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Assessment of the relationship between obstructive sleep apnea syndrome and sleep quality among dental students

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ABSTRACT

Aims: Dental students are under the risk of developing sleep disorders due to intensive curriculum and long study hours. Hence, we aimed to assess the prevalance of obstuctive sleep apnea syndrome and its relation with sleep quality among Turkish dental students.

Methods: A cross-sectional study was conducted among 314 dental students, who completed Epworth Sleepiness Scale (ESS) to identify the sleep quality (SQ) and excessive daytime sleepiness (EDS) and Berlin Questionnaire (BQ) for Obstructive Sleep Apnea Syndrome (OSAS). Demographic variables were also recorded. SPSS Version 23 (IBM Corporation, Armonk, NY, USA) was used for istatistical analysis. The statistical significance level was accepted as $p<0.05$.

Results: OSAS risk was found to be 16.8% in Turkish dental students. Higher hypertension, obesity and body mass index (BMI) values were found to be related with higher risk for sleep apnea. There was a statistically significant positive correlation between ESS and BQ assessments ($r=0.334$, $p<0.05$). Normal daytime sleepiness was observed in 46.6% of dental students.

Conclusion: OSAS risk was found to be high in dental students who will be the primary step in the diagnosis and treatment of sleep apnea. As the OSAS risk increases, sleep quality decreases. It should be emphasized that sleep and lifestyle habits may increase the risk of OSAS in dental students.

Keywords: Sleep disorders, obstructive sleep apnea syndrome, sleep quality, excessive daytime sleepiness, dental students

INTRODUCTION

Sleep, which is an important component in the growth and development of the body and in the formation of the circadian rhythm, is an indispensable part of our life. It is also known to be important for the maturation of cognitive functions and their optimal functioning. Poor sleep quality can cause a decrease in the individual's occupational performance at work or school,[1,2] impaired social functionality,[3] work accidents,[4] and poor physical health.[5] The negative impact that occurs in healthcare specialists such as physicians, nurses, medical and dental students, does not only affect the individual, but also affects the safety of patients.[6,7] New social and academic environment, unhealthy lifestyle, excessive use of social media cause sleep problems in undergraduate students.[8] In addition to these factors, dental students who are under high pressure, usually do not have good quality of life due to their high academic load, clinic practice responsibilities and long hours of night study. Thus, they face to lots of stress that causes poor sleep quality. Dental students are considered a population that is prone to sleep disorders.

Obstructive sleep apnea syndrome (OSAS) is a widespread disease that increases with age and is seen in approximately 2-4% of the adult population, characterized by recurrent apnea or hypopnea during sleep, episodes of upper airway obstruction, and decreased blood oxygen saturation. Although the diagnosis of the disease is only confirmed as a result of polysomnographic (PSG) evaluation, various screening tests in the form of surveys are also used to evaluate the individuals at risk.[9] It is thought that 80-90% of people with symptoms of the disease continue their lives without being diagnosed.[10] The Berlin Questionnaire (BQ) is the first test used to identify risk groups for OSAS.[11] Translation of BQ to Turkish[12] have been made and validated. Although there are various studies in the literature investigating sleep disorders in the healthcare professionals and medical students, there are few studies about sleep disorders among the dental students. Hence, in our study, we aimed to determine the prevalence of OSAS in Turkish dental students.

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METHODS

The study was carried out with the permission of İstinye University Human Researches Ethics Committee (Date: 21.07.2022, Decision No: 22-117). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

The current cross-sectional study was carried out on 313 volunteer dental students (male: 118, female: 195) in İstanbul Beykent University School of Dentistry from August 2022 to November 2022. They provided written consent and participated on a voluntary and anonymous basis. All the participants completed a self-administered questionnaire. Sociodemographic characteristics (i.e. sex, age, height, weight, BMI) of the dental students were collected.

The BQ is a commonly used screening tool for OSAS and has been validated in primary care settings and other specific patient populations.[13,14] BQ contains 10 questions in three categories: The first category asks refers to snoring and witnessed apneas, the second category asks about sleepiness and fatigue and the last category asks about existence of hypertension and also body mass index (BMI) of >30 kg/m². Categories are evaluated separately from each other, 2 or more positive categories are considered as high risk of OSAS according to the Berlin questionnaire.

