

ORIGINAL RESEARCH

Evaluation of Correlation between Obstructive Sleep Apnea and Chronic Periodontitis: A Clinical Study

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ABSTRACT

Aim: To investigate the prevalence of periodontal diseases in obstructive sleep apnea (OSA) patients and identify the various factors common to OSA and periodontal disease.

Materials and Methods: Total, 100 subjects were identified from newly diagnosed patients with OSA and confirmed with polysomnography-derived apnea-hypopnea index (AHI) score >5/hour. Patients underwent complete clinical periodontal examination, which included the following measures: Plaque index (PI) (Silness and Loe, 1964), gingival index (GI) (Loe and Silness, 1963), pocket depth (PD), and clinical attachment level (CAL). Each patient filled a questionnaire, which was used to obtain information about the patient's age, gender, nasal breathing status, smoking status, dry mouth, and systemic diseases like hypertension and diabetes mellitus.

Results: (a) Clinical parameters, such as PI, GI, CAL, and PD were directly proportional to the severity of OSA. (b) Factors that were observed to be commonly linked between sleep apnea and periodontitis were gender, smoking, hypertension, nasal breathing, and dry mouth.

Conclusion: Further research with larger sample size, biochemical changes, and study of various other confounding factors could be designed for better understanding of the inter-relationship between OSA and chronic periodontitis (CP).

Keywords: Chronic periodontitis, Obstructive sleep apnea, Systemic inflammation.

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INTRODUCTION

Chronic periodontitis is a preventable and treatable inflammatory disease of the gingiva,¹ which is characterized by

destruction of the tooth-supporting tissues, thus resulting in the development of periodontal pockets, alveolar bone loss, and tooth mobility.²

The CP has been suggested to be a suspected risk factor for the development of cerebrovascular/cardiovascular diseases,³⁻⁷ pulmonary diseases,⁴ as well as pregnancy, diabetes,⁴ cancer,^{8,9} rheumatoid arthritis,¹⁰ and osteoporosis.¹¹

Obstructive sleep apnea and its associated daytime symptoms form a syndrome, the obstructive sleep apnea-hypopnea syndrome.^{13,14}

Risk factors for periodontal disease include age, smoking, drinking, obesity, and diabetes, whereas both periodontal disease and OSA are associated with systemic inflammation.

AIMS AND OBJECTIVES

Aims

- To investigate the prevalence of periodontal diseases in OSA patients.
- To identify the various factors common to OSA and periodontal diseases.

Objective

The objective of the study is to explore the association between OSA and CP.

MATERIALS AND METHODS

The present study was conducted at Jain ENT Hospital, Jaipur, India, and it was designed to investigate the correlation of OSA with CP.

A total of 100 subjects were identified from newly diagnosed patients with OSA and confirmed with polysomnography-derived AHI score >5/hour.

Out of 100 subjects, 93 subjects consented to participate in the study. Subjects were selected based upon inclusion and exclusion criteria. An informed verbal and written consent duly signed by the patient was taken from all the subjects prior to their enrollment into the study.

Inclusion Criteria

- Patients from both sexes with age ranging from 18 to 85 years.

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- No prior history of any treatment for sleep apnea.
- Nonsmokers or former smokers who quit at least 6 months prior to their examination.

Exclusion Criteria

- Subjects with a medical condition requiring antibiotic prophylaxis.
- Patients who had periodontal treatment within the previous 3 months.
- Pregnant and lactating females and patients who underwent complete clinical periodontal examination.

Periodontal assessments in this study included the following measures: PI (Silness and Loe 1964),¹⁴ GI (Loe and Silness 1963),¹⁵ PD, and CAL.

Every patient was requested to duly fill a questionnaire whereas the investigator completed a clinical characteristics questionnaire. The questionnaires were designed so as to obtain data for this study as well as for a separate analysis of sociodemographic and clinical characteristics associated with high risk of OSA. The questionnaire was used to obtain information about the patient's age, gender, nasal-breathing status, smoking status, dry mouth, and systemic diseases like hypertension and diabetes mellitus.

Clinical Parameters

- PI: by Silness and Loe (1964)¹⁴
- GI: by Loe and Silness (1963)¹⁵
- Probing PD and CAL: measured by UNC-15 probe
- AHI (according to AASMT, 1999)

RESULTS

In the present study based on statistical analysis of clinical parameters and the questionnaire, the following results were observed:

- Clinical parameters, such as PI, GI, CAL, and PD were directly proportional to severity of OSA.
- Factors that were commonly associated between OSA and periodontitis were gender, smoking, hypertension, nasal breathing, and dry mouth.

DISCUSSION

In the present study, the mean PI, GI, PD, and CAL were significantly different among mild, moderate, and severe sleep apnea patients.

