ECRONICON OPEN ACCESS

EC DENTAL SCIENCE
Review Article

The Impact of Smoking on Periodontal Tissues: Review Article

Meshari Alsuwailem*

Dentistry College, Prince Sattam Bin Abdulaziz University, Saudi Arabia

***Corresponding Author:** Meshari Alsuwailem, Dentistry College, Prince Sattam Bin Abdulaziz University, Saudi Arabia.

Received: January 11, 2020; **Published:** January 22, 2020

Abstract

Smoking have potential biological mechanisms that might effects the human's immune system, altering microflora of the mouth, periodontal tissues destruction including clinical attachment loss, mobility and loosing of teeth, oral malodor and nonsurgical and surgical periodontal treatments. Furthermore, in this article will review the impact of smoking on periodontal tissues give importance to the impact of smoking on periodontium, oral microflora of smokers, impact of smoking on host response, gingival diseases, periodontal diseases, frequencies smoking, response to treatment of periodontium, discontinuation of smoking and systemic manifestations of smokers.

Keywords: *Smoking; Periodontal Tissues; Microflora*

Introduction

Periodontal problems consider to be a major reason for the universal burden of oral disease. However, small amount of care has been given by oral health carer and public health educator to periodontal problems in a lot of regions [1]. In the last 10 years, researchers have started to give more care about smoking and their major impact on the severity and incidence of periodontal problems, subsequently started to consider smoking one of the main risk factors [2]. Furthermore, previous researches reported that life anticipation of individuals who smoke is reduced by 14 years relying on the period of time they smoke [3]. Smoking not only leads to halitosis and break down the human's immune system but it raises the risk of periodontal problems by 2 - 7 fold. The impact of smoking on the periodontium relies on consumption and the period of smoking in an individual [4]. Males show more predilection in periodontal diseases than females due to smoking. Cigarettes contains over than 4000 components that retard recovery through periodontal therapy which includes carbon monoxide, formaldehyde, arsenic and ammonia. By-products of cigarettes retard the mechanisms of forbidding the sprouting of bacteria in the mouth which make a convenient flora for bacteria in the oral cavity like *P. gingivalis, P. intermedia* and *A. actinomycetemcomitans* [5].

Oral microflora of smokers

Zambon reported in his study of 798 participants with various histories of smoking, that smokers show significantly greater levels of *B. forsythia*, and has higher chance of infection. Also, smokers showed 2.3 times more chance to harbor *B. forsythia* than who smokes in the past or never smoked [6]. Periodontal pockets of present smokers exhibit an increased chance of harboring *T. denticola* and that the presence of *A. actinomycetemcomitans, P. gingivalis, P. intermedia, E. corrodens* or *F. nucleatum*. Also, rise the chance of having a mean periodontal pocket depth of ≥ 3.5 mm in smokers [7]. Haffajee and colleges concluded in their study that the main variance between non-smokers and smokers was in the spread of colonies i.e. periodontal microorganism colonized a larger amount of species, rather than counts or portion. With excess colonization shown among smokers in their shallower periodontal pockets. Moreover, they reported that maxilla show more proportions of sites colonized by *B. forsythus* and *P. nigrescens* than mandible [8].

Impact of smoking on host response

Bacteria consider the primary etiology of periodontal diseases, however, patient's chance to be affected it depends by the host response. Borbour and colleagues provide strong proof that immune host responses effects by smoking, while BERGSTRÖM and Lie reported decreased inflammation [9-11]. Furthermore, Kinane and Radvar stated that smokers show reduced gingival crevicular fluid volumes as compared to nonsmokers, which suggest that smoking reduced gingival blood flow [12]. Mosely and Riebel reported impairs revascularization of bone and soft tissues due to smoking, which might be a major impact on healing of wounds, particularly in regenerative periodontal and implant therapies [13,14]. Smokers have significantly higher numbers of neutrophils in the peripheral circulation, which consider the primary line of defense against infection, but their function is impaired [15]. Smoking also altered another protective host mechanism which is antibody production, with a consistent finding that smoking decreases serum IgG concentration [16,17].

