



Impact of Periodontal Disease on Sleep Quality and Oral Health-related Quality of Life

Periodontal Hastalığın Uyku Kalitesi ve Ağız Sağlığı ile ilgili Yaşam Kalitesi Üzerindeki Etkisi

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Abstract

Objective: To investigate the association between periodontitis and sleep quality and oral health-related quality of life.

Materials and Methods: According to the new classification of periodontal diseases (American Academy of Periodontology, 2017), the study comprised 112 patients who were divided into groups. Stage 0-I (periodontally healthy/initial periodontitis) and stage II- IV (periodontitis). Periodontal indicators such as plaque index, gingival index, probing pocket depth, and clinical attachment loss were noted at baseline, and the participants were given Pittsburgh sleep quality index (PSQI) and oral health impact profile (OHIP)-20 questionnaire to observe the mentioned components. After 15 days, data were collected and subjected to statistical analysis.

Results: The PSQI and OHIP-20 global scores were greater in stage II- IV with a mean difference of 2.45 in PSQI scores and 17.467 in OHIP scores between the groups with a highly statistically significant difference.

Conclusion: There is a considerable association between the severity of periodontitis and sleep deprivation, which has an impact on an individual's quality of life.

Keywords: Periodontal disease, sleep quality, oral health related quality of life, wellbeing

Öz

Amaç: Diş eti hastalığı veya periodontitis ile uyku kalitesi ve ağız sağlığına bağlı yaşam kalitesi ile ilişkisini araştırmaktır.

Gereç ve Yöntemler: Bu randomize olmayan, tek kör kesitli bir klinik çalışmadır. Hastalar 2017 Dünya Periodontal ve Peri-İmplant Hastalıkları ve Koşullarının Sınıflandırılması Çalıştayı uyarınca teşhis edildi. Toplam 112 hasta, evre 0-I (periodontal olarak sağlıklı/ başlangıç periodontit), evre II-IV (periodontit) gruplarına ayrıldı. Plak indeksi, dişeti indeksi, problama cebi derinliği gibi periodontal göstergeler, başlangıçta klinik bağlanma kaybı not edildi ve katılımcılara belirtilen bileşenleri gözlemlemek için Pittsburg uyku kalitesi endeksi (PSQI) ve ağız sağlığı etki profili (OHIP)-20 anketi verildi. On beş gün sonra veriler toplandı ve istatistiksel analize tabi tutuldu.

Bulgular: PSQI ve OHIP-20 küresel skorları, aşama II-IV'de daha yüksekti ve gruplar arasında PSQI skorlarında ortalama 2,45 ve OHIP skorlarında 17.467 fark vardı. Global PSQI ve OHIP-20 skorları periodontit aşaması ($p<0,001$) ile oldukça istatistiksel anlamlı fark göstermiştir.

Sonuç: Aşama II-IV'teki periodontitisin, bireyin yaşam kalitesini etkileyen uyku yoksunluğu ile önemli ölçüde ilişkili olduğu bulunmuştur.

Anahtar Kelimeler: Periodontal cep, uyku kalitesi, ağız sağlığına bağlı yaşam kalitesi, refah

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Introduction

Oral health is an important aspect of overall wellness and diseases of the oral tissues may have an impact on the general wellbeing of the patients (1,2). Among the varied oral diseases, periodontal disease (gum diseases) is most common with an impact on individual's well-being. Periodontal disease is a chronic infectious entity affecting the tooth supporting structures resulting in tooth loss when left untreated (3). Risk determinants of periodontal disease are common to a number of other chronic diseases accelerating tissue destruction and disease progression (4).

Oral health-related quality of life (OHRQoL) focuses on determining how oral health affects a person's daily life (2). Sleep is one factor that plays a critical part in maintaining physical and mental health. Sleep deprivation is linked to lower immunity and higher inflammatory markers, both of which have a significant impact on the onset and course of a variety of infectious disorders, including periodontal disease. Acute and chronic sleep deprivation can activate inflammatory processes, resulting in increased C-reactive protein concentrations, increased peripheral circulation of leukocytes, and increased levels of interleukin-6 (IL-6) and tumour necrosis factor alpha (TNF- α) (5), all of which can lead to systemic infections and negatively impact an individual's quality of life. Although bacteria invade the tooth surface and gingival sulcus to cause periodontal disease, pro-inflammatory cytokines such as IL-1, 6, TNF- α , and PGE2 generated by the host are thought to have a key role in disrupting tissue homeostasis (6).

