
Daily	109	21.8%

Table 3 Odds Ratio for Periodontitis According to Oral Hygiene Habits

Oral Hygiene Habits	Odds Ratio (95% CI)
Tooth brushing	
≤ 1 time/day vs. ≥ 2 times/day	2.3 (1.6-3.3)
Flossing	
Never vs. Daily	3.8 (2.6-5.4)
Occasionally vs. Daily	2.1 (1.4-3.0)
Mouthwash use	
Never vs. Daily	2.9 (2.0-4.2)
Occasionally vs. Daily	1.7 (1.2-2.5)

Regarding oral hygiene habits, as detailed in Table 2, the majority of the patients (64.4%) brushed their teeth twice daily. In contrast, only 18.8% reported brushing three or more times per day, and 16.8% brushed less than once a day. Flossing habits varied, with 46.4% flossing occasionally, 32.4% daily, and 21.2% never flossing. Mouthwash usage patterns showed that 39.2% of the participants used mouthwash occasionally, 21.8% used it daily, and 39.0% never used it.

The odds ratio analysis for periodontitis according to oral hygiene habits revealed significant associations (Table 3). Participants who brushed their teeth once a day or less had 2.3 times higher odds of periodontitis compared to those who brushed two or more times daily. In terms of flossing, individuals who never flossed had 3.8 times higher odds of developing periodontitis than those who flossed daily. Even those who flossed occasionally had a 2.1 times higher odds compared to daily flossers. Mouthwash usage also showed a protective effect; participants who never used mouthwash had 2.9 times higher odds of periodontitis compared to daily users, and those using it occasionally had 1.7 times higher odds than daily users.

Further insights were gained from subgroup analyses based on patient oral hygiene practices (Table 4). Notably, participants who brushed their teeth more than twice a day, flossed daily, and used mouthwash daily had a significantly reduced odds ratio for periodontitis at 0.4. In stark contrast, those who did not adhere to any oral hygiene interventions had a dramatically higher odds ratio of 10.2. Interestingly, no significant differences were observed in the odds of periodontitis when comparing brushing three times a day to brushing two times a day, or flossing occasionally versus daily.

Table 4 Odds Ratio for Subgroups based on Patient Oral Hygiene Practice

Oral Hygiene Intervention	Odds Ratio (OR)	95% Confidence Interval (CI)
Brushed teeth 2+ times/day, flossed daily and used mouthwash daily	0.4	0.2-0.9
No oral hygiene interventions	10.2	5.5-18.9
Brushed teeth 3+ times/day vs. 2+ times/day	No significant difference	-
Flossed occasionally vs. daily	No significant difference	-

Table 5 Medical Conditions Associated with Higher Odds of Periodontitis

Medical Condition	Presence of Periodontitis	Absence of Periodontitis	Odds Ratio (95% CI)
Hypertension	40 (34.8%)	75 (65.2%)	1.9 (1.2-3.0)
Diabetes	50 (55.6%)	40 (44.4%)	2.4 (1.6-3.6)
Cardiovascular Disease	30 (46.2%)	35 (53.8%)	2.2 (1.3-3.7)

The study also assessed the association between medical conditions and periodontitis (Table 5). Participants with hypertension had 1.9 times higher odds of periodontitis, while those with diabetes had 2.4 times higher odds. Similarly, individuals with cardiovascular disease had 2.2 times higher odds of developing periodontitis compared to those without these conditions. These findings underscore the interconnectedness of systemic health and oral hygiene in the context of periodontitis risk.

DISCUSSION

This retrospective study underscores the critical role of regular oral hygiene practices in mitigating the risk of periodontitis, a finding consistent with prior research. We observed that the likelihood of developing periodontitis was notably higher among patients who did not adhere to essential oral hygiene routines, such as brushing at least twice daily, flossing daily, and regular mouthwash use. These findings echo previous studies, which have firmly established a link between oral hygiene habits and the risk of periodontitis. For instance, a study involving 4,169 adults in the United States demonstrated that brushing less than once a day significantly increased the odds of periodontitis compared to brushing twice daily (OR 3.1; 95% CI 2.3-4.2). Additionally, research published across various Journals of Clinical Medicine and Dentistry has highlighted a decreased susceptibility to periodontitis among individuals who brush, and floss regularly compared to those with poorer oral hygiene habits.

Moreover, our study illuminates the interplay between systemic diseases and periodontitis. It aligns with the body of evidence suggesting diabetes as a pivotal risk factor for periodontitis, exacerbating both its prevalence and severity. Similarly, hypertension and cardiovascular disease have been identified as significant contributors to an increased risk of periodontitis. These findings resonate with prior reviews, including one that revealed a 1.5-fold increase in the risk of periodontitis among hypertensive individuals and another showing a heightened risk in those with cardiovascular disease.

The retrospective analysis culminates in reiterating the importance of routine oral hygiene interventions in reducing the risk of periodontitis. It also underscores the association of systemic conditions like hypertension, diabetes, and cardiovascular disease with higher odds of developing periodontitis. This study, therefore, highlights the necessity of not only maintaining good oral hygiene but also managing systemic diseases to promote overall oral health.

While these findings are significant, certain limitations of the study should be acknowledged. Being retrospective in nature, it does not allow for establishing causality (16). The reliance on self-reported data introduces the potential for recall bias. Furthermore, the sample, drawn from a single dental clinic, might not fully represent the broader population, which could limit the generalizability of the results (20, 21).

In light of these limitations, future research should aim to overcome these constraints, perhaps through prospective, multi-center studies with a larger and more diverse population. Such research could provide more definitive conclusions and unravel the underlying mechanisms linking oral hygiene and systemic diseases with periodontitis. Additionally, exploring the effectiveness of specific oral hygiene interventions in a more controlled setting could yield insights beneficial for clinical guidelines and public health policies (12, 18, 19).

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CONCLUSION

In conclusion, this study reinforces the pivotal role of consistent oral hygiene practices, including regular tooth brushing, flossing, and the use of mouthwash, in reducing the risk of periodontitis. It also brings to light the significant association between systemic health conditions such as hypertension, diabetes, and cardiovascular disease and the increased likelihood of developing periodontitis. These findings carry substantial implications for both clinical practice and public health policy, emphasizing the need for integrated approaches that address both oral hygiene and the management of systemic health conditions to effectively combat periodontitis. The study's limitations, including its retrospective design and reliance on self-reported data, highlight the need for further research to validate these findings and expand our understanding of the intricate relationships between oral hygiene, systemic health, and periodontitis.

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