

Article

The effect of sleep disorders on periodontal disease related to salivary alpha-amylase among dental students

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ABSTRACT

The study aimed to assess the effect of sleep disorders on periodontal health related to salivary alpha-amylase. A cross-sectional comparative study was done among dental students aged 22 - 23 years attending the College of Dentistry at Al-Kufa University; 270 students participated in this study, and a questionnaire completed by those students was used to collect information about sleep disorders [Pittsburg sleep quality index (PSQI)]. The Community Periodontal Index (CPI) by WHO 1997 assessed periodontal health. Unstimulated Salivary samples were chemically analyzed for alpha-amylase detection using Enzyme Linked Immuno-Sorbent Assay. It was found that the prevalence of poor sleep quality among dental students was 58.9%; concerning periodontal status, the occurrence of students with health sextant as the highest score (CPI0) was higher among students with poor sleep quality (81.13%) than this for students with good sleep quality (75.67%), the opposite result was found concerning students with gingival bleeding and calculus as the highest score, on the other hand, the mean value of salivary alpha-amylase was found to be higher for students those who have poor sleep quality than those who have good sleep quality, yet the difference was not significant. Students with good sleep quality suffer more from periodontal disease than those with poor sleep quality. However, salivary alpha-amylase was higher in students with poor sleep quality than in those with good sleep quality.

Keywords: Pittsburg sleep quality index, sleep disorder, alpha-amylase, periodontal disease

INTRODUCTION

Natural product concerns to the primary and secondary metabolites. Since the origin of life, human beings depend on nature for their basic needs, such as shelter, food, clothing, means of transportation, and medicines ¹. Adults with sleep difficulties often refer to sleeping less than 7–8 hours each night. According to previous polls, at least 18% of adults don't get enough sleep ^{1,2}. Sleep deprivation is common among college students and can have a negative impact on academic performance, health, and mood. ³. According to the National Sleep Foundation, (59%) of adults aged 18 to 29 identify as night owls. Many

studies on dental students have been undertaken to determine sleep efficiency and its impact on them ^{4,5}. Numerous studies have shown good sleep habits to increase immune function by influencing pathogen defense pathways ⁶. So that interleukin-6 and tumor necrosis factor-alpha levels are increased by sleep loss. ⁷. Late sleeping appears to cause a systemic inflammatory response that could lead to bacterial infection of endothelial tissue. ⁸. In observational studies, short sleep duration and poor sleep quality have been linked to periodontal disease severity ^{9,10}. Several studies, however, have identified a relationship between the length of sleep duration and periodontitis ^{11,12}. Other studies in a nationally representative population revealed no connection between sleep duration and periodontitis ^{13,14}. The effect of sleep interruptions on salivary alpha-amylase activity has also been investigated, with results showing increased salivary alpha-amylase activity after acute sleep restriction ¹⁵ and total sleep deprivation ¹⁶. Salivary alpha-amylase levels have been linked to driver stress and decreased reaction times ¹⁹ in typical sleep-wake circumstances ^{17,18}. Amylase helps produce pellicle on the surface of the teeth. It binds to lipopolysaccharide, a bacterial surface structure, and bacterial toxin, which can cause tissue damage ²⁰. Salivary alpha-amylase has been observed to inhibit *Porphyromonas gingivalis* growth and *Aggregatibacter actinomycetemcomitans* adhesion and biofilm formation, indicating that alpha-amylase has a preventing function against oral infections ^{21,22}. Because there had been no prior Iraqi investigation on the impact of sleeping disturbances on periodontal health among dentistry students, this study focused on salivary amylase

MATERIALS AND METHODS

This study is a cross-sectional comparative study. Before data collection, ethical approval was obtained from the ethical approval committee, College of Dentistry / University of Baghdad, to perform this study. Official permission was obtained from the general direction of the College of Dentistry \ University of Al-Kufa to meet the dental students.

Only 270 dental students (98 men, 172 women) from the University of Al-Kufa College of Dentistry were accepted to participate in the study; their ages were from 22 to 23 years. The Pittsburg Sleep Quality Index (PSQI) questionnaire created by ²³ measured sleep issues. It assesses sleep quality on both quantitative and subjective levels.

This questionnaire also assessed the efficiency of sleep. The PSQI consists of 19 self-rated items and seven clinically derived domains of sleep difficulties in the preceding month: Subjective sleep quality, sleep latency, sleep length, habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction; each of these domains is equally weighted on a 0-3 scale. The seven component scores are summed to yield the total global PSQI score, which ranges between 0 and 21 points. A total PSQI score > 5 denotes poor sleep quality ²³. The reliability of this index is measured in the present study and found to be equal to 0.67 Cronbach's alpha

The full group (270 persons) completed the scale questionnaire independently. Periodontal health was assessed using the Community Periodontal Index (CPI) ²⁴. For clinical tests, plane mouth dental mirrors and CPI probes were employed. In order to draw parallels with salivary alpha-amylase from sub-samples (45 students with good sleep quality and 44 students with poor sleep quality), unstimulated saliva was collected in sterile screw-capped vials ²⁶, and subsample saliva was centrifuged and analyzed in the laboratory. An ELISA Kit and Enzyme-Linked Immuno-Sorbent Assay (ELISA) equipment were used to

quantify the concentration of salivary alpha-amylase in mg/dl. The concept of reagent preparation, method assay, and result computation were all carried out in accordance with the manufacturer's procedure instructions.

