ORIGINAL ARTICLE / *ARTICLE ORIGINAL*

Periodontology / *Parodontologie*

THE IMPACT OF SMOKING CESSATION ON CLINICAL OUTCOMES OF STAGE I/STAGE II, GRADE A/GRADE B PERIODONTITIS PATIENTS IN PERIODONTAL MAINTENANCE PHASE: A 2-YEAR LONGITUDINAL STUDY

Santosh R Patil[1] | Shikar Daniel[2] | Aysha Jebin A[3]

Objectives: The objective of this study is to investigate the influence of smoking cessation interventions on periodontal outcomes in individuals who have successfully abstained from smoking for a minimum of six months following non-surgical periodontal therapy.

Methods: A total of 122 participants, based on inclusion & exclusion criteria, were divided into a smoking cessation group (n=61) and a control group (n=61). Demographic characteristics, smoking history, and baseline oral health parameters were assessed in these patients. Over a 2-year follow-up period, changes in probing depth and alveolar bone loss were measured, statistically analysis were performed using SPSS software.

Results: The smoking cessation group demonstrated significant improvements in periodontal health, as evidenced by a substantial reduction in probing depth (mean change of -1.5 mm), while the control group exhibited an increase in probing depth (mean change of +0.8 mm). Subgroup analysis revealed a decrease in alveolar bone loss in the smoking cessation group compared to an increase in the control group. These findings align with existing research, highlighting the positive effects of smoking cessation on periodontal health.

Conclusions: Smoking cessation interventions have a substantial positive impact on oral health, particularly in terms of periodontal health and the potential preservation of alveolar bone. Healthcare professionals should prioritize engaging patients in discussions about smoking cessation and providing support to individuals striving to quit smoking to promote better oral health.

Keywords: alveolar bone loss, dental hygiene, oral health, periodontal health, probing depth, smoking cessation.

Corresponding author:
Aysha Jebin A, e-mail: ayshpathu3@gmail.com - Phone number: 9895205190 - Facsimile number: 080-28416199

Conflicts of interest:
The authors declare no conflicts of interest.

1. Professor, Department(s) and institution(s) :1Department of Oral Medicine and Radiology, Chhattisgarh Dental College and Research Institute, India.
   E-mail Patil: drpsantosh@gmail.com ;
2. Senior Lecturer, Department of Oral Medicine and Radiology, Chhattisgarh Dental College and Research Institute, India.
   E-mail Daniel: shikhardaniel555@gmail.com
3. Senior Lecturer, Department of Periodontics,Krishnadevaraya college of dental sciences and Hospital, Rajiv Gandhi University of Health Sciences, Bangalore, Karnataka, India
   E-mail: ayshpathu3@gmail.com

L'IMPACT DE L'ARRÊT DE TABAC SUR LES RESULTATS CLINIQUES DES PATIENTS ATTEINTS DE PARODONTITE DE STADEI/STADE II, ET DE GRADE A/GRADE B EN PHASE DE MAINTENANCE PARODONTALE: UNE ÉTUDE LONGITUDINALE DE 2 ANS

Objectifs: Cette étude vise à évaluer l'influence des interventions de sevrage tabagique sur les résultats parodontaux chez des personnes ayant réussi à s'abstenir de fumer pendant au moins six mois après un traitement parodontal non chirurgical.

Méthodes: Un total de 122 participants, sélectionnés selon les critères d'inclusion et d'exclusion, ont été répartis en un groupe de sevrage tabagique (n = 61) et un groupe témoin (n = 61). Les caractéristiques démographiques, les antécédents de tabagisme et les paramètres de santé bucco-dentaire initiaux ont été évalués chez ces patients. Sur une période de suivi de deux ans, l'évolution de la profondeur des poches et de la perte osseuse alvéolaire est mesurée et une analyse statistique est réalisée à l'aide du logiciel SPSS.

Résultats: Le groupe de sevrage tabagique a montré une amélioration significative de la santé parodontale, comme en témoigne une réduction substantielle de la profondeur de sondage (variation moyenne de -1,5 mm), tandis que le groupe témoin a présenté une augmentation de la profondeur de sondage (variation moyenne de +0,8 mm). L'analyse en sous-groupe a révélé une diminution de la perte osseuse alvéolaire dans le groupe de sevrage tabagique, comparativement à une augmentation dans le groupe témoin. Ces résultats concordent avec les recherches existantes, soulignant les effets positifs du sevrage tabagique sur la santé parodontale.