The Epsworth sleepiness scale (ESS) is a standard and validated questionnaire which is used to evaluate subjective excessive daytime sleepiness (EDS).[15] ESS consists of 8 questions for which the study participants are asked to rate on a 4-point scale from 0-3 (0=would never doze, 1=slight chance of dozing, 2=moderate chance of dozing, and 3=high chance of dozing), their chance of dozing off or falling asleep in 8 different conditions, or daily activities. According to this scale which range from 0-24, people who score above 10 are considered to be at high risk for excessive daytime sleepiness.

Statistical Analysis

Within the scope of the study, SPSS Version 23 (IBM Corporation, Armonk, NY, USA) was used for analysis. Mean and standard deviation values were used for open-ended data. One-way Anova and independent sample t-tests were used in the assessment based on gender and age. Correlation analysis was used to compare the participants' overall ESS scores and BQ scores. The statistical significance level was accepted as $p<0.05$. The sample size was calculated at a 95% confidence level using the G*Power programme (version 3.1.9.7; Heinrich Heine University, Dusseldorf, Germany). Based on the previous study comparing within the groups, considering an α of 0.05, a standardized effect size of 0.25, and a theoretical power of 95%, the minimum size for each group was estimated to be 57 and 285 in total.[16]

RESULTS

The characteristics of the study population was shown in Table 1. The total number of participants was 313 dental students, aged 18-40 years old (21.81±2.52), 62.3% of the participants were female and 37.7% of them were male. When Body Mass Indexes (BMI) were calculated, it was found that the mean was 22.27±3.60, the lowest BMI value was 15.70, and the highest BMI value was 36.7. 14.4% of the participants had a family history of OSAS.

Table 1. Main findings regarding age, height, weight and body mass index of participants

	N	Min	Max	Mean	SD
Age	313	18	40	21.81	2.52
Lenght	313	152	194	171.46	8.93
Weight	313	41	108	65.99	14.55
Body mass index	313	15.70	36.70	22.27	3.60

N: Number, Min: Minimum, Max: Maximum, SD: Standard deviation

As seen in Table 2, the presence of snoring was 23% (male: 36.4%, female: 14.4%) , frequency of snoring was 6.7% (male: 15.3%, female: 1.5%), snoring bothers other people was 3.8% (male: 9.3%, female: 0.5%) and it was determined that there was a statistically significant difference based on gender in terms of the presence and frequency of snoring and snoring bothers other people ($p<0.05$). The snoring severity was found 2.9% and respiratory arrest during sleep was 0.3% ($p>0.05$). While the general rate of participants who had a high frequency of feeling sluggish and tired upon waking from sleep is 39.9%, this rate is 35.6% for male participants and 42.6% for female participants, was found to be absent ($p>0.05$). However, while the general rate of participants who had a high frequency of feeling tired during the daytime was 42.2% (male: 33.9%, female: 47.2%, $p<0.05$). This rate was higher for female participants. There was a statistically important difference in term of fallen asleep while driving, the rate was found 16.1% for males, 4.6% for females ($p<0.05$). There was no significant gender-based finding in terms of feeling excessively sleepy while driving (male: 3.4%, female: 3.1%, $p<0.05$). Table 2 shows that male participants were more prone to hypertension and obesity than female ones (male: 6.8%, female: 1, $p<0.05$). The risk of OSAS was 27% in men and 10.8% in women. It was found to be 16.8% in the general population. When the Berlin risk assessment levels of the participants were compared according to the presence of hypertension or obesity, a statistically significant difference was found ($p<0.05$). The proportion of individuals in the high-risk group was higher in individuals with hypertension or obesity. Table 3 shows that there was a statistically significant difference between the OSAS risk in terms of BMI levels of the participants ($p<0.05$). The average BMI of the participants evaluated in the high-risk group was higher (Table 3).