The Statistical Package for Social Science (SPSS-22, Chicago, Illinois, USA) was used for the statistical analysis, with frequency and percentage as qualitative variables, mean and standard error as quantitative variables, Independent two sample T-test and Pearson correlation as inferential statistics, and 0.05 as the level of significance

RESULTS

The results of the present study illustrate the prevalence of poor sleep quality was found among dental students to be 58.89%. Concerning periodontal health, the result in Table 1 shows that the occurrence of students with health score CPI (0) was higher among students with poor sleep quality (81.13%) than for students with good sleep quality (75.67%); the opposite result was found concerning gingival bleeding and calculus score. The results in Table 2 illustrate that the mean value of CPI score 0 (health) and CPI score 1(bleeding) were not significantly lower among students with good sleep quality than those with poor sleep quality; the opposite result was found concerning CPI score (calculus). Table 3 determines that the mean value of alpha-amylase was not significantly lower among students with good than poor sleep quality. The results in Table 4 show that among students with poor sleep quality, the correlations between several healthy sextants (CPI 0) and alpha-amylase are significant in a positive direction, and the opposite result was found concerning the number of sextants with gingival bleeding (CPI1) as the relation was significant in a negative direction. Another result was found concerning students with good sleep quality as the correlations were not significant in a positive direction.

Variables	good		poor	
	N.	% CPI	N.	% CPI
CPI score 0 (healthy)	84	75.68	12 9	81.13
CPI score1 (bleeding)	19	17.12	25	15.72
CPI score2 (calculus)	8	7.21	5	3.14

Table 1. Distribution of subjects by highest CPI score by Pittsburgh Sleep Quality Index

	Pittsburgh Sleep Quality Index				T-test	P value
	good		poor			
	Mean	±SE	Mean	SE		
CPI score0	5.486	0.107	5.491	0.097	0.028	0.978
CPI score1	.423	0.089	.465	0.090	0.322	0.748
CPI Score 2	.090	0.033	.044	0.021	1.250	0.212

Table 2. Descriptive and statistical test of the number of sites CPI among groups of Pittsburgh Sleep Quality Index

	Pittsburgh Sleep Quality Index				T-test	P value
	good		poor			
	Mean	±SE	Mean	±SE		
salivary amylase	376.055	11.623	385.424	17.201	0.453	0.652

Table 2. Descriptive and statistical test of the number of sites CPI among groups of Pittsburgh Sleep Quality Index

Pittsburgh Sleep Quality Index		Amylase	
		r	p
good	CPI score 0	0.061	0.693
	CPI score 1	0.070	0.649
	CPI score 2	0.016	0.917
poor	CPI score 0	0.443	0.003
	CPI score 1	- 0.443	0.003
	CPI score 2	0.000	1

Table 2. Descriptive and statistical test of the number of sites CPI among groups of Pittsburgh Sleep Quality Index

DISCUSSION

Sleep disorders have become common among students²⁷. This study deals with students of the fourth and fifth grades of the Faculty of Dentistry because they are exposed to tension and anxiety about exams, especially the fatigue generated by the clinic, which may affect the efficiency of their sleep²⁸. Although periodontal disease is considered a multifactorial disease, the data of the present study found that the percentage of gingival bleeding and dental calculus was higher among students with good sleep quality than those with poor sleep quality who have more healthy gingiva. This agrees with other studies that found an association between long sleep duration and periodontitis^{11,12} while disagreeing with other studies that associated poor sleep quality with the severity of periodontal disease^{9,10}. The present study found the salivary alpha-amylase to be non-significantly higher among students with poor sleep quality. This goes in accordance with previous study^{15,16}, concerning the relation between salivary alpha-amylase and periodontal disease; the result of this study found a significant negative relation between students with poor sleep quality that proves the protective effect of salivary alpha-amylase^{21,22}. This agrees with other studies that found alpha-amylase concentration is negatively correlated with gingival health²⁹. In contrast, other studies found the relation between the concentration of salivary alpha-amylase and periodontal diseases in which increasing salivary alpha-amylase is associated with mild to moderate gingivitis^{30, 31, 32, 33}. While opposite result found for the good sleep quality students as CPI scores go not significantly in a positive direction may be due to salivary alpha-amylase is lower among students in good sleep quality.

CONCLUSION

Students with excellent sleep quality had more periodontal disease than students with bad sleep quality. At the same time, salivary alpha-amylase levels were greater in students with poor sleep quality than in those with good sleep quality.

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Institutional Review Board Statement: The study was conducted according to the guidelines of the Declaration of Helsinki and approved by the Institutional Review Board (or Ethics Committee) of the College of Dentistry at the University of Baghdad

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Conflicts of Interest: The authors declare no conflict of interest

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