ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 9, Issue, 06, pp.51971-51974, June, 2017

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

SLEEP DEPRIVATION AND CHRONIC PERIODONTITIS

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ARTICLE INFO

Article History:
Received 23rd March, 2017
Received in revised form
09th April, 2017
Accepted 17th May, 2017
Published online 20th June, 2017

Key words:

Chronic periodontitis,
Pittsburgh Sleep Quality Index,
Sleep deprivation.

ABSTRACT

Background: Deficits in daytime performance due to sleep loss are experienced universally and associated with a significant social, financial, and human cost. Overall, immunity decreases, a state of systemic inflammation with increased inflammatory markers ensues, and several hormones become up regulated. Underlying mechanisms involve modulation of immune inflammatory mechanisms. These changes might contribute to potentiation of destructive periodontal disease. Therefore, the present study aimed to assess if there is an association of sleep deprivation with chronic periodontal diseases.
Materials and Methods: Hundred sleep deprived subjects were taken and their Periodontal status was assessed by gingival index and pocket probing depth. All the study subjects were administered Pittsburgh Sleep Quality Index (PSQI) questionnaire for the assessment of sleep deprivation.
Results: Present investigation revealed that mean PSQI was highest in the subjects with chronic periodontitis compared to normal and gingivitis subjects and the difference among three groups was statistically significant.
Conclusion: The present study with preliminary results suggests that there is association between sleep deprivation and severity of periodontal disease. Hence, there is a need for future studies with larger samples to understand how sleep habits can influence periodontitis.

Citation: Dr. Prabhahar, C. S. and Dr. Brindhav Devi, 2017. "Sleep deprivation and chronic periodontitis", *International Journal of Current Research*, 9, (06), 51971-51974.

INTRODUCTION

Periodontitis is defined as "an inflammatory disease of the supporting tissues of the teeth caused by specific microorganisms or groups of specific microorganisms, resulting in progressive destruction of the periodontal ligament and alveolar bone with pocket formation, recession, or both (Clinical Periodontology). "The importance of successful management and treatment of periodontitis has gained added importance in recent years with the recognition that periodontitis is associated with a number of important systemic diseases, which include respiratory disease, chronic kidney disease, rheumatoid arthritis, cognitive impairment, obesity, metabolic syndrome and cancer (Linden *et al.,* 2013). Three basic mechanisms have been postulated to play a role in these interactions; metastatic infections, inflammation and inflammatory injury, and adaptive immunity (Dyke and Winkelhoff, 2013). Loss of sleep during only part of the night is one of the most common complaints of persons who experience environmental or psychological stress, travel across time meridians, engage in shift work, or suffer from a psychiatric disorder (Irwin *et al.,* 1999). Sleeplessness also relates to the changes in the immune response and the pattern of hormonal secretion, of the growth hormone in particular. The risk of obesity, diabetes and cardiovascular disease increases (Orzeł Gryglewska, 2010).

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MATERIALS AND METHODS

A total of 100 subjects with history of sleep deprivation were identified and selected from among the patients visiting the Department of Periodontology and Oral Implantology, Best Dental Science college and hospital, Madurai and Akshaya trust, Nagatheertham. All study subjects underwent detailed medical history and periodontal examination before enrollment. Subjects were excluded if they were pregnant or lactating, smokers, suffering from known systemic diseases which could alter healing response of periodontium, who had received any periodontal treatment in 6 months before study or those who had history of medication (antibiotics or anti inflammatory drugs) in 3 months before study. Subjects were examined by a single examiner for the assessment of gingival index (GI) (Loe, 1963) and pocket probing depth (PPD). William's periodontal probe was used to measure the PPD from the gingival margin to the bottom of the periodontal sulcus or pocket at two proximal sites of each tooth.

Subject grouping

- Group I – Healthy: GI score: 0, PPD ≤ 3 mm

- Group II – Gingivitis: GI score ≥ 1, PPD ≤ 3 mm
- Group III – Moderate to severe generalized chronic periodontitis: Generalized - PPD ≥ 3 in ≥30% of sites;

Moderate - severe periodontitis - PPD ≥ 6 mm (Grover *et al.,* 2015).

The pittsburgh sleep quality index

All the study subjects were administered PSQI questionnaire. The PSQI is an effective instrument used to measure the quality and patterns of sleep in the older adult. It is brief, reliable, valid, and standardized self reported measure of sleep quality. It differentiates "poor" from "good" sleep by measuring seven domains: Subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction over the last month. All subjects rated each of these seven areas of sleep. PSQI questionnaire was modified from the original in order to include the first 9 items only these items contribute to the total score. Scoring of the answers was based on a 0 to 3 scale, whereby 3 reflected the negative extreme on the Likert scale. The component scores were summed to produce a global score (range 0 to 21).

A global sum of "5" or greater indicated a "poor" sleeper. Higher PSQI scores represented worse sleep quality (Buysse *et al.,* 1989).

Statistical analysis

All statistical analyses were carried out using Statistical Package for Social Sciences version 17. Descriptive data were presented as mean and standard deviation. ANOVA test was used for comparison between means of groups and to determine the significance of each parameter under study. Correlations among the variables were calculated using the Pearson's correlation coefficient.