Table 2. Comparison of Berlin Questionnaire Results by Gender

	Total (n=313)	Male (n=118)	Female (n=195)	p
Category 1				
Presence of snoring	72 (23%)	43 (36.4%)	29 (14.4%)	0.001
Snoring severity	9 (2.9%)	5 (4.2%)	4 (2.1%)	0.217
Frequency of snoring	21 (6.7%)	18 (15.3%)	3 (1.5%)	0.001
Snoring bothers other people	12 (3.8%)	11 (9.3%)	1 (0.5%)	0.001
Quit breathing during sleep	1 (0.3%)	0 (0.0%)	1 (0.5%)	0.623
Category 2				
Feel fatigue after waking up	125 (39.9%)	42 (35.6%)	83 (42.6%)	0.135
Daytime fatigue	132 (42.2%)	40 (33.9%)	92 (47.2%)	0.014
Fall asleep during driving	28 (8.9%)	19 (16.1%)	9 (4.6%)	0.001
Excessive sleepiness while driving	10 (3.2%)	4 (3.4%)	6 (3.1%)	0.560
Category 3				
Hypertension or obesity	10 (3.2%)	8 (6.8%)	2 (1.0%)	0.001

Table 3. Evaluation of Berlin Risk Categories According to Participants' BMI Levels

	N	Mean	SD	p
Low risk	258	21.78	3.23	0.001
High risk	52	24.81	4.29	

N: Number; SD: Standart deviation, BMI: Body mass index

According to the results of the BQ, Table 4 shows that 46.6% of low-risk participants and 19.2% of high-risk participants were in the normal ESS group, while 3.9% of low-risk participants had increased severe daytime sleepiness. In the high-risk group, 13.5% of the participants were in the increased severe daytime sleepiness group. Participants with high-risk status were more likely to experience increased moderate to severe daytime sleepiness by the ESS assessment (Table 4).

Table 4. Comparison of ESS and BQ results

	BQ		Total	p
	Low risk	High risk		
ESS				0.002
Normal daytime sleepiness	115 (46.6%)	10 (19.2%)	125 (40.3%)	
Normal but increased daytime sleepiness	90 (34.9%)	24 (46.2%)	114 (36.8%)	
Mild daytime sleepiness	28 (10.9%)	9 (17.3%)	37 (11.9%)	
Moderate daytime sleepiness	15 (5.8%)	2 (3.8%)	17 (5.5%)	
Excessive daytime sleepiness	10 (3.9%)	7 (13.5%)	17 (5.5%)	
Total	258 (100.0%)	52 (100.0%)	310 (100.0%)	

ESS: Epworth sleepiness scale, BQ: Berlin questionnaire

When the categories according to the general ESS evaluations of the participants and the risk levels according to the answers given to the BQ were compared; it was determined that there was a statistically significant low and strong positive correlation between ESS and Berlin assessments according to categories (r=0.334, p<0.05) (Table 5). There was no statistically significant relationship between ESS and Berlin questionnaire category 1 evaluation (r=0.081, p>0.05). There was a statistically significant low-level strong positive correlation between ESS and Berlin questionnaire category 2 evaluation (r=0.334, p<0.05). There was no statistically significant relationship between ESS and Berlin questionnaire category 3 evaluation (r=-0.042, p>0.05). However, there was a statistically significant low and strong positive correlation between ESS and BQ assessments (r=0.334, p<0.05) (Table 5).

Table 5. Evaluation of the Relationship between ESS and BQ Categories

	ESS	BQ Category 1	BQ Category 2	BQ Category 3	BQ Total
ESS	7.30±4.28	0.081	.395**	-0.042	.334**
BQ Category 1	0.37±0.74		0.07	.228**	.654**
BQ Category 2	0.94±0.97			0.049	.788**
BQ Category 3	0.03±0.18				.302**
BQ Total	1.34±1.30				

ESS: Epworth sleepiness scale, BQ: Berlin Questionnaire, **p<0.001, In the 1st category (questions 1 to 5) and 2nd category (questions 6 to 8), the patients considered "at risk" if they have answered positively to at least two questions. In the third category, the patient must have at least a positive response, or a BMI (body mass index) greater than 30. For a patient to be considered "high risk", they must have obtained a "positive" result in at least two categories of the Berlin questionnaire. "Low risk" subjects are those who will have at most one "positive" category.