Conclusions: Les interventions de sevrage tabagique ont un impact positif considérable sur la santé bucco-dentaire, notamment en termes de santé parodontale et de préservation potentielle de l'os alvéolaire. Les professionnels de santé devraient privilégier l'engagement des patients dans des discussions sur le sevrage tabagique et le soutien aux personnes qui s'efforcent d'arrêter de fumer afin de favoriser une meilleure santé bucco-dentaire.

Mots clés: perte osseuse alvéolaire, hygiène dentaire, santé bucco-dentaire, santé parodontale, profondeur des poches, sevrage tabagique.

Introduction

Tobacco use remains one of the leading causes of preventable morbidity and mortality worldwide, with a profound impact on public health. The harmful effects of smoking extend far beyond the well-established risks of cardiovascular disease, chronic obstructive pulmonary disease, and various cancers. Emerging research has increasingly shed light on the deleterious consequences of smoking on oral health. Smoking is a well-recognized risk factor for numerous oral diseases, including periodontal disease, dental caries, tooth loss, and most significantly, oral squamous cell carcinoma (OSCC) [1, 2].

The detrimental effects of smoking on oral health are multifaceted. Smoking has been associated with reduced salivary flow, altered microbial composition in the oral cavity, impaired wound healing, and compromised immune responses within the oral mucosa [3, 4]. These changes create an oral environment conducive to the development and progression of various oral diseases. Moreover, the risk of developing OSCC is significantly elevated among smokers, with the carcinogenic properties of tobacco being well-documented [5].

Smoking cessation interventions have long been regarded as pivotal in reducing the burden of tobacco-related diseases. Various strategies, ranging from behavioral counseling to pharmacological aids, have been developed to assist individuals in quitting smoking. These interventions have demonstrated success in achieving smoking cessation and are associated with substantial health benefits, including reduced risks of cardiovascular events and respiratory diseases [6, 7].

However, while the general health advantages of smoking cessation are well-documented, the specific impact of smoking cessation interventions on oral health outcomes has received less attention in the scientific literature. It is imperative to comprehensively investigate how successful smoking cessation interventions may mitigate the adverse effects of smoking on oral health, including the amelioration of periodontal conditions, the reduction of oral cancer risk, and improvements in overall oral health.

This study seeks to address this knowledge gap by conducting a detailed assessment of the impact of smoking cessation interventions on oral health and periodontal outcomes. Through a longitudinal examination of individuals who have successfully quit smoking with various cessation methods, we aim to elucidate the extent to which these interventions can positively influence oral health parameters. By employing a comprehensive methodology that includes oral health assessments at multiple time points, our research endeavors to provide valuable insights that can inform public health strategies and motivate individuals to embark on the path towards smoking cessation, ultimately enhancing their oral health and well-being.

The purpose of this controlled, two-year longitudinal study was to investigate the effects of non surgical periodontal therapy and oral hygiene instructions on clinical, radio-graphical parameters and patient-related outcomes in in patients undergoing periodontal maintenance in relation to smoking cessation.The null hypothesis for this study is that there is no significant difference in periodontal health outcomes, specifically in terms of probing depth reduction and alveolar bone loss, between patients who have undergone smoking cessation and those who continue to smoke. Additionally, it is hypothesized that smoking cessation does not have a statistically significant effect on the progression of periodontal disease over the 2-year follow-up period.

Materials and Methods

Participant Recruitment

The study was initiated after the approval of the Institutional Ethical Committee [IEC approval number:DMIHER(DU)/IEC/2023/1069]. The inclusion criteria for the study were smoker patients on supportive periodontal therapy after treatment for stage I/II, grade A/B Periodontitis and undergoing successful cessation of smoking for a minimum of six months, achieved through various smoking cessation interventions, such as personalized counseling, nicotine replacement therapy, or prescription medications. The patients included also had . Exclusion criteria were medically compromised patients, thought to be the risk factors for periodontal disease, continuous systemic use of steroidal or anti-inflammatory drugs, ans surgical periodontal therapy within the six months prior to enrollment. Participants willingly engaged in the study after providing informed consent, which was preceded by a thorough explanation of the study's objectives and procedures.

Using nMaster software, the sample size for this study was determined. For the study to have an $\alpha = 0.05$ power and achieve 80% power, a minimum of 50 patients were needed in each group. A total of 122 patients of age ranging from 20-60 years on periodontal maintenance phase were enrolled in this study and divided into study and control groups. The control group of active smokers, meticulously matched for age, gender, and smoking history, was enrolled. The recruitment process was executed through a comprehensive strategy that involved disseminating information via local healthcare clinics, smoking cessation programs, and community centers and the study process was conducted in the Department of Oral Medicine and Radiology, Chhattisgarh Dental College and Research Institute, India. A

detailed questionnaire was administered to collect comprehensive demographic information, smoking history, and detailed accounts of the smoking cessation interventions utilized by each participant.