The relationship of tobacco and gingival diseases

Smoking and its clinical manifestations on periodontal tissues is evident, but contradictory, clinical signs of inflammation in response to dental plaque reported to be less in smokers than non-smokers, specifically gingival bleeding on probing and edema are the crucial diagnostic signs. Suggesting that this might reflects changing of the diameter of the blood vessels that perfuse the gingiva, which might be related to the nicotine and cotinine metabolic by-product, as it has a narrowing action on peripheral gingival vessels which reduces gingival clinical signs of redness, bleeding and edema [18,19]. Poor level of oral hygiene has been reported in smokers when compared to nonsmokers [20-22]. Effectiveness of tooth brushing in smokers reported to be lesser, and dental plaque showed to be significantly raised in calcium concentration than in non-smokers, suggesting an impairment of routine oral hygiene and favorable environment for calculus formation [23]. Regarding plaque, it has been reported to be significantly more in males than females where plaque adherence of smokers reported to be doubled the percentage of nonsmokers in both genders [24].

The relationship of tobacco and periodontal diseases

Periodontitis have been defined as an inflammation of supportive tissues of teeth caused by particular pathogens which initiate advanced resorption of alveolar bone and periodontal membrane, with increased of clinical attachment lost. Divided opinions regarding effect of smoking on inflammatory periodontal problems. Earlier reviews regarding periodontal problems epidemiology stated that smoking considered a possible causative factor. Conclusively demonstration of any related pathological alteration in the periodontium credited to smoking have been reported in few studies. Smokers reported to be at increased risk to have *P. gingivalis* in subgingival region, despite this was not reported to be statistically significant. Investigators In the same study reported that smokers were triple the times probably to have *A. actinomycetemcomitans* [25]. Machuca studied a community of youthful Spanish healthy male soldiers to see the correlation of smoking habits and periodontal problems. The report included increased attachment loss and probing depths in smokers, although raised in plaque and bleeding in nonsmokers [26]. Aggressive configuration of periodontitis diagnosed in youthful smokers with more affected teeth and raised mean of clinical attachment lost than non-smokers. Bone loss and significantly greater probing depths reported in smokers than non-smokers, regarding tooth mobility no difference was founded [27]. Bergstrom., *et al.* reported smokers have significantly increased probing depths, alveolar bone loss and increased tooth mobility. Moreover, regarding the most region to be affected, clinical investigators have reported substantial periodontal destruction to be in maxilla in smokers with different types of periodontitis [28]. In a Brazillian investigation it was noticed that alveolar bone resorption raised in smokers comparing to nonsmokers, confirming that cigarettes utilization resorb maxillary jaw more than mandible, specifically anterior proportion [29].

The relationship of frequencies smoking and intensity of periodontal diseases

One of the major risk-determining factors is daily number of cigarettes smoked, increasing it sixfold in the subgrouped who smoked over than thirty cigarettes daily and doubling the risk for smokers in the lowest consumption category [30,31]. Several papers have reported a relationship between intensity of periodontitis and the number of smoked cigarettes. A correlation has been described between

the daily consumption of cigarettes and the spread of moderate to sever periodontal disease [32-36]. Severity of attachment loss was reported to be increased by 0.5% for smoking 1 cigarette per day, while smoking up to 10 and 20 cigarettes a day increases attachment loss by 5% and 10%, respectively [34].

Impact of smoking cessation on periodontium

Little knowledge on the impact of smoking cessation related to the risk of teeth loss reported, but literature suggests linked between teeth loss and smokers. Veterans Administration evaluation for men who cease smoking showed an average of 50% of teeth loss lower than the average of smokers, but remains remarkably higher than nonsmokers [35]. However, changing in increasing length of cessation was not addressed in the analysis. In a 12-year prospective research of 1031 Swedish ladies, who had cessation of smoking within an average of 10 years prior to be involved in the research showed similarity in previous smokers and who never smoked [37]. Progress of periodontium loss is observed to be cease in individuals who quit smoking [10]. The periodontal status of former smokers shows levels between that of never smoked and current smokers, which suggests that irreversible changes happened to the periodontium due to smoking, but the deterioration does not continue after cessation [10,35]. Furthermore, encouraging to note that respond to periodontal therapy in former smokers similar to nonsmoker [38,39].