DISCUSSION

An optimal sleep quality is an important part of healthy life.[2] When sleep quality deteriorates, it can cause different problems such as sleep disorders, psychiatric illnesses, etc. University students are a part of the group that is faced with stress due to getting used to a new order, being more responsible, being more free and having a heavy course load. Dental students also have to endure these pressures. However, dental students are bound to be under more stress due to their clinical responsibilities and practical lessons. Students should be taught methods of having optimal sleep and coping with stress. Various studies in the literature have investigated sleep quality in university students has been elaborated.[17-19] In the previous studies, the prevalence of sleep disorders were evaluated in university students.[16,20] However, few studies investigated the prevalence and risk factors of obstructive

apnea syndrome in dental students.[21,22] Therefore, in our study, our purpose was evaluating the prevalence of obstructive sleep apnea syndrome, which is one of the sleep disorders and can affect activities in daily life, and its relationship with sleep quality in Turkish dental students.

Since the polysomnography is the gold standard method in the OSAS diagnosis, we think that the value obtained in our study should be considered only as a risk assessment. In our study, 16.8% of people were found to be at high risk for the development of OSAS. In studies evaluating the prevalence of OSAS in the general population using the BQ, the risk of sleep apnea was reported to be 4.98% by Amra et al.[23] and 27.3% by Khazaei et al.[24] When studies of OSAS prevalence in healthcare workers using the BQ were examined, Geidr-Brown et al.[25] reported that 24% of nurses working 12-hour night shifts had a high risk of sleep apnea and Seyedmehdi et al.[26] found this risk to be 6.9% in health workers in their study. Similar to previous studies, Aydın Güçlü et al.[27] investigated the risk of OSAS in healthcare workers and reported that 15.2% of individuals had a high risk of sleep apnea. In the present study, the risk of OSAS was found to be 16.8%. However, OSAS risk in men was found to be statistically significantly higher than in women. Unlike our study results, Yavuz et al.[28] found no difference between gender and sleep apnea in medical students and 35.5% of students were found to be at risk for OSAS. Belingheri et al.[20] reported a huge prevalence of sleep disorders among medical and nursing students and an relationship between these symptoms and perceived stress. The difference in our results with the previous studies may be related to the difference in the scales used and diversity of the study population. However, there are also studies, argue that gender and OSAS risk are related in the literature.[27,28-30]

Studies have demonsrated that approximately 50% of OSAS patients have hypertension and approximately 30% of hypertensive patients have OSAS.[31,32] Obesity increases the risk of developing OSAS.[33] The risk of OSAS is 8-12 times higher in individuals with a BMI >29.[34] Similiar to Aydın Güçlü et al.[27] the present study also evaluated the association of sleep apnea with age, gender, BMI, hypertension, and obesity, and found that high sleep apnea risk was directly related to these factors. Similar to our study, dos Santos et al.[21] also examined OSAS in Brazilian dental students and found a relationship with BMI and OSAS.

If left untreated, OSAS can lead to impaired attention and concentration, decreased work performance, and academic failure. Aydin Güçlü et al.[27] in their study, 19.5% of healthcare professionals stated that they felt daytime fatigue and fatigue almost every day, while 14.1% of them fell asleep while driving. Similar to the previous study, Seyehmedhi et al.[26] reported that 22.6% of the participants felt tired almost every day during the day, while 15.4% felt excessive sleepiness and fell asleep while driving. However, in our study, 42.2% of the dental students stated that they felt tired almost every day, while the rate of those who fell asleep while driving was 10%. The fact that daytime fatigue is much higher than the previous studies, may be due to the fact that the dentistry curriculum is quite full of both clinical practice and theoretical course loads and the responsibility of the patients who have to be cared for during internships. It is important to identify the population at risk among healthcare workers. It is also very important to raise awareness of OSAS, especially since the dental students constitute the first step in diagnosis and treatment.

Sleep deprivation is a community health problem associated with obesity, morbidity, and mortality. The academic performance of dental students appears to be influenced by sleep.[35,36] In 2006, Curcio et al.[37] suggested that students' learning and academic performance were associated with sleep quality and the amount of sleep they received. Although relationship was found between the academic period of the student and sleep quality, gender and age were not linked to sleep quality or with excessive daytime sleepiness.[37] Ergin et al.[38] observed that, the best sleep quality was found in the Health Sciences students and the worst sleep quality was found in the dental students. Unlike to our study, the previous study results showed no statistically significant difference between gender and sleep quality.