Baseline Oral Health Assessment

Prior to the commencement of any assessments, rigorous adherence to ethical standards was observed, ensuring the highest level of ethical conduct, participant safety, and stringent data confidentiality protocols. The baseline oral health evaluations were conducted by a cadre of extensively trained and rigorously calibrated dental professionals, collectively bringing a wealth of clinical expertise to the assessments.

Dental Examinations

Dental health was meticulously assessed, encompassing an evaluation of the number of remaining teeth, the identification of caries or dental restorations, and an overall appraisal of dental health. This rigorous examination provided a foundational understanding of the participants' dental status.

Oral Lesion Screenings

The study protocol included systematic screenings for oral lesions, involving a meticulous examination to detect any signs of lesions or abnormalities within the oral cavity. This screening was conducted in accordance with established clinical guidelines for the detection of oral lesions and was a critical component of the baseline assessment.

Periodontal Evaluations

A thorough periodontal assessment was conducted, comprising probing depth measurements, attachment loss assessments, and the examination of bleeding on probing to ascertain the periodontal health status of the participants. These measurements followed standardized techniques to ensure consistency and precision, with the intent of capturing the full spectrum of periodontal health.

Radiographic Examinations

Radiographic assessments, including Intraoral Periapical Radiographs (IOPA), bitewing or panoramic radiographs, were judiciously employed. These radiographic examinations were conducted following established protocols to uphold the highest standards of consistency, precision, and patient safety. Such radiographs were utilized to complement the clinical assessments and provide a comprehensive understanding of the participants' oral health status.To ensure consistent and accurate assessment of alveolar bone changes over time, radio-graphs were standardized using uniform protocols. IOPA were captured at baseline, 6 months, 1 year, and 2 years, employing a positioning device to maintain consistent angulation and magnification across all time points. Radiographic settings, including exposure time and contrast, were kept constant to minimize variability. The radiographs were analyzed using digital imaging software to enhance precision in the measurement of alveolar bone levels, ensuring reliable comparison of changes over time.

Longitudinal Data Collection

To capture the dynamic changes over time, participants were scheduled for follow-up assessments at specific intervals, including 6 months, 1 year, and 2 years subsequent to the baseline assessment. These follow-up assessments were meticulously conducted by the primary investigator who had conducted the baseline examinations, ensuring consistency and reliability in data collection. During each follow-up visit, oral health parameters were revisited, allowing for the systematic tracking of changes over time and facilitating the assessment of the long-term impact of smoking cessation interventions on oral health.

Data Analysis

Data collected from the assessments was methodically compiled and subjected to rigorous statistical analysis using SPSS v21.0. A normality test was conducted to evaluate the distribution of the continuous variables. The Shapiro-Wilk test was employed to assess the normality of data due to the small sample size. For non-normally distributed data, non-parametric tests were utilized. Specifically, the Mann-Whitney U test was applied for comparing independent samples, as an alternative to the T-test, to assess differences between the smoking cessation group and the control group. For comparing multiple groups, the Kruskal-Wallis test was applied, as an alternative to one-way ANOVA. The Chi-square test was used to compare categorical variables, with Fisher's test employed where appropriate. A p-value of less than 0.05 was considered statistically significant.

Results

Table 1 provides an overview of the demographic characteristics of the study participants, including age, gender, smoking history, and

Table 1. Participant Demographics (N=122)

Variable	Smoking Cessation Group (n=61)	Control Group (n=61)
Age (years, mean ± SD)	48.2 ± 6.4	47.8 ± 6.2
Gender (Male/Female)	35/26	34/27
Smoking History (years, mean ± SD)	18.5 ± 7.2	18.8 ± 7.5
Smoking Cessation Duration (months, mean ± SD)	14.6 ± 3.2	N/A (active smokers)

the duration of smoking cessation. It shows that the smoking cessation group and the control group were well-matched in terms of age, gender distribution, and smoking history. The smoking cessation group had successfully quit smoking for an average of 14.6 months.

