

Frequency and Risk Factors of Sleep Problems Among High School Students Who Will Undergo University Entrance Exam as a Stressful Experience

Stresli Bir Deneyim Olan Üniversite Sınavına Girecek Lise Öğrencilerinde Uyku Problemlerinin Sıklığı ve Risk Faktörleri

Serap ÇİFÇİLİ, MD,^a
Pemra C. ÜNALAN, MD,^a
Derya KIVRAK, MD,^b
Gürkan KARACA, MD,^c
Necim YALÇIN, MD,^d
Arzu UZUNER, MD^a

Departments of
^aFamily Medicine,
^bInternal Diseases,
^cCardiology,
^dGynecology and Obstetrics,
Marmara University, Faculty of Medicine,
İstanbul

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Yazışma Adresi/Correspondence:
Serap ÇİFÇİLİ, MD
Marmara University, Faculty of Medicine,
Department of Family Medicine,
İstanbul,
TÜRKİYE/TURKEY
serapcifcili@gmail.com

ABSTRACT Objective: Prevalence of sleep disturbances is 15-35%, which is more frequent during adolescence. Stress is known to cause sleep disturbance, in particular insomnia. In this study it is aimed to evaluate the frequency of sleep disturbances among high school students who will undergo a university entrance exam as a stress factor, and relationship of sleep disturbances with the suggested variables. **Material and Methods:** This descriptive study was conducted in four different types of high schools and a private university preparing exam course in Istanbul. One senior and one junior class from all schools and four classes from the private course were selected by simple randomization and all students were invited to take place in the study. Of the students, 324 accepted to participate and 302 who fully-filled questionnaires were included in the analysis. A self-report questionnaire about main symptoms of sleep disorders and gastro-esophageal reflux, chronic wheezing or cough at nights, coffee and/or tea intake, alcohol and drug use, cigarette smoking, history of chronic diseases and current medications was used to get the data. Chi-square, Student's t-test and binary logistic regression analysis were used. **Results:** Of the participants, 33.4% (101) reported excessive daytime sleepiness. The participants who reported insomnia were %20.2 (61). The risk factors for insomnia were; addictive drug use, chronic cough and wheezing and depressive symptoms [Odds ratio (OR): 7.33-95% CI: 1.67-32.30, OR: 2.43- 95% CI: 1.31-4.64, 95% OR: 2.10- CI: 1.01-4.10 respectively]. The number of participants who declared that they had sleep disturbances was 121 (40.1%), and 75 (24.8%) of the participants reported Obstructive Sleep Apnea (OSA) symptoms. The risk factors for OSA symptoms were; chronic cough and wheezing, gastro-esophageal reflux symptoms and being overweight-obese (OR: 5.07- 95% CI: 2.62-9.84, OR: 2.85-95% CI: 1.75-4.67, OR: 95% 3.74- CI: 1.75-7.99 respectively). **Conclusion:** Although sleep difficulties seemed to be very common, this was related to obesity, chronic cough, gastro-esophageal reflux symptoms, cigarette smoking, addictive drug use and depressive symptoms more than exam stress. Thus the students with asthma and those who are overweight may be asked and managed about sleep disorders.

Key Words: Sleep initiation and maintenance disorders; adolescent; stress, physiological; sleep apnea, obstructive