Periodontitis-related bleeding, redness, swollen gums, foul breath, tooth movement, and tooth loss have a detrimental impact on self-esteem and quality of life (7). As a result, periodontitis may have an impact on sleep, as inflammation is a common feature of both periodontitis and poor sleep. The goal of this research is to investigate into the relationship between periodontitis and sleep quality and OHRQoL in periodontitis patients.

Materials and Methods

Study Design

This is a cross sectional clinical study in which a total of 135 periodontally healthy and periodontitis patients in age range of 35-55 years were assessed and included during initial examination. The study protocol was approved by The Vishnu Dental College Ethics Committee (no: VDC/RP/2020/27, date: 11.2019). All the clinical procedures were followed according to the declaration of Helsinki and good clinical practice guidelines. Written informed consents were obtained from all the participants before the commencement of participation.

Screening and Patient Eligibility

Patients visiting post graduate department of Periodontics, Vishnu Dental College were included in the study. The

demographic factors of the patients, such as their age, gender, educational and economic position, as well as the preliminary assessment, which included their medical and dental histories, were all recorded.

Inclusion Criteria

Patient related criteria: Asymptomatic patients.

Teeth related criteria: Minimum number of 20 teeth in the mouth and a minimum of 4 teeth in each quadrant; who had not received non-surgical and surgical periodontal treatment in the past one year.

Exclusion Criteria

Patient related criteria: Smokers, pregnant and lactating woman, patients with uncontrolled systemic diseases like hypertension, diabetes mellitus, salivary gland diseases, patients who had taken antibiotics in the past 3 months, patients with poor dietary intake, students were excluded due to higher prevalence of sleep disorders amongst them.

Teeth related criteria: Presence symptomatic dental diseases (i.e., caries, pulpal disease, trauma, etc.,).

After a thorough clinical examination, periodontal disease activity was recorded using periodontal parameters like plaque index (PI), gingival index (GI), probing pocket depth (PPD) and clinical attachment loss (CAL). Patients were categorized based on the new classification given by AAP 2017 (8). The severity of periodontitis was calculated using the staging approach wherein the stage classifies the severity and complexity of periodontal disease.

A total of 135 patients who satisfied the inclusion and exclusion criteria were enrolled for the study and were categorized into 2 groups in consideration of the low sensitivity of panoramic radiographs for slight crestal bone changes (9,10). Stage 0-I (Periodontally healthy/initial periodontitis)-interproximal attachment loss ≤ 2 mm at the site of greatest loss and radiographic bone loss extending only upto coronal third i.e., $<15\%$ as visible in radiographs. Stage II-IV (periodontitis)-interdental CAL of >2 mm and radiographic bone loss extending beyond the coronal third i.e., $>15\%$ as visible in radiographs.

During initial examination all the patients were prescribed chlorhexidine mouth rinse and advised oral hygiene instructions. No periodontal therapy was performed. Awareness and importance of Pittsburgh sleep quality index (PSQI) and oral health impact profile (OHIP) questionnaire was explained to all the participants and were made to observe the components mentioned in the questionnaires for 2 weeks after initial examination. However 8 patients in group A and 15 in group B were excluded during follow up due to various reasons such as use of medications for other systemic problems, pain due to pulpal involvement or any other general conditions, underwent dental treatments, failure to report for evaluation after 15 days etc.

PSQI and OHIP assessments were done 15 days after the initial examination. PSQI is a self-reported questionnaire

with 19 self-rated items organised into seven components that is powerful, reliable, and standardized (11). To achieve a global score, the domain scores were added together. The OHIP-20 questionnaire is a modification of OHIP-14 questionnaire to accommodate the regional considerations. After the questionnaire was validated, it was utilised to investigate the impact of periodontitis on OHRQoL (12). The OHIP-20 is divided into 3 basic domains with the highest score indicating poorer quality of life.

Statistical Analysis

Data analysis was done using SPSS software v.20.0 (Armonk, NY, IBM). Comparison of the study groups with means of all the parameters was done by independent t-test. Intragroup comparison of all the clinical parameters was done by One-Way ANOVA and post-hoc Tukey HSD test. Correlation among various parameters was done using Pearson correlation. Data were represented as mean and standard deviation with a statistical significance level of 0.05.

Results

A total of 203 periodontally healthy and periodontitis patients were screened and based on the established selection criteria a total of 135 participants were included. Twenty-three participants were excluded later on, thus data of only 112 participants was analyzed. Stage 0-I included 66 participants with healthy periodontium or initial periodontitis and stage II-IV included 46 subjects with stage II, III and IV periodontitis (Figure 1).