The baseline oral health parameters, as presented in Table 2, show that there were no statistically significant differences between the smoking cessation group and the control group across most variables. The mean number of remaining teeth was similar between the smoking cessation group (23.8 ± 3.5) and the control group (24.1 ± 3.6), with a p-value of 0.68, indicating no significant difference. Additionally, the percentage of participants with dental restorations was comparable between the groups (13.1% in the smoking cessation group vs. 11.5% in the control group), with a p-value of 0.80.

However, there was a noticeable, though not statistically significant, difference in the prevalence of periodontal disease, defined as the presence of probing depth greater than 4 mm. The smoking cessation group had a higher prevalence of periodontal disease (57.4%) compared to the control group (42.6%), with a p-value of 0.13. This could suggest that individuals in the smoking cessation group may have had more severe baseline periodontal conditions, which aligns with previous findings linking smoking to periodontal disease severity. For the presence of alveolar bone loss, the percentages were 36.1% in the smoking cessation group and 29.5% in the control group, with a non-significant p-value of 0.43. Overall, these findings indicate that the groups were generally well-matched at baseline, with no major disparities that could skew the outcome assessments.

Table 2. Baseline Oral Health Parameters

Parameter	Smoking Cessation Group (n=61)	Control Group (n=61)	p-value
Number of Remaining Teeth (mean ± SD)	23.8 ± 3.5	24.1 ± 3.6	0.68
Dental Restorations Present (n %)	8 (13.1%)	7 (11.5%)	0.80
Probing Depth (mm, mean ± SD)	3.9 ± 1.2	3.7 ± 1.1	0.52
Periodontal Disease (PD > 4 mm, n %)	35 (57.4%)	26 (42.6%)	0.13
Oral Lesions Detected (n %)	0 (0%)	0 (0%)	N/A
Alveolar Bone Loss Present (n %)	22 (36.1%)	18 (29.5%)	0.43

** significant if p<0.05*

Table 3. Changes in Probing Depth Over Time (2-Year Follow-up)

Group	Baseline Probing Depth (mm, mean ± SD)	2-Year Probing Depth (mm, mean ± SD)	Change in Probing Depth (mm, mean ± SD)	p-value
Smoking Cessation	3.9 ± 1.2	2.4 ± 1.0	-1.5 ± 0.9	< 0.05*
Control	3.7 ± 1.1	4.5 ± 1.2	+0.8 ± 1.1	< 0.05*

** significant if p<0.05*

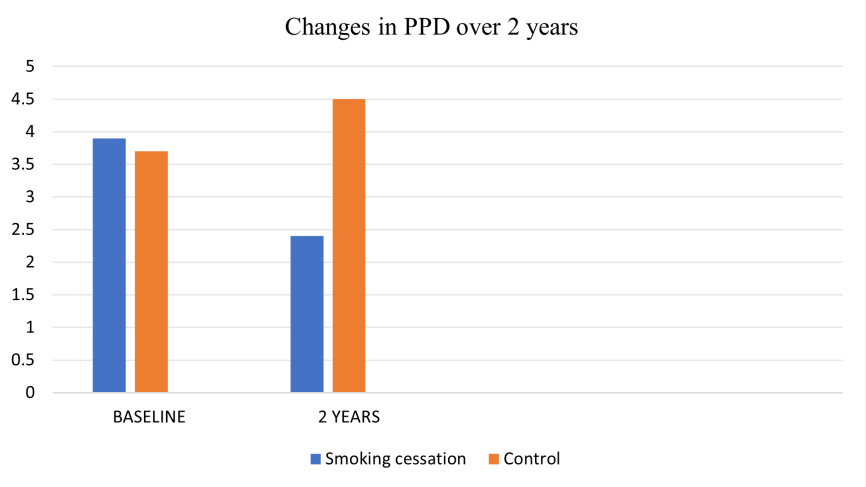

Figure 1. presents the statistical comparison of the changes in probing depth between the smoking cessation group and the control group after the 2-year follow-up. The p-value is less than 0.05, indicating a highly significant difference.

Table 3 and Figure 1 illustrate the changes in probing depth over a 2-year follow-up period for both groups. The smoking cessation group exhibited a significant improvement in periodontal health, as evidenced by a reduction in probing depth from 3.9 ± 1.2 mm at baseline to 2.4 ± 1.0 mm at the 2-year follow-up. This represents a mean change of -1.5 ± 0.9 mm ($p < 0.05$), indicating a substantial reduction in

periodontal pocket depths, which is a positive indicator of improved periodontal health status.