Periodontal treatment responses in smokers

Smokers had approximately 50 percent less recovery in clinical attachment gain and probing depth than nonsmokers in a six-year longitudinal study [40]. Numbered of papers have reported that 90 percent of refractory periodontitis showed in smokers [41-43]. Success of gingival grafting for root coverage reported less in smokers than nonsmokers in majority of studies [44-46]. De Bruyn and Collaert believes that cigarettes smoking is a relative contraindication to dental implant therapy. Early failures before loading in maxilla were higher in smokers 9% than non-smoker 2% [47]. Implants supporting mandibular fixed prostheses in a fifteen-year longitudinal study showed only 1% loss of implants, but more bone loss demonstrated in smokers than former or who never smoked [48]. Several studies reported that smoking inhabit outcomes of attachment gain and probing depth after nonsurgical or surgical treatments [39,49,50]. Differences numerically among nonsmokers and smokers related to probing depths is ≥5 mm, where individual who smokes show 0.4 mm to 0.6 mm less recovery in clinical attachment gain after nonsurgical treatment [39,51]. Regarding surgical debridement, smokers show up to 1 mm less recovery in clinical attachment gains in probing depths that were previously ≥ 7 mm [52].

Systemic manifestations in smokers

Smokers are exhibiting a number of ways regarding insulin resistance and they are at high risk for developing type 2 diabetes. Diabetic nephropathy, retinopathy, neuropathy, macrovascular problems, and peripheral vascular problems reported to be at increased risk to happened to smokers [53-55]. Analyzing the correlation of smoking and its impact on the relationship between chronic obstructive pulmonary disease and periodontal inflammation reported by Hyman. The results showed that smoking is a co-factor in the correlation of these both diseases and the range of pathogenesis action count on the number of tobacco consumption by the patient [56]. Smoking at initial onset of nephritis stated by Orth and colleagues to be a separated risk factor for accelerating established end stage renal problems [57]. Ritz recognize that smoking is the cause of damaging endothelial cells, restrict the fibrinolysis systems and oxygen regeneration, perhaps these factors are the reasons of the relationship of the two [58]. A substantial factor for preventing of having osteoporosis and good prognosis after therapy is to cease or decrease in smoking [59].

Conclusion

Smokers exhibit an increased chance of harboring different pathogens in the periodontal pockets and mean periodontal pocket depth of ≥ 3.5 mm. Maxilla show more proportions of colonization than mandible. Smoking effects immune host responses decreased inflammation and reduced gingival crevicular fluid volumes. Also, clinical attachment lost but no difference in tooth mobility. Smokers showed poor

level of oral hygiene and double the percentage of dental plaque in nonsmokers. Daily numbered of cigarettes smoked is a major risk-determining factor. Cessation of periodontium loss in individuals who quit smoking. Responding to periodontal therapy in former smokers and nonsmoker is similar. Systemic manifestations including pulmonary destruction, diabetes mellitus, renal problems and osteoporosis.

Bibliography

1. Chatrchaiwiwatana S and Ratanasiri A. "Periodontitis associated with tobacco smoking among rural Khon Kaen Thai males: Analysis of two data sets". *Journal of the Medical Association of Thailand* (2009).

2. Yanagisawa T., *et al*. "Relationship of smoking and smoking cessation with number of teeth present: JPHC Oral Health Study". *Oral Diseases* (2009).

3. Bergström J. "Oral hygiene compliance and gingivitis expression in cigarette smokers". *European Journal of Oral Sciences* (1990).

4. Danielsen B., *et al*. "Transition dynamics in experimental gingivitis in humans". *Journal of Periodontal Research* (1989).

5. Qandil R., *et al*. "Tobacco smoking and periodontal diseases". *Journal Canadian Dental Association* 63.3 (1997): 187-192.

6. Zambon JJ., *et al*. "Cigarette smoking increases the risk for subgingival infection with periodontal pathogens". *Journal of Periodontology* 67.10 (1996): 1050-1054.

7. Umeda M., *et al*. "Risk Indicators for Harboring Periodontal Pathogens". *Journal of Periodontology* (1998).

8. Haffajee AD and Socransky SS. "Relationship of cigarette smoking to the subgingival microbiota". *Journal of Clinical Periodontology* (2001).