The mean age of all participants was a 35.34 ± 4.5 year ranging from 20 to 55 years. The sample consisted of 58 (51.7%) females and 52 (46.7%) males. There was no statistically significant difference between the groups in any of the above variables.

All the clinical parameters showed significant difference between stage 0-I and stage II-IV with greater PI, GI scores and greater PPDs and attachment loss in Stage II-IV. The mean of the global PSQI score was 7.53 ± 2.07 and OHIP-20 score was 21.13 ± 12.1 . The mean PSQI global score was highest in stage II-IV (9.26 ± 1.34) and least in stage 0-I (6.81 ± 1.17) with highly statistically significant difference (Table 1). Stage II-IV showed considerable difference in sleep quality, duration, habitual sleeping and daytime dysfunction as compared to stage 0-I. However there is no significant difference in sleep latency and disturbances between the groups. Amongst all the subjects included in the study only one patient in stage II-IV was under medication for sleep improvement (Table 1).

The mean OHIP-20 global and component scores were assessed and the difference of the scores was found to be highly statistically significant between stage II-IV (32.73 ± 8.58), and stage 0-I (15.27 ± 6.57). All the three components of OHIP score i.e., functional, physical and psychosocial disability showed greater values for stage II-IV compared to stage 0-I. However, the physical disability was more in both Stages compared to functional and psychosocial disability (Table 2).

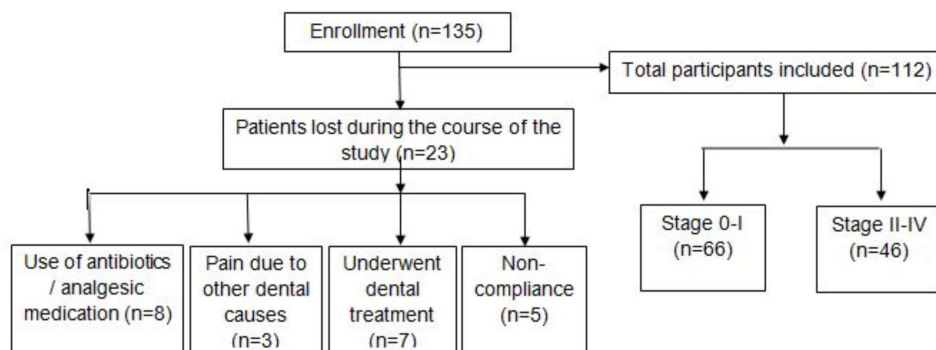


Figure 1. Patient screening chart

Variables	Groups	Mean
Age	Stage 0-I	31.02
	Stage II-IV	39.69
Gender (M/F)	Stage 0-I	48.2/51.8% (n=29/28)
	Stage II-IV	46.2/53.8% (n=25/30)

M: Male, F: Female

Table 2. OHIP-20 component scores and stage of periodontitis

OHIP	Groups	Mean	95% confidence interval for mean		p-value
			Lower limit	Upper limit	
Functional disability	Stage 0-I	3.72±1.574	3.3403	4.1143	0.000**
	Stage II-IV	8.04±1.172	7.6952	8.3918	
Physical disability	Stage 0-I	6.36±3.066	5.6098	7.1175	0.000**
	Stage II-IV	13.95±2.139	13.3213	14.5918	
Psychosocial disability	Stage 0-I	5.15±2.684	4.4915	5.8115	0.000**
	Stage II-IV	11.91±3.437	10.8923	12.9338	

**p<0.001: Highly statistically significant, OHIP: Oral health impact profile

There was a significant positive correlation between PSQI scores and stage of periodontitis. There was also a significant correlation between the global and all the three domain scores with periodontitis (Table 3).

Discussion

Oral health is all about functional, physical, psychological and social well-being of an individual rather than the surrogate end points measured at the time of treatment procedures. Periodontal disease is a chronic inflammatory disease which influences host immune-inflammatory mechanisms and evidence suggests sleep deprivation also has an increase in the similar inflammatory markers.