In contrast, the control group showed a worsening of periodontal health, with an increase in probing depth from 3.7 ± 1.1 mm at baseline to 4.5 ± 1.2 mm at the 2-year follow-up. This represents a mean change of +0.8 ± 1.1 mm ($p < 0.05$), suggesting that continued smoking may exacerbate periodontal disease over time. The statistically significant difference in the changes between the two groups ($p < 0.05$) highlights the beneficial impact of smoking cessation on periodontal health, specifically in reducing periodontal pocket depths and potentially stabilizing periodontal disease progression.

Table 4 presents a subgroup analysis focusing on participants with alveolar bone loss at baseline. At the beginning of the study, 45% of the participants in the smoking cessation group and 37.5% in the control group exhibited alveolar bone loss. Over the 2-year follow-up period, the smoking cessation group showed a marked reduction in alveolar bone loss, with the prevalence decreasing from 18 participants (45%) at baseline to 14 participants (35%) at the end of the study. This corresponds to a 10% decrease in the prevalence of alveolar bone loss ($p = 0.02$).

Conversely, the control group experienced an increase in alveolar bone loss, with the number of affected participants rising from 15 (37.5%) at baseline to 20 (50%) at the 2-year follow-up, representing a 12.5% increase ($p = 0.02$). The statistically significant difference in alveolar bone loss changes between the groups ($p = 0.02$) suggests that smoking cessation has a protective effect on the supporting bone structures of the teeth, reducing the risk of progressive bone loss commonly associated with periodontal disease in smokers. This finding is particularly relevant as alveolar bone loss is a critical determinant of long-term periodontal prognosis and tooth retention.

Table 4. Subgroup Analysis - Participants with Alveolar Bone Loss

Group	Baseline Alveolar Bone Loss (n=40)	2-Year Alveolar Bone Loss (n=40)	Change in Alveolar Bone Loss (n=40)	p-value
Smoking Cessation	18 (45%)	14 (35%)	-4 (10%)	0.02*
Control	15 (37.5%)	20 (50%)	+5 (12.5%)	0.02*

** significant if p<0.05*

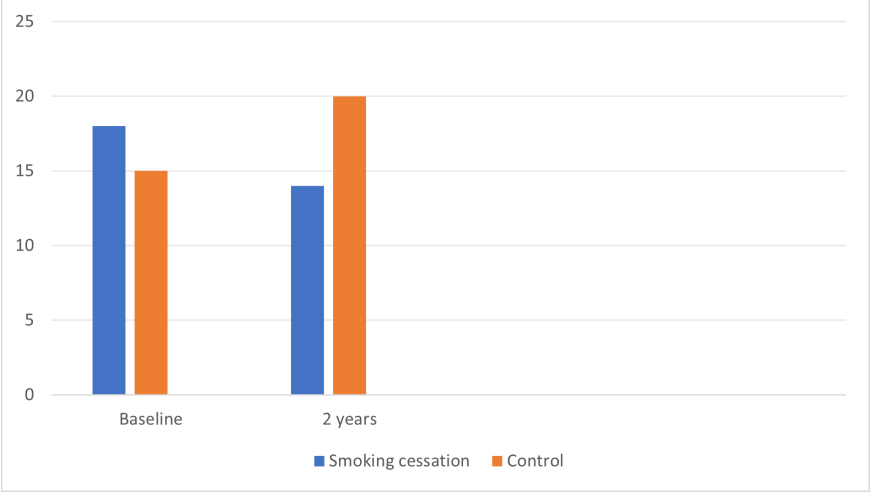

Figure 2. Comparison of Alveolar Bone Loss Changes Between Groups (2-Year Follow-up)

Figure 2 presents the statistical comparison of the changes in alveolar bone loss between the two groups within the subgroup of participants with baseline bone loss. The p-value is 0.02, indicating a statistically significant difference.

Discussion

To the best of our knowledge, the current study is the first to identify the distinct effects of non-surgical periodontal therapy and oral hygiene instructions in patients on the maintenance phase of periodontal disease concurrent with quitting smoking.Tobacco use continues to be a major global health concern, contributing significantly to preventable morbidity and mortality. Its detrimental effects on public health are well-established, encompassing a wide spectrum of chronic diseases, including cardiovascular diseases, chronic obstructive pulmonary disease, and various types of cancers. However, it is increasingly apparent that the adverse consequences of smoking extend beyond these well-recognized risks, delving into the realm of oral health. In this discussion, we will explore the multifaceted impact of smoking on oral health, the potential benefits of smoking cessation interventions, and the broader public health implications of our findings.