All periodontal clinical parameters were significantly higher in patients with OSA.¹⁶

On further *post hoc* analysis, the severe sleep apnea patients had significantly greater PI, GI, PD, and CAL scores compared with the moderate and mild cases. Similarly, the moderate patients had higher PI, GI, PD,

and CAL scores as compared with the mild cases, and these differences were statistically significant ($p \leq 0.05$).

The increased prevalence of periodontitis in OSA patients could be due to a true association between OSA and periodontitis. OSA could act as an inflammatory mediator for periodontitis or vice versa. (i) The OSA may increase the presence and severity of periodontitis by contributing to increased systemic inflammation; or (ii) periodontitis may be contributing to the increased systemic inflammation noted in OSA patients.¹⁷

Periodontal disease as a chronic inflammatory disease and OSA are associated with multiple inflammatory cells, such as neutrophils and monocytes and inflammatory mediators, such as interleukin (IL)-1, IL-6 and IL-8 and tumor necrosis factor α . This chronic inflammatory state may indirectly contribute to systemic inflammation via mediators.¹⁷

Results were in concordance with the study done by Seo et al,¹⁸ who determined the prevalence of periodontitis in a group of patients diagnosed with OSA and suggested that OSA is associated with periodontitis.

Results were in accordance with those of Ahmad et al,¹⁹ Keller et al,²⁰ and Gamsiz-Isik et al,²¹ who found the association between OSA and CP.

CONFOUNDING FACTORS

Gender

The present study demonstrated a prevalence of periodontitis more in males as compared with females. The results are in accordance with the study done by Albandar et al,²² who attributed this aspect to habits, such as smoking and associated systemic diseases, such as hypertension.

Age

In the present study, there was no specific age predilection associated with OSA. This could be due to diverse population, habits, and systemic status. The results do not agree with the study done by Albandar et al²² and Ahmad et al,¹⁹ who reported age predilection.

Smoking Status

In the current study, the incidence of smoking was proportionately related to severity of OSA and periodontal parameters. The number of subjects having history of smoking was considerably higher as compared with those who never smoked. The results are in accordance with the study done by Bergström,²³ Moimaz et al.²⁴

Diabetes

The present study revealed no significant association between subjects having OSA and diabetes. However,

those OSA subjects having diabetes had a greater tendency of having moderate-to-severe periodontitis. This finding has been supported by Preshaw et al²⁵ and Taylor and Borgnakke²⁶ that indicate that diabetes and poor glycemic control are significant risk factors for periodontitis and *vice versa*.

Hypertension

The OSA subjects having hypertension was significant, which also related to increased incidence of periodontal finding. The study results are in accordance with the study done by Akkara et al.²⁷ The most common mechanism includes the effect of intermittent negative intrathoracic pressure during apneic episodes and recurrent episodes of hypoxemia and hypercapnia causing abnormal activation of arterial chemoreceptors increased sympathetic activity associated with repeated arousals due to apnea and remodeling of systemic vasculature.

Nasal Breathing

The incidence of no difficulty with nasal breathing in OSA subjects was significant in the present study. However, those subjects who demonstrated difficulty in nasal breathing were having higher incidence of periodontitis, as reflected in the clinical parameters assessed. The findings are supported by the study done by Wagaiyu and Ashley²⁸ in teenagers.

Dry Mouth

A considerable subject population in the present study had dry mouth. Dry mouth has a direct influence on periodontitis. This may be because saliva does not enter into the periodontal pockets where the bacterial pathogens are located. Drying of mouth can also impair the self-cleansing ability of the oral cavity, leading to gingivitis and increased bacterial colonization. The findings are in accordance with the study done by Dawes.²⁹

CONCLUSION

Further research with larger sample size, biochemical changes, and study of various other confounding factors could be designed for better understanding of the inter-relationship between OSA and CP.