Sleep disorders are a condition that can be triggered by people's lifestyles and habits, affecting the body and orofacial structures. For this reason, it is possible to detect respiratory disorders that occur during sleep as soon as possible and to inform individuals, and to prevent disease and improve health by clinical and/or surgical intervention. Problems such as sleep apnea can also cause sleep disturbance. Pasha et al.[22] evaluated sleep apnea risk factors in medical school students in Pakistan and stated that 27% of men and 12% of women had disturbing snoring. Similarly, in our study, 12% of dental students had the same discomfort. Also in our study, in the dental students at risk of OSAS, sleep quality also decreases and excessive daytime sleepiness increases. Hence we observed that OSAS and sleep quality were related according to our study results. Conditions such as lifestyle, attitudes towards events, academic load, social media and internet use of medical and dental students may be risk factors for sleep apnea. However, no study has been conducted to evaluate the prevalence and risk factors of sleep apnea in dental faculties in our country. In the literature, the prevalence of predictive factors for obstructive sleep apnea was investigated in dental and speech language hearing students in only one study.[21]

Our study has several limitations. The first one is that the study is a cross-sectional study. Only questionnaires were used to collect data in the study, no clinical examination was performed and imaging techniques were not used. The second limitation is the small number of the study population. The participation of all dental school students in Turkey may enable us to obtain more accurate results. Third, only two questionnaires were used in the study. In order to obtain clearer results, more scales from which we can obtain data such as stress, anxiety, life habits, etc., which may be risk factors for sleep apnea, should be used in future studies.

CONCLUSION

The risk of developing sleep apnea was found to be high in the dental students. Those with poor sleep quality are at greater risk. Since sleep disorders are also quite common among dental students, early diagnosis and treatment will reduce the risk of harm to students and patients.

ETHICAL DECLARATIONS

Ethics Committee Approval: The study was carried out with the permission of İstinye University Human Researches Ethics Committee (Date: 21.07.2022, Decision No: 22-117).

Informed consent: Written consent was obtained from the patient participating in the present study.

Referee Evaluation Process: Externally peer reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