Emerging research has cast a spotlight on the deleterious consequences of smoking on oral health, encompassing a wide range of conditions such as periodontal disease, dental caries, tooth loss, and, most significantly, oral squamous cell carcinoma (OSCC) [8, 9]. The detrimental effects of smoking on oral health are multifaceted, affecting various

aspects of the oral environment. One of the critical mechanisms through which smoking impacts oral health is by reducing salivary flow [10]. Smoking also disrupts the balance of microbial communities within the oral cavity. The oral micro-biome is a complex ecosystem, and alterations in its composition can have profound consequences [11]. Smoking impairs wound healing, and this effect extends to oral tissues. Following dental procedures or injuries, impaired wound healing can lead to delayed recovery and increased susceptibility to infections [12]. The immune responses within the oral mucosa are compromised in smokers, making them more susceptible to infections and impairing the body's ability to combat oral diseases [13]. Perhaps the most well-documented effect of smoking on oral health is its carcinogenic properties. The chemicals present in tobacco are potent carcinogens, and the risk of developing OSCC is significantly elevated among smokers [14]. These carcinogens can initiate genetic mutations and promote the growth of cancerous cells within the oral cavity.

Smoking cessation interventions have long been regarded as crucial tools in reducing the burden of tobacco-related diseases. Various strategies, including behavioral counseling and pharmacological aids, have been developed to assist individuals in quitting smoking [15]. These interventions have demonstrated success in achieving smoking cessation and are associated with substantial health benefits, including reduced risks of cardiovascular events and respiratory diseases [16]. Our study aimed to address this knowledge gap by conducting a detailed assessment of the impact of smoking cessation interventions on oral health and periodontal outcomes.

Our results provide compelling evidence that successful smoking cessation interventions can have a positive and substantial impact on various oral health parameters. This finding aligns with previous research that has consistently shown a link between smoking and an increased risk of periodontal disease [17-19].

However, over the 2-year follow-up period, the smoking cessation group demonstrated a significant reduction in probing depth (-1.5 mm), indicating a trend toward improved periodontal health. In contrast, the control group, composed of active smokers, exhibited an increase in probing depth (+0.8 mm). This substantial difference was statistically significant, highlighting the potential for smoking cessation to mitigate periodontal disease progression.

In this study, the normality test (Shapiro-Wilk) indicated that certain parameters did not follow a normal distribution. Therefore, non-parametric statistical methods were employed to compare the groups. The Mann-Whitney U test showed significant differences in probing depth changes between the smoking cessation group and the control group ($p < 0.05$). Similarly, the Kruskal-Wallis test revealed significant differences in the subgroup analysis of alveolar bone loss, with a p-value of 0.02.

Our study also conducted a subgroup analysis focusing on participants with alveolar bone loss at baseline . Alveolar bone loss is a hallmark of severe periodontal disease and is often indicative of a poor prognosis for tooth retention [20]. The smoking cessation group experienced a reduction in alveolar bone loss (10% decrease), while the control group showed an increase (12.5% rise) over the 2-year follow-up period. This finding underscores the potential of smoking cessation not only to halt the progression of periodontal disease, but also to facilitate the recovery of periodontal tissues [21].

These findings have significant implications for public health strategies aimed at reducing the burden of tobacco-related diseases. While the general health benefits of smoking cessation are well-established, our study highlights that quitting smoking can also lead to substantial improvements in oral health. This is particularly relevant given the established association between smoking and OSCC, which is one of the most severe consequences of tobacco use.

Incorporating oral health promotion into smoking cessation programs can provide additional motivation for individuals to quit smoking. Dental professionals and healthcare providers should underscore the oral health benefits of smoking cessation when counseling patients on smoking cessation strategies. Furthermore, public health campaigns should emphasize the holistic benefits of quitting smoking, including improvements in oral health, to encourage more individuals to embark on the path toward smoking cessation.

The strengths of this study lie in its rigorous design and methodology. First and foremost, the study utilized a well-matched cohort of participants in both the smoking cessation and control groups, ensuring that the baseline characteristics, including age, gender, and smoking history, were balanced. This robust matching enhances the internal validity of the study and strengthens the credibility of the comparisons made between the two groups. Additionally, the 2-year follow-up duration allowed for a comprehensive assessment of the long-term effects of smoking cessation on oral health outcomes, particularly in terms of probing depth reduction and alveolar bone preservation. Moreover, the subgroup analysis focusing on participants with baseline alveolar bone loss provided valuable insights into the potential for smoking cessation to not only halt but also reverse bone loss, a critical determinant of periodontal health.