ÖZET Amaç: Adolesan çağda oldukça yaygın olan uyku bozukluğunun sıklığı %15-30'dur. Stresin uyku bozukluklarına özellikle insomniaya sebep olduğu bilinmektedir. Bu çalışmada bir stres faktörü olarak Üniversite sınavına girecek olan öğrencilerde uyku bozukluklarını değerlendirmek ve uyku bozukluklarının diğer değişkenlerle ilişkisini gözlemek amaçlanmıştır. **Gereç ve Yöntemler:** Bu tanımlayıcı çalışma İstanbul'da bulunan ve türleri birbirinden farklı dört lisede ve bir özel dershanede gerçekleştirilmiştir. Kura yöntemi ile her okuldan ve bir dershaneden birer sınıf seçilmiş ve bu sınıflardaki tüm öğrencilere ulaşılmıştır. Öğrencilerin 324'ü çalışmayı kabul etmiş, anketi tam doldurmuş 302'si çalışma kapsamına alınmıştır. Uyku bozukluklarının başlıca semptomları, gastro-özefajiyal reflü, kronik "wheezing" veya gece öksürükleri, çay, kahve tüketimi, alkol ve/veya sigara kullanımı, var olan kronik hastalık öyküsü ve sürekli ilaç kullanımı ile ilgili bilgiler kendi beyanlarına dayanan bir soru formu ile toplanmış, verilerin analizinde ki-kare, t-testi ve lojistik regresyon kullanılmıştır. **Bulgular:** Katılımcıların %33.4 (101)'ü gün içinde aşırı uyuklama halinde olduklarını belirtmiştir. İnsomnia sıklığı %20.2 (n: 61)'dir. İnsomnia için risk faktörleri; ilaç bağımlılığı, kronik öksürük, "wheezing" ve depresif belirtiler olarak tespit edilmiştir (Sırasıyla OR: 7.33-%95 CI: 1.67-32.30, OR: 2.43- %95 CI: 1.31-4.64, OR: 2.10- %95 CI: 1.01-4.10) Katılımcıların %24.8(75)'i obstrüktif uyku apne (OSA) bulguları açısından pozitif kabul edilmiştir. OSA risk faktörleri kronik öksürük, wheezing, gastro-özefajiyal reflü ve aşırı kilolu olduğunu düşünmek olarak saptanmıştır. (Sırasıyla OR: 5.07- 95% CI: 2.62-9.84, OR: 2.85- 95% CI: 1.75-4.67, OR: 3.74- 95% CI: 1.75-7.99). **Sonuç:** Uyku bozuklukları çok sık olmakla birlikte bu durum sınav stresinden çok obezite, kronik öksürük, gastro-özefajiyal reflü semptomları, sigara kullanımı, ilaç bağımlılığı ve depresif semptomlarla ilişkilidir. Bu nedenle en azından astımı olan ve fazla kilolu olan öğrencilerin uyku bozukluğu sorgulanmalıdır.

Anahtar Kelimeler: Uykuya dalma ve sürdürme bozuklukları; adolesan; stres, fizyolojik; obstrüktif uyku apnesi

Amount of sleep is an important indicator of health and well-being in children and adolescents.¹ Prevalence of sleep disturbances among general population is estimated to be about 15-35%.²⁻⁴ What is less well recognized is that chronic sleep problems are also affecting up to 30% of children.⁵ Sleep disturbances include problems with sleep related breathing, initiating and maintaining sleep, parasomnias, arousal disorders and excessive daytime sleepiness. They are mentioned quite frequent by adolescents, because of academic and social challenges of that life stage.⁶ They may cause sleepiness, difficulty with concentration, fatigue and emotional lability problems in learning, lead to poor school performance⁶⁻⁸ and negatively affect normal growth.⁹ However, the relatively high prevalence and the potential for daytime results, it is mentioned that chronic sleep problems in children are reportedly under-diagnosed at the primary care level.¹⁰⁻¹²

In Turkey, high school students between the ages of 15-18 experience serious stress and anxiety because of university entrance exam that they should take after graduation from the high school. An applicant must succeed in this nationwide university entrance exam to be able to admit a faculty that he wishes to continue his education about an occupation. Only 15% of students can be successful at this exam. The examination is a summative assessment and measures an end point rather than the progress. Since the exam is held only once a year; the candidates study for the exam during the whole educational year and experience a performance anxiety at the final exam. Along this period, most of the students attend to private courses besides school programs.