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REFERENCES

1. Haavisto ML, Porkka-Heiskanen T, Hublin C, et al. Sleep restriction for the duration of a work week impairs multitasking performance. *J Sleep Res.* 2010;19(3):444-454. doi:10.1111/j.1365-2869.2010.00823.x
2. Azad MC, Fraser K, Rumana N, et al. Sleep disturbances among medical students: a global perspective. *J Clin Sleep Med.* 2015;11(1):69-74. doi:10.5664/jcsm.4370
3. Alhola P, Polo-Kantola P. Sleep deprivation: Impact on cognitive performance. *Neuropsychiatr Dis Treat.* 2007;3(5):553-567.
4. Ozer C, Etcibaşı S, Oztürk L. Daytime sleepiness and sleep habits as risk factors of traffic accidents in a group of Turkish public transport drivers. *Int J Clin Exp Med.* 2014;7(1):268-273.
5. Al Lawati NM, Patel SR, Ayas NT. Epidemiology, risk factors, and consequences of obstructive sleep apnea and short sleep duration. *Prog Cardiovasc Dis.* 2009;51(4):285-293. doi:10.1016/j.pcad.2008.08.001
6. Barger LK, Ayas NT, Cade BE, et al. Impact of extended-duration shifts on medical errors, adverse events, and attentional failures. *PLoS Med.* 2006;3(12):e487. doi:10.1371/journal.pmed.0030487
7. Weaver MD, Vetter C, Rajaratnam SMW, et al. Sleep disorders, depression and anxiety are associated with adverse safety outcomes in healthcare workers: A prospective cohort study. *J Sleep Res.* 2018;27(6):e12722. doi:10.1111/jsr.12722
8. Lund HG, Reider BD, Whiting AB, Prichard JR. Sleep patterns and predictors of disturbed sleep in a large population of college students. *J Adolesc Health.* 2010;46(2):124-132. doi:10.1016/j.jadohealth.2009.06.016
9. Chiu HY, Chen PY, Chuang LP, et al. Diagnostic accuracy of the Berlin questionnaire, STOP-BANG, STOP, and Epworth sleepiness scale in detecting obstructive sleep apnea: A bivariate meta-analysis. *Sleep Med Rev.* 2017;36:57-70. doi:10.1016/j.smrv.2016.10.004
10. Arıtürk Atılgan Z, Abakay A, Ülgen S. Obstructive sleep apnea syndrome and cardiovascular problems. *Dicle Med J.* 2011;38:253-256.
11. Senaratna CV, Perret JL, Matheson MC, et al. Validity of the Berlin questionnaire in detecting obstructive sleep apnea: a systematic review and meta-analysis. *Sleep Med Rev.* 2017;36:116-124. doi:10.1016/j.smrv.2017.04.001
12. Ulasli SS, Gunay E, Koyuncu T, et al. Predictive value of Berlin Questionnaire and Epworth Sleepiness Scale for obstructive sleep apnea in a sleep clinic population. *Clin Respir J.* 2014;8(3):292-296. doi:10.1111/crj.12070
13. Netzer NC, Stoohs RA, Netzer CM, Clark K, Strohl KP. Using the Berlin Questionnaire to identify patients at risk for the sleep apnea syndrome. *Ann Intern Med.* 1999;131(7):485-491. doi:10.7326/0003-4819-131-7-199910050-00002
14. Sharma SK, Vasudev C, Sinha S, Banga A, Pandey RM, Handa KK. Validation of the modified Berlin questionnaire to identify patients at risk for the obstructive sleep apnoea syndrome. *Indian J Med Res.* 2006;124(3):281-290.
15. Johns MW. A new method for measuring daytime sleepiness: the Epworth sleepiness scale. *Sleep.* 1991;14(6):540-545. doi:10.1093/sleep/14.6.540
16. Alsaggaf MA, Wali SO, Merdad RA, Merdad LA. Sleep quantity, quality, and insomnia symptoms of medical students during clinical years. Relationship with stress and academic performance. *Saudi Med J.* 2016;37(2):173-182. doi:10.15537/smj.2016.2.14288
17. Léger D, Partinen M, Hirshkowitz M, Chokroverty S, Hedner J; EQUINOX (Evaluation of daytime QUality Impairment by Nocturnal awakenings in Outpatient's eXperience) Survey Investigators. Characteristics of insomnia in a primary care setting: EQUINOX survey of 5293 insomniacs from 10 countries. *Sleep Med.* 2010;11(10):987-998. doi:10.1016/j.sleep.2010.04.019
18. Chan-Chee C, Bayon V, Bloch J, Beck F, Giordanella JP, Leger D. Épidémiologie de l'insomnie en France : état des lieux. *Rev Epidemiol Sante Publique.* 2011;59(6):409-422. doi:10.1016/j.respe.2011.05.005
19. Kim EJ, Dimsdale JE. The effect of psychosocial stress on sleep: a review of polysomnographic evidence. *Behav Sleep Med.* 2007;5(4):256-278. doi:10.1080/15402000701557383
20. Belingheri M, Pellegrini A, Facchetti R, De Vito G, Cesana G, Riva MA. Self-reported prevalence of sleep disorders among medical and nursing students. *Occup Med (Lond).* 2020;70(2):127-130. doi:10.1093/occmed/kqaa011
21. Dos Santos ER, da Silva JHC, Lima AMJ, Studart-Pereira LM. Prevalence of predictive factors for obstructive sleep apnea in university students. *Sleep Sci.* 2022;15(Spec 1):234-238. doi:10.5935/1984-0063.20210008
22. Pasha SN, Khan UA. Frequency of snoring and symptoms of sleep apnea among Pakistani medical students. *J Ayub Med Coll Abbottabad.* 2003;15(1):23-25.