According to a systematic review, quitting smoking can restore one's risk of developing periodontitis to the same degree as never smoking [22]. These outcomes concur with our conclusions. The meta-analysis

of data from cross-sectional studies did not reveal any significant differences between current and former smokers with respect to the risk of becoming edentulous, losing one or more teeth, and losing eight or more teeth, in contrast to the findings from longitudinal studies. The inherent limitations of cross-sectional studies, particularly the lack of information regarding the temporal relationship between cause (smoking cessation) and effect (tooth loss), may account for this lack of effect [22].

In a study conducted by Sahli et al, they concluded that, oral hygiene instructions and periodontal non-surgical treatment play pivotal roles in the management of periodontitis patients, periodontal clinical parameters and patient-reported outcome measures which is in accordance with the present study [23].

It is essential to acknowledge the limitations of this study. While we observed significant improvements in periodontal health and alveolar bone loss reduction among participants who quit smoking, other factors, such as oral hygiene practices and diet, may also influence these outcomes. Future research should consider controlling for these variables to provide a more comprehensive understanding of the specific effects of smoking cessation on oral health.

Additionally, the follow-up period in this study was limited to 2 years. Longer-term studies are needed to assess the sustainability of the observed improvements and to investigate the potential for further recovery of oral health with continued smoking abstinence.

Conclusion

In conclusion, this study provides valuable insights into the impact of smoking cessation interventions on oral health outcomes. Our findings underscore the potential of smoking cessation to improve periodontal health and mitigate alveolar bone loss, highlighting the importance of including oral health promotion in smoking cessation programs. Public health initiatives should leverage the dual benefits of smoking cessation, both in terms of general health and oral health, to motivate individuals to quit smoking and improve their overall well-being.

Ultimately, this research serves as a foundation for future investigations into the mechanisms underlying these improvements and the long-term effects of smoking cessation on oral health. Understanding these mechanisms can inform the development of more effective smoking cessation strategies with a focus on preserving and enhancing oral health, ultimately contributing to improved public health outcomes worldwide.

Acknowledgement

We would like to extend our sincere gratitude to doctors and supporting staff of dental clinics and institutions for their assistance in tobacco cessation, management and follow-up of the patients.

Ethical approval

The study was approved by Institutional Ethical Committee Board of Chattisgarh Dental College and Research Institute on 06/06/2021.

Statement of informed consent

Written informed consent was obtained from the patients for publication of this article. A copy of the written consent is available for review by the Editor-in Chief of this journal on request.