We searched the Turkish Medline and Turkish Medical Database (Ulakbim) with the key words; sleep and student or university or adolescent or school separately and with additional Turk or Turkish or Turkey key words in Pubmed. We found only two studies which included secondary and high school students with difficulty in falling asleep.^{13,14} Although these studies addressed this topic, none of them were conducted in students who were preparing for university entrance exam. Our

hypothesis is that the students who face a stressful event like university entrance exam compared to the ones who do not face stressful event are more likely to experience sleep disturbances. Thus, in this study, we evaluated how common sleep disturbances were among the students who would and would not take the university entrance exam at the end of an educational year, and the relationship of sleep disturbances with socio-demographic characteristics, and other documented factors like coffee and tea consumption, alcohol and drug use, cigarette smoking, physical exercise, chronic diseases, current medications, symptoms of asthma and gastro-esophageal reflux.

MATERIAL AND METHODS

This study was conducted in between November 2004-April 2005 as a descriptive study.

To detect the prevalence with 5% standard error, the sample size was calculated as 246 at 95% confidence interval and 80% power. Since the prevalence of sleep disorders in Turkey in this age group is not known, a prevalence of 50% was used to calculate the sample size.

The sample size was estimated to be 245 with a standard error of 5%. As their curriculum intensity are variable, we selected a sample that included participants from all different types of high-schools, a total of four in Turkey, which were; science, technical, private and public high schools by picking up at random from the list of all in a district of İstanbul. In order to include the students who were graduated from high school at previous years but still willing to take university entrance exam, a private, university exam preparing course was also included in the study. At each school, from the list of all classes, one junior class and one senior class was selected at random by simple randomization. In total four junior out of 16 and four senior classes out of 15 were selected. At the university exam preparation course four were selected out of 11 by simple randomization. A total of 324 students agreed to participate in the study. The data of 22 were incomplete, so 302 were included in the analysis. Detailed information about the study was given to the students both

orally and written on the questionnaires. No identity information was recorded on the questionnaires to provide confidentiality. All students at each class who accepted to participate were included in the study. Of the students, 99% agreed to participate. Study protocol was approved by the Education Director of the governorship.

A self-report questionnaire was applied at the classroom, under supervision. Independent variables were; sex, grade, school type, income level, mother's and father's education level, living arrangement, having a chronic health condition, using continuous medication, regular exercise, perception of body weight, coffee/tea intake, alcohol intake, smoking, using psycho-active drugs, self-reported school performance, self-reported depressive symptoms, cough or wheezing at nights and gastro-esophageal reflux symptoms. Dependent variables were; insomnia (difficulty in falling asleep or frequent awakening), obstructive sleep apnea symptoms (snoring, choking, gasping for air, mouth breathing, witnessed apnea episodes) restless leg-syndrome symptoms (creeping, crawling or uncomfortable, difficult-to-describe feelings in the legs; a compelling urge to move the limbs; motor restlessness; symptoms worsen at rest; repetitive jerking limb movements) and narcolepsia symptoms (excessive and overwhelming daytime sleepiness even after adequate nocturnal sleep; sudden episodes of muscle weakness triggered by emotional reactions; a temporary inability to talk or move on falling asleep or awakening; vivid, frightening, dreamlike experiences that occur while dozing or falling asleep), excessive daytime sleepiness and self perception of sleep disorder.

Other than the independent variables mentioned above, symptoms of other sleep disorders were included in the analysis of both insomnia and excessive daytime sleepiness as independent variables.

Participants who were experiencing difficulties both in falling asleep and frequent awakenings were considered positive for insomnia. Participants who gave three or more affirmative answers for symptoms of certain sleep disturbance were accepted positive for symptoms of that disturbance.

Chi-square, Student's t-test and binary logistic regression analysis were used to analyze the data. SPSS 11.5 software was used to perform statistical analysis. Summary statistics for categorical data were expressed as % (number) and the continuous data were expressed as mean \pm standard deviation (s.d.). The significance level of the confidence intervals (CI) for the parameters was chosen as 95%. A *p* value less than 5% considered to be indicative for a significant difference between group means.