9. Borbour SE., *et al*. "Tobacco and smoking: Environmental factors modify the host response (immune system) and have an impact on periodontal health". *Critical Reviews in Oral Biology and Medicine* (1997).

10. Bergström J., *et al*. "A 10-Year Prospective Study of Tobacco Smoking and Periodontal Health". *Journal of Periodontology* (2005).

11. Lie MA., *et al*. "Evaluation of 2 methods to assess gingival bleeding in smokers and non-smokers in natural and experimental gingivitis". *Journal of Clinical Periodontology* (1998).

12. Kinane DF and Radvar M. "The Effect of Smoking on Mechanical and Antimicrobial Periodontal Therapy". *Journal of Periodontology* (1997).

13. Mosely LH., *et al*. "Nicotine and its effect on wound healing". *Plastic and Reconstructive Surgery* (1978).

14. Riebel GD., *et al*. "The effect of nicotine on incorporation of cancellous bone graft in an animal model". *Spine* (1995).

15. Noble RC and Penny BB. "Comparison of leukocyte count and function in smoking and nonsmoking young men". *Infection and Immunity* (1975).

16. Mcsharry C., *et al*. "Effect of cigarette smoking on the antibody response to inhaled antigens and the prevalence of extrinsic allergic alveolitis among pigeon breeders". *Clinical and Experimental Allergy* (1985).

17. Gunsolley JC., *et al*. "The effect of race, smoking and immunoglobulin allotypes on IgG subclass concentrations". *Journal of Periodontal Research* (1997).

18. Bagaitkar J., *et al*. "Smoking enhances bone loss in anterior teeth in a Brazilian population: a retrospective cross-sectional study". *Brazilian Oral Research* 22.4 (2008): 328-333.

19. Bagaitkar J., *et al*. "Tobacco upregulates *P. gingivalis* fimbrial proteins which induce TLR2 hyposensitivity". *PLoS ONE* (2010).

20. Preber H., *et al*. "Cigarette smoking, oral hygiene and periodontal health in Swedish army conscripts". *Journal of Clinical Periodontology* (1980).

21. Preber H and Kant T. "Effect of tobacco- smoking on periodontal tissue of 15-year-old schoolchildren". *Journal of Periodontal Research* (2006).

22. Feldman RS., *et al*. "Association Between Smoking Different Tobacco Products and Periodontal Disease Indexes". *Journal of Periodontology* (2012).

23. Macgregor IDM. "Toothbrushing efficiency in smokers and non-smokers". *Journal of Clinical Periodontology* (1984).

24. Ismail AI., *et al*. "Epidemiologic patterns of smoking and periodontal disease in the United States". *Journal of the American Dental Association* (1939).

25. Boström L., *et al*. "Smoking and subgingival microflora in periodontal disease". *Journal of Clinical Periodontology* (2001).

26. Machuca G., *et al*. "Effect of cigarette smoking on periodontal status of healthy young adults". *Journal of Periodontology* (2000).

27. Locker D and Leake JL. "Risk Indicators and Risk Markers for Periodontal Disease Experience in Older Adults Living Independently in Ontario, Canada". *Journal of Dental Research* (1993).

28. Bergstrom J., *et al*. "Cigarette smoking and periodontal bone loss". *Journal of Periodontology* 62.12 (1991): 809.

29. Lima FR., *et al*. "Smoking enhances bone loss in anterior teeth in a Brazilian population: a retrospective cross-sectional study". *Brazilian Oral Research* 22.4 (2008): 328-333.

30. Tomar SL and Asma S. "Smoking-attributable periodontitis in the United States: findings from NHANES III. National Health and Nutrition Examination Survey". *Journal of Periodontology* (2000).

31. Winn DM. "Tobacco Use and Oral Disease". *Journal of Dental Education* (2001).

32. Grossi SG., *et al*. "Assessment of risk for periodontal disease. I. Risk indicators for attachment loss". *The Journal of Periodontology* (1994).

33. Grossi SG., *et al*. "Assessment of risk for periodontal disease. II. Risk indicators for alveolar bone loss". *The Journal of Periodontology* (1995).