Table 3. Correlation between stage and PSQI global, OHIP global, domain scores

Variables	Stage	
	r-value	p-value
Global PSQI	0.770**	0.000**
Sleep quality	0.337**	0.000**
Sleep latency	0.064	0.487
Sleep duration	0.652**	0.000**
Habitual sleeping	0.658**	0.000**
Sleep disturbances	0.034	0.712
Medication	0.215*	0.019*
Daytime dysfunction	0.578**	0.000**
Correlation between stage and OHIP global, domain scores		
Global OHIP	0.792**	0.000**
Functional disability	0.849**	0.000**
Physical disability	0.837**	0.000**
Psychosocial disability	0.772**	0.000**

r: Pearson correlation coefficient, *Correlation is significant at the 0.05 level (2-tailed), **Correlation is significant at the 0.01 level (2-tailed). OHIP: Oral health impact profile, PSQI: Pittsburgh sleep quality index

Although, improvement in traditional measures i.e., probing depth, clinical attachment level along with various clinical indices are important, little is known about periodontal disease and its influence on other conditions like sleep disturbance to improve ones quality of life (13). Sleep disturbance in patients with periodontal disease can have an impact on the general well-being of the patient and on OHRQoL.

In the present study after eliminating the confounding factors such as systemic risk factors and environmental risk factors, the participants were categorized into stage 0-I and stage II-IV.

Results of the current study elucidated that the mean global PSQI score was greater in stage II-IV periodontitis. A positive correlation between PSQI scores and the stage of periodontitis suggest that sleep quality commensurate with periodontal tissue destruction. Though various other methods for assessing the quality of sleep have been utilized PSQI is found to have 89.6% sensitivity and 86.5% specificity for identifying sleep disturbances. The findings of this study are consistent with earlier research that has suggested a link between sleep and periodontitis (14,15). However all these studies are case control studies which compared the possible association of sleep in periodontitis and non-periodontitis patients. Only one research looked at the relationship between sleep quality and periodontal disease severity i.e., based on the 2017 classification of periodontal disease and the results correlate with the results of the current investigation. Fatigue caused due to sleep deprivation could worsen systemic health in rats and increased gingival inflammation and alveolar bone loss was reported in an experimental periodontitis model (16).

The OHIP 20 results showed that the patients with stage 0-I i.e., periodontally healthy/initial periodontitis had a better OHRQoL scores compared to stage II-IV. The results indicate that the greater the severity of periodontal disease the poorer is the QoL. In particular when all the three domains of OHIP questionnaire were compared, the physical disability was found to be greater when compared to the functional and psychosocial disability. The results of this study are in accordance to a srilankan study which

showed a greater association of periodontitis with physical pain (17). However in a similar study done to assess the association of stage grade of periodontitis to OHRQoL, psychological disability was found to be greater compared to other components (16).

The majority of previous investigations have demonstrated that periodontitis has a detrimental influence on OHRQoL (18-20). In a few studies, however, there is no control for confounding by other oral diseases, and several research only control a few factors in their multivariate analysis. Because OHRQoL is a subjective phenomena that may be influenced by a variety of circumstances, it's critical to account for known confounding factors (such as other clinical disorders that have an impact on people's daily lives) to prevent misinterpreting the results. In this study maximum effort was made either to eliminate or to exclude all confounding factors, and the findings are consistent with a recent study that indicated a strong link between periodontal disease severity and QoL (21). In the present study an attempt was made to measure the dysfunction, discomfort and disability in conjunction with the traditional indicators of clinical disease.

Assessing the individual confounding variables like race/ethnicity, education, and socio-economic status with inclusion of wide range of populations from different geographical areas and their relation or influence on sleep would help in giving more specific result. Further, assessing the impact of periodontal disease and its treatment on functional and social well-being of the patients was also not measured.

Conclusion

Within the scope of the study, there is a probable link between periodontitis severity and sleep deprivation, which might have an influence on quality of life.

There is a need to focus on the prevention of periodontal disease, screening, diagnosis and management of the disease at early stages. Assessing the OHRQoL should become an integral part of examination by health care professionals for the general health and well-being of an individual.

Ethics

Ethics Committee Approval: The study protocol was approved by The Vishnu Dental Collage Ethics Committee (no: VDC/RP/2020/27, date: 11.2019).

Informed Consent: Written informed consents were obtained from all the participants before the commencement of participation.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: R.S.V.K., S.G., A.B., K.V., Concept: R.S.V.K., S.G., Design: R.S.V.K., S.G., M.K.P., Data

Collection or Processing: R.S.V.K., S.G., M.K.P., S.P., A.B., G.P., K.V., Analysis or Interpretation: R.S.V.K., S.G., M.K.P., Literature Search: R.S.V.K., S.G., M.K.P., S.P., A.B., G.P., K.V., Writing: R.S.V.K., S.G., S.P.

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