REFERENCES

1. Burt B, Research, Science and Therapy Committee of the American Academy of Periodontology. Epidemiology of periodontal diseases (position paper). J Periodontol 2005 Aug;76(8):1406-1419.
2. Kim J, Amar S. Periodontal disease and systemic conditions: a bidirectional relationship. Odontology 2006 Sep;94(1):10-21.
3. Beck JD, Offenbacher S. Systemic effects of periodontitis: epidemiology of periodontal disease and cardiovascular disease. J Periodontol 2005 Nov;76(11 Suppl):2089-2100.
4. Dietrich T, Garcia RI. Associations between periodontal disease and systemic disease: evaluating the strength of the evidence. J Periodontol 2005 Nov;76(Suppl 11):2175-2184.
5. DeStefano F, Anda R.F, Kahn HS, Williamson DF, Russell CM. Dental disease and risk of coronary heart disease and mortality. BMJ 1993 Mar;306(6879):688-691.
6. Williams RC, Barnett AH, Claffey N, Davis M, Gadsby R, Kellett M, Lip GY, Thackray S. The potential impact of periodontal disease on general health: a consensus view. Curr Med Res Opin 2008 Jun;24(6):1635-1643.
7. Wu T, Trevisan M, Genco RJ, Dorn JP, Falkner KL, Sempos CT. Periodontal disease and risk of cerebrovascular disease the first national health and nutrition examination survey and its follow-up study. Arch Intern Med 2000 Oct;160(18):2749-2755.
8. Yao SG, Fine JB. Periodontitis and cancer...a link? A review of the recent literature. Compend Contin Educ Dent 2010 Jul-Aug;31(6):436-442.
9. Hujuel PP, Drangsholt M, Spiekerman C, Weiss NS. An exploration of the periodontitis- cancer association. Ann Epidemiol 2003 May;13(5):312-316.
10. Detert J, Pischon N, Burmester GR, Buttgerit F. The association between rheumatoid arthritis and periodontal disease. Arthritis Res Ther 2010 Oct;12(5):218.
11. Azarpazhooh A, Leake JL. Systematic review of the association between respiratory diseases and oral health. J Periodontol 2006 Sep;77(9):1465-1482.
12. Young T, Peppard P, Palta M, Hla KM, Finn L, Morgan B, Skatrud J. Population-based study of sleep-disordered breathing as a risk factor for hypertension. Arch Intern Med 1997 Aug;157(15):1746-1752.
13. Pack AI. Advances in sleep-disordered breathing. Am J Respir Crit Care Med 2006 Jan;173(1):7-15.
14. Silness J, Loe H. Periodontal disease in pregnancy II. Correlation between oral hygiene and periodontal condition. Acta Odontol Scand; 22: 121-135, 1964
15. Loe, H. & Silness, J. Periodontal disease in pregnancy I . Prevalence and severity, Acta Odont Scand, 21:533-551, 1963
16. Katancik JA, Kritchevsky S, Weyant RJ, Corby P, Bretz W, Crapo RO, Jensen R, Waterer G, Rubin SM, Newman AB. Periodontitis and airway obstruction. J Periodontol 2005 Nov;76(11 Suppl):2161-2167.
17. Gunaratnam K, Taylor B, Curtis B, Cistulli P. Obstructive sleep apnoea and periodontitis: a novel association? Sleep Breath 2009 Aug;13(3):233-239.
18. Seo WH, Cho ER, Thomas RJ, An SY, Ryu JJ, Kim H, Shin C. The association between periodontitis and obstructive sleep apnea: a preliminary study. J Periodont Res 2013 Aug;48(4): 500-506.
19. Ahmad NE, Sanders AE, Sheats R, Brame JL, Essick GK. Obstructive sleep apnea in association with periodontitis: a case control study. J Dent Hyg 2013 Aug;87(4):188-199.
20. Keller JJ, Wu CS, Chen YH, Lin HC. Association between obstructive sleep apnoea and chronic periodontitis: a population based study. J Clin Periodontol 2013 Feb;40(2):111-117.
21. Gamsiz-Isik H, Kiyani E, Bingol Z, Baser U, Ademoglu E, Yalcin F. Does obstructive sleep apnea increase the risk for periodontal disease?: a case-control study. J Periodontol 2017 May;88(5):443-449.

22. Albandar JM, Brunelle JA, Kingman A. Destructive periodontal disease in adults 30 years of age and older in the United States, 1988-1994. *J Periodontol* 1999 Jan;70(1):13-29.
23. Bergström J. Cigarette smoking as risk factor in chronic periodontal disease. *Community Dent Oral Epidemiol* 1989 Oct;17(5):245-247.
24. Moimaz SA, Zina LG, Saliba O, Garbin CA. Smoking and periodontal disease: Clinical evidence for an association. *Oral Health Prev Dent*. 2009;7(4):369-376
25. Preshaw PM, Alba AL, Herrera D, Jepsen S, Konstantinidis A, Makrilakis K, Taylor R. Periodontitis and diabetes: a two-way relationship. *Diabetologia* 2012 Jan;55(1):21-23.
26. Taylor GW, Borgnakke WS. Periodontal disease: associations with diabetes, glycemic control and complications. *Oral Dis* 2008 Apr;14(3):191-203.
27. Akkara SA, Shah DA, Akkarra AG, Singhanian AA. Effect of obstructive sleep apnea on hypertension. *J Integr Health Sci* 2013 Dec;1(2):82-85.
28. Wagaiyu EG, Ashley FP. Mouthbreathing, lip seal and upper lip coverage and their relationship with gingival inflammation in 11-14 year-old schoolchildren. *J Clin Periodontol* 1991 Oct;18(9):698-702.
29. Dawes C. Salivary flow patterns and the health of hard and soft oral tissues. *J Am Dent Assoc* 2008 May;139(Suppl):18S-24S.