23. Amra B, Farajzadegan Z, Golshan M, Fietze I, Penzel T. Prevalence of sleep apnea-related symptoms in a Persian population. *Sleep Breath.* 2011;15(3):425-429. doi:10.1007/s11325-010-0353-4
24. Khazaie H, Najafi F, Rezaie L, Tahmasian M, Sepehry AA, Herth FJ. Prevalence of symptoms and risk of obstructive sleep apnea syndrome in the general population. *Arch Iran Med.* 2011;14(5):335-338.
25. Geiger-Brown J, Rogers VE, Trinkoff AM, Kane RL, Bausell RB, Scharf SM. Sleep, sleepiness, fatigue, and performance of 12-hour-shift nurses. *Chronobiol Int.* 2012;29(2):211-219. doi:10.3109/07420528.2011.645752
26. Seyedmehdi SM, Rahnama N, Yazdanparast T, et al. Prevalence of snoring and the risk of sleep apnea in hospital staff. *Work.* 2016;55(4):765-772. doi:10.3233/WOR-162460
27. Aydın Güçlü Ö, Karadağ M, İntepe YS, Acıcan T, Arslan S, Sertoğullarından B. Assessment of the risk of obstructive sleep apnoea syndrome among healthcare workers. Sağlık çalışanlarında obstrüktif uyku apne sendromu riskinin değerlendirilmesi. *Tuberk Toraks.* 2019;67(1):47-54. doi:10.5578/tt.68166
28. Yavuz F, Kabağıl B, İsmailoğulları S, Zararsız G, Per H. Tıp öğrencilerinde uyku bozuklukları sıklığının araştırılması ve sınıflara, cinsiyete ve vücut kitle indeksine göre değişiminin incelenmesi. *J Turk Sleep Med.* 2019;3:88-92.
29. Punjabi NM. The epidemiology of adult obstructive sleep apnea. *Proc Am Thorac Soc.* 2008;5(2):136-143. doi:10.1513/pats.200709-155MG
30. Al Lawati NM, Patel SR, Ayas NT. Epidemiology, risk factors, and consequences of obstructive sleep apnea and short sleep duration. *Prog Cardiovasc Dis.* 2009;51(4):285-293. doi:10.1016/j.pcad.2008.08.001
31. Silverberg DS, Oksenberg A, Iaina A. Sleep-related breathing disorders as a major cause of essential hypertension: fact or fiction?. *Curr Opin Nephrol Hypertens.* 1998;7(4):353-357. doi:10.1097/00041552-199807000-00001
32. Fletcher EC, DeBehnke RD, Lovoi MS, Gorin AB. Undiagnosed sleep apnea in patients with essential hypertension. *Ann Intern Med.* 1985;103(2):190-195. doi:10.7326/0003-4819-103-2-190
33. Schwartz AR, Patil SP, Laffan AM, Polotsky V, Schneider H, Smith PL. Obesity and obstructive sleep apnea: pathogenic mechanisms and therapeutic approaches. *Proc Am Thorac Soc.* 2008;5(2):185-192. doi:10.1513/pats.200708-137MG
34. Young T, Palta M, Dempsey J, Skatrud J, Weber S, Badr S. The occurrence of sleep-disordered breathing among middle-aged adults. *N Engl J Med.* 1993;328(17):1230-1235. doi:10.1056/NEJM199304293281704
35. Muñoz MDS, Dantas PPA, Pola NM, Casarin M, de Almeida RZ, Muniz FWMG. Poor quality of sleep is associated with lower academic performance in undergraduate dental students: a cross-sectional study. *Sleep Vigil.* 2023;1-10. doi:10.1007/s41782-022-00223-2
36. Caldeira FID, Cardoso B, Carvalho LS, Batista Ferreira E, Pigossi SC, Rodriguez LS. Perception of health-related quality of life, sleep quality and sleepiness index in an educational environment at a dental school in Southeast Brazil. *Eur J Dent Educ.* 2022;26(4):794-800. doi:10.1111/eje.12762
37. Curcio G, Ferrara M, De Gennaro L. Sleep loss, learning capacity and academic performance. *Sleep Med Rev.* 2006;10(5):323-337. doi:10.1016/j.smrv.2005.11.001
38. Ergin A, Aydemir-Acar G, Bekar T. Sağlıkla ilgili eğitim veren fakültelerdeki öğrencilerin uyku kalitesinin belirlenmesi. *Pam Tıp Derg.* 2018;11(3):347-54.