34. Martinez-Canut P., *et al*. "Smoking and periodontal disease severity". *Journal of Clinical Periodontology* (1995).

35. Krall EA. "Smoking, smoking cessation, and tooth loss". *Journal of Dental Research* (1997).

36. Kent RL., *et al*. "Evidence for Cigarette Smoking as a Major Risk Factor for Periodontitis". *Journal of Periodontology* (2010).

37. Ahlqwist, M., *et al*. "Smoking habits and tooth loss in Swedish women". *Community Dentistry and Oral Epidemiology* 17.3 (1989): 144-147.

38. Kaldahl WB., *et al*. "Levels of Cigarette Consumption and Response to Periodontal Therapy". *Journal of Periodontology* (1996).

39. Grossi SG., *et al*. "Effects of smoking and smoking cessation on healing after mechanical periodontal therapy". *Journal of the American Dental Association* (1997).

40. Baumert Ah MK., *et al*. "The effect of smoking on the response to periodontal therapy". *Journal of Clinical Periodontology* (1994).

41. MacFarlane GD., *et al*. "Refractory Periodontitis Associated With Abnormal Polymorphonuclear Leukocyte Phagocytosis and Cigarette Smoking". *Journal of Periodontology* (1992).

42. Magnusson I., *et al*. "Treatment of subjects with refractory periodontal disease". *Journal of Clinical Periodontology* (1994).

43. Magnusson I and Walker CB. "Refractory periodontitis or recurrence of disease". *Journal of Clinical Periodontology* (1996).

44. Miller PD. "Root coverage with the free gingival graft. Factors associated with incomplete coverage". *Journal of Periodontology* (1987).

45. Müller HP., *et al*. "Gingival dimensions after root coverage with free connective tissue grafts". *Journal of Clinical Periodontology* (1998).

46. Zucchelli, G., *et al*. "Mucogingival Versus Guided Tissue Regeneration Procedures in the Treatment of Deep Recession Type Defects". *Journal of Periodontology* (1998).

47. De Bruyn H and Collaert B. "The effect of smoking on early implant failure". *Clinical Oral Implants Research* (1994).

48. Lindquist LW. "Association between marginal bone loss around osseointegrated mandibular implants and smoking habits: A 10-year follow-up study". *Journal of Dental Research* (1997).

49. Jin L., *et al*. "Comparison of Treatment Response Patterns Following Scaling and Root Planing in Smokers and Non-smokers with Untreated Adult Periodontitis". *Journal of Clinical Dentistry* (2000).

50. Scabbia A., *et al*. "Cigarette Smoking Negatively Affects Healing Response Following Flap Debridement Surgery". *Journal of Periodontology* (2001).

51. Söder B., *et al*. "Longitudinal Effect of Non-Surgical Treatment and Systemic Metronidazole for 1 Week in Smokers and Non-Smokers with Refractory Periodontitis: A 5-Year Study". *Journal of Periodontology* (1999).

52. Heasman, L., *et al*. "The effect of smoking on periodontal treatment response: A review of clinical evidence". *Journal of Clinical Periodontology* (2006).

53. Eliasson B. "Cigarette smoking and diabetes". *Progress in Cardiovascular Diseases* (2003): 405-413.

54. Willi C., *et al*. "Active smoking and the risk of type 2 diabetes: A systematic review and meta-analysis". *Journal of the American Medical Association* (2007).

55. American Diabetes Association "Executive summary: Standards of medical care in diabetes--2012". *Diabetes Care* (2012).

56. Hyman JJ and Reid BC. "Cigarette Smoking, Periodontal Disease, and Chronic Obstructive Pulmonary Disease". *Journal of Periodontology* (2004).

57. Orth S. R., *et al*. "Smoking as a risk factor for end-stage renal failure in men with primary renal disease". *Kidney International* 54.3 (1998): 926-931.

58. Ritz E., *et al*. "Effects of smoking on renal hemodynamics in healthy volunteers and in patients with glomerular disease". *Journal of the American Society of Nephrology* 9.10 (1998): 1798-1804.

59. Hollenbach KA., *et al*. "Cigarette smoking and bone mineral density in older men and women". *American Journal of Public Health* (1993).

Volume 19 Issue 2 February 2020