References

1. Petersen PE. Oral health. In: Merson MH, Black RE, Mills AJ, editors. Global Health: Diseases, Programs, Systems, and Policies. Jones & Bartlett Learning; 2012.
2. Warnakulasuriya S. Global epidemiology of oral and oropharyngeal cancer. Oral Oncol. 2009 Apr-May;45(4-5):309-16. doi: 10.1016/j.oraloncology.2008.06.002.
3. Johnson GK, Slach NA. Impact of tobacco use on periodontal status. J Dent Educ. 2001 Apr;65(4):313-21. PMID: 11336116.
4. Scannapieco FA, Cantos A. Oral inflammation and infection, and chronic medical diseases: implications for the elderly. Periodontol 2000. 2016 Oct;72(1):153-75. doi: 10.1111/prd.12129.
5. Hashibe M, Brennan P, Chuang SC, Boccia S, Castellsague X, Chen C, et al. Interaction between tobacco and alcohol use and the risk of head and neck cancer: pooled analysis in the International Head and Neck Cancer Epidemiology Consortium. Cancer Epidemiol Biomarkers Prev. 2009 Feb;18(2):541-50. doi: 10.1158/1055-9965.EPI-08-0347.
6. Tobacco Use and Dependence Guideline Panel. Treating Tobacco Use and Dependence: 2008 Update. Rockville (MD): US Department of Health and Human Services; 2008 May. Available from: https://www.ncbi.nlm.nih.gov/books/NBK63952/
7. Doll R, Peto R, Boreham J, Sutherland I. Mortality from cancer in relation to smoking: 50 years observations on British doctors. Br J Cancer. 2005 Feb 14;92(3):426-9. doi: 10.1038/sj.bjc.6602359.
8. Leite FRM, Nascimento GG, Scheutz F, López R. Effect of Smoking on Periodontitis: A Systematic Review and Meta-regression. Am J Prev Med. 2018 Jun;54(6):831-841. doi: 10.1016/j.amepre.2018.02.014.
9. More AB, Rodrigues A, Sadhu BJ. Effects of smoking on oral health: Awareness among dental patients and their attitude towards its cessation. Indian J Dent Res. 2021 Jan-Feb;32(1):23-26. doi: 10.4103/ijdr.IJDR_711_18.
10. Dawes C. Salivary flow patterns and the health of hard and soft oral tissues. J Am Dent Assoc. 2008 May;139 Suppl:18S-24S. doi: 10.14219/jada.archive.2008.0351.
11. Borojevic T. Smoking and periodontal disease. Mater Sociomed. 2012;24(4):274-6. doi: 10.5455/msm.2012.24.274-276.
12. Ozkan A, Bayar GR, Altug HA, Sencimen M, Dogan N, Gunaydin Y, Ergodan E. The effect of cigarette smoking on the healing of extraction sockets: an immunohistochemical study. J Craniofac Surg. 2014 Jul;25(4):e397-402. doi: 10.1097/SCS.0b013e31829ae609.
13. Potempa J, Mydel P, Koziel J. The case for periodontitis in the pathogenesis of rheumatoid arthritis. Nat Rev Rheumatol. 2017 Oct;13(10):606-620. doi: 10.1038/nrrheum.2017.132.
14. Secretan B, Straif K, Baan R, Grosse Y, El Ghissassi F, Bouvard V, et al; WHO International Agency for Research on Cancer Monograph Working Group. A review of human carcinogens-Part E: tobacco, areca nut, alcohol, coal smoke, and salted fish. Lancet Oncol. 2009 Nov;10(11):1033-4. doi: 10.1016/s1470-2045(09)70326-2.
15. Rashid ME, Alam MK, Akhter K, Abdelghani A, Babkair HA, Sghaireen MG. Assessing the Impact of Smoking Cessation Interventions on Periodontal Health and Gingival Inflammation in Smokers with Periodontitis. J Pharm Bioallied Sci. 2024 Feb;16(Suppl 1):S742-S744. doi: 10.4103/jpbs.jpbs_987_23.
16. Leite FRM, Nascimento GG, Baake S, Pedersen LD, Scheutz F, López R. Impact of Smoking Cessation on Periodontitis: A Systematic Review and Meta-analysis of Prospective Longitudinal Observational and Interventional Studies. Nicotine Tob Res. 2019 Nov 19;21(12):1600-1608. doi: 10.1093/ntr/nty147.
17. Bergström J, Eliasson S, Dock J. A 10-year prospective study of tobacco smoking and periodontal health. J Periodontol. 2000 Aug;71(8):1338-47. doi: 10.1902/jop.2000.71.8.1338.
18. Al-Habashneh R, Al-Omari MA, Taani DQ. Smoking and caries experience in subjects with various form of periodontal diseases from a teaching hospital clinic. Int J Dent Hyg. 2009 Feb;7(1):55-61. doi: 10.1111/j.1601-5037.2008.00349.x.
19. Beklen A, Sali N, Yavuz MB. The impact of smoking on periodontal status and dental caries. Tob Induc Dis. 2022 Aug 29;20:72. doi: 10.18332/tid/152112.
20. Dixit A, Dhanalakshmi P, Rameshchandra PT, Chachlani KS, Dithi C, Dash KC, Obulareddy VT, Kamma PKG. Effect of Smoking Cessation Programs on Periodontal Disease Progression. J Pharm Bioallied Sci. 2024 Feb;16(Suppl 1):S771-S773. doi: 10.4103/jpbs.jpbs_1004_23.

21. Duarte PM, Nogueira CFP, Silva SM, Pannuti CM, Schey KC, Miranda TS. Impact of Smoking Cessation on Periodontal Tissues. Int Dent J. 2022 Feb;72(1):31-36. doi: 10.1016/j.identj.2021.01.016.

22. Chambrone L, Preshaw PM, Rosa EF, Heasman PA, Romito GA, Pannuti CM, Tu YK. Effects of smoking cessation on the outcomes of non-surgical periodontal therapy: a systematic review and individual patient data meta-analysis. J Clin Periodontol. 2013 Jun;40(6):607-15. doi: 10.1111/jcpe.12106.

23. Salhi L, Albert A, Seidel L, Lambert F. Respective Effects of Oral Hygiene Instructions and Periodontal Nonsurgical Treatment (Debridement) on Clinical Parameters and Patient-Reported Outcome Measures with Respect to Smoking. J Clin Med. 2020 Aug 3;9(8):2491. doi: 10.3390/jcm9082491.