RESULTS

Hundred systemically healthy subjects (47 females and 53 males) in age group of 25–50 years were assessed for association of sleep deprivation with chronic periodontal disease. Present study revealed that mean GI in group I, II and III were 0, 1.69 and 2.73, respectively whereas PPD were 2.19, 2.81, 7.48, respectively. Mean PSQI score in three groups was 6.75, 9.53, 14.63, respectively.

Overall Descriptive statistics

	N	Minimum	Maximum	Mean ± Std. Deviation
Age	100	25	50	35.86 ± 8.105
PSQI Score	100	3	20	11.74 ± 4.303
GI Score	100	0	3	1.96 ± 1.072
PPD	100	2	12	5.14 ± 2.789
Valid N (listwise)	100			

Group 1

	N	Minimum	Maximum	Mean ± Std. Deviation
Age	16	25	38	28.12 ± 3.757
Gender	16	1	2	1.56 ± .512
PSQI Score	16	3	14	6.75 ± 2.543
GI Score	16	0	0	.00 ± .000
PPD	16	2	3	2.19 ± .403
Valid N (listwise)	16			

Group 2

	N	Minimum	Maximum	Mean ± Std. Deviation
Gender	32	1	2	1.47 ± .507
PSQI Score	32	5	17	9.53 ± 3.048
GI Score	32	1	3	1.69 ± .535
PPD	32	2	3	2.81 ± .397
Group	32	2	2	2.00 ± .000
Valid N (listwise)	32			

Group 3

	N	Minimum	Maximum	Mean ± Std. Deviation
Gender	52	1	2	1.44 ± .502
PSQI Score	52	8	20	14.63 ± 2.997
GI Score	52	2	3	2.73 ± .448
PPD	52	5	12	7.48 ± 1.799
Group	52	3	3	3.00 ± .000
Age	52	25	50	41.04 ± 7.192
Valid N (listwise)	52			

Comparison across groups

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
PSQI Score	Between Groups	990.214	2	495.107	56.968	.000
	Within Groups	843.026	97	8.691		
	Total	1833.240	99			
GI Score	Between Groups	94.734	2	47.367	240.483	.000
	Within Groups	19.106	97	.197		
	Total	113.840	99			
PPD	Between Groups	597.747	2	298.873	168.264	.000
	Within Groups	172.293	97	1.776		
	Total	770.040	99			

Comparison across gender

Group Statistics

	Gender	N	Mean	Std. Deviation	Std. Error Mean
PSQI Score	1	53	11.94	4.190	.576
	2	47	11.51	4.462	.651
GI Score	1	53	2.02	1.028	.141
	2	47	1.89	1.127	.164
PPD	1	53	5.43	2.906	.399
	2	47	4.81	2.643	.385

Correlation (Association between PSQI and GI vs PPD)

Correlations

		PSQI Score	GI Score	PPD
PSQI Score	Pearson Correlation	1	.700**	.707**
	Sig. (2-tailed)		.000	.000
	N	100	100	100
GI Score	Pearson Correlation	.700**	1	.765**
	Sig. (2-tailed)	.000		.000
	N	100	100	100
PPD	Pearson Correlation	.707**	.765**	1
	Sig. (2-tailed)	.000	.000	
	N	100	100	100

**. Correlation is significant at the 0.01 level (2-tailed).

DISCUSSION

The current investigation was aimed at assessing association of sleep deprivation with chronic periodontal disease. Results of the present investigation elucidated that mean PSQI was highest in the group with periodontitis followed by group with gingivitis and lowest in healthy subjects and the difference among three groups was statistically significant. A positive correlation of PSQI with GI and PPD was observed in groups I and II suggesting that PSQI scores commensurate with periodontal destruction. In this study sleep deprivation was assessed by means of PSQI index. The need for sleep varies considerably between individuals (Shneerson 2000). The average sleep length is between 7 and 8.5 h per day (Kripke *et al.,* 2002; Carskadon and Dement 2005; Kronholm et al 2006). Sleep-deprived subjects are at higher risk of developing depression, obesity, hypertension, dyslipedemia and diabetes mellitus. Recent data showed that sleep deprivation increases total daily energy expenditure in humans.[5] Aging infl uences a person's ability to cope with SD. In general the cognitive performance of aging people is often poorer than that of younger individuals but during Sleep deprivation performance in older subjects seems to deteriorate less. Women may endure prolonged wakefulness better than men, whereas physiologically they recover slower but tolerating sleep deprivation depend on individual traits (Alhola and Polo-Kantola, 2007). Sleep deprivation is linked to increased daytime levels of inflammatory mediators such as IL-1, IL-6 and TNF. Significant hormonal changes affecting hypothalamic-pituitary-adrenal axis activity take place in the setting of sleep deprivation (AlDabal and BaHammam, 2011) short sleep had reduced leptin and elevated ghrelin. These differences in leptin and ghrelin are likely to increase appetite, possibly explaining the increased BMI observed with short sleep duration (Taheri *et al.,* 2004). Sleep deprivation might impair an individual's capacity to perform adequate oral hygiene practices, thus increasing the risk of periodontal disease. Due to multifactorial etiology of both sleep deprivation and periodontal disease other unknown confounding factors might explain this association too (Alhola and Polo-Kantola, 2007).

Conclusion

The present study with preliminary results suggests that there is association between sleep deprivation and severity of periodontal disease. Hence, there is a need for future studies with larger samples to understand how sleep habits can influence periodontitis.

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