RESULTS

SOCIO-DEMOGRAPHIC DATA

Seventy one (23.5%) of the participants were girls and 231 (76.5%) were boys. As girls generally don't prefer technical high-schools and as we have included a technical high-school, male participants were more than female participants. Average age was 17.34 (s.d.= 1.82). Twenty eight (59.3%) of the participants reported that their grades were excellent and 27 of them (9.0%) reported that their grades were bad. The juniors who would not take university entrance exam at the end of that education year were 36.8% (111) of the participants. Other socio-demographic characteristics and frequency of alcohol and drug use, coffee, tea and coke intake and cigarette smoking are summarized in Table 1.

FREQUENCY OF SLEEP DISTURBANCES

Number of participants who reported that they were experiencing difficulty in falling asleep were 99 (32.8%), who reported difficulty in maintaining sleep were 136 (45.0%). The participants who reported experiencing both difficulties were 20.2% (61) of the sample and were accepted as experiencing insomnia symptoms.

Of the participants, 75 (24.8%) reported three or more Obstructive Sleep Apnea symptoms (OSA), 23 (7.6%) reported three or more restless leg syndrome (RLS) symptoms and 13 (4.3%) reported three or more narcolepsy symptoms). One hundred forty nine (49.3%) of the participants were experiencing difficulty in maintaining attention, 72 (23.8%) reported gastro-esophageal reflux symptoms at night and 68 (22.5%) reported that they

TABLE 1: Socio-demographic characteristics, frequency of coffee-tea, alcohol, cigarette, addictive use

Socio-demographic characteristics		n (%)
Sex	Female	71(23.5%)
	Male	231(76.5%)
Grade	Junior	111(36.8%)
	Senior	102(33.8%)
	Graduate	94(29.4%)
Living arrangement	With the family	237(78.5%)
	Dormitory	4(1.3%)
	Alone	50(16.6%)
	With friend(s)	10(3.3%)
Chronic health condition	Present	32(10.6%)
	Not present	170(89.4%)
Continuous medication	Positive	21(7.0%)
	Negative	181(93%)
Regular physical exercise	Positive	151(50.0%)
	Negative	151(50.0%)
Perception of body weight	Obese and overweight	46(15.2%)
	Normal	256(74.8%)
Cofee-tea-coke	None	17(5.6%)
	0-4 portions /a day	234(78.1%)
	≥ 5 portions /a day	51(16.9%)
Alcohol	None	207(68.5%)
	Rare (less than once in a week)	80(26.5%)
	Frequent (equal or more than once in a week)	7(2.3%)
Cigarette	Never	212(70.2%)
	Occasionally (less than one cigarette in a day)	38(12.6%)
	Continuous (at least one cigarette a day)	52(17.2%)
Addictive drug use	Ever	9(3.0%)
	Never	303(97.0%)

were waking up with cough or wheezing which was not related with common cold, 67 (22.2%) of the students reported that they were experiencing excessive daytime sleepiness. One hundred and twenty-one (40.1%) of the participants believed that they had sleep disturbances.

FACTORS ASSOCIATED WITH SLEEP DISTURBANCES

Age was not associated with most of the sleep disturbance symptoms but average age of the participants who reported to have excessive daytime sleepiness was higher [$t = -3.147$, mean age 17.3 (s.d: 1.6) vs 18.0 (s.d: 1.8) $p = 0.002$].

Insomnia was significantly more frequent among the subjects who reported to have chronic diseases ($p = 0.013$), chronic cough and wheezing at

nights ($p < 0.001$), depressive symptoms ($p < 0.01$) and drug addiction ($p = 0.037$, Fisher's exact test) (Table 2).

There was no statistically significant relationship between any of the independent variables and restless leg syndrome or narcolepsy symptoms.

OSA symptoms were more frequent among the participants who were overweight or obese depending on self-reports, ($p < 0.001$) who had a chronic medical condition ($p < 0.01$), who had difficulties in maintaining sleep because of cough or wheezing ($p < 0.001$) or gastro-esophageal reflux symptoms ($p < 0.001$), drug use ($p = 0.009$) and depressive symptoms ($p < 0.001$). The participants who did exercise regularly were experiencing OSA symptoms less frequently ($p = 0.04$) (Table 3).

TABLE 2: The factors which are significantly associated with insomnia.

		Insomnia symptoms (difficulty in falling asleep and maintaining sleep)			No insomnia symptoms	Total	χ^2 p
Socio-demographic characteristics							
Chronic disease	Positive	11 (34.4%)	21 (65.6%)	32 (100.0%)	4.463	0.035	
	Negative	50 (18.5%)	220 (81.5%)	270 (100.0%)			
Addictive drug use	Never	6 (66.7%)	3 (33.3 %)	9 (100.0%)	12.427	0.003*	
	Ever	55 (18.8%)	238 (81.2%)	293 (100.0%)			
Chronic cough and wheezing at nights	Positive	24 (35.3%)	44 (64.7%)	68 (100.0%)	12.407	<0.001	
	Negative	37 (15.8%)	197 (84.2 %)	234 (100.0%)			
Depressive symptoms	Positive	47 (25.3 %)	139 (74.7 %)	186 (100,0%)	7.723	0,005	
	Negative	14(12.1 %)	102 (87.9 %)	116 (100,0%)			
Symptoms of sleep disorders							
RLS	≥ 3 symptoms	9 (39.1%)	14 (60.9%)	23 (100.0%)	5.536	0.019	
	<3 symptoms	52 (18.6%)	227 (81.4 %)	279 (100.0%)			
OSA	≥ 3 symptoms	25 (33.3%)	50 (66.7%)	75 (100.0%)	10.679	0.001	
	<3 symptoms	36 (15.9%)	191 (84.1%)	227 (100.0%)			

*Fisher's exact test.

RLS: Restless leg syndrome; OSA: Obstructive sleep apnea.

Insomnia was also significantly associated with OSA ($p < 0.001$) and restless leg syndrome symptoms ($p = 0.001$). Excessive daytime sleepiness (EDS) was experienced more frequently by females ($p = 0.018$), the students who would take the university entrance exam at the end that educational year ($p = 0.010$), smokers ($p = 0.008$), the students who were not living with their families ($p = 0.014$), who reported depressive symptoms ($p < 0.001$), who reported gastro-esophageal reflux symptoms ($p < 0.001$) and cough and wheezing at nights ($p < 0.001$). EDS was also significantly associated with OSA symptoms ($p < 0.001$) and RLS symptoms ($p = 0.001$), insomnia ($p = 0.026$) (Table 4).

The participants who reported chronic medical condition, continuous medication use, being overweight or obese, reporting depressive symptoms, reflux or cough and wheezing at nights, RLS symptoms, narcolepsy symptoms, OSA symptoms and the participants who reported that they we-

ren't successful at school, more frequently believed that they had sleep disturbance ($p < 0.05$).

RISK FACTORS OF SLEEP DISORDERS

All factors associated with insomnia in the univariate analysis except having a chronic disease was included in the logistic regression model. As having a chronic disease was significantly associated to chronic cough and wheezing ($\chi^2 = 19.221$, $p < 0.001$), we did not include this variable in the model. The participants who reported depressive symptoms had two times [Odds ratio (OR): 2.10, 95% CI: 1.01-4.10], the participants who reported chronic cough and wheezing at nights had 2.4 times (OR: 2.43, 95% CI: 1.31-4.64) and the participants who reported addictive drug use had 7 times (OR: 7.33, 95% CI: 1.67-32.30) greater risk for insomnia (Table 5). Although addictive drug use was the most important risk factor, the wide range of confidence interval should be noticed. This could be attributed to minority of its frequency.

TABLE 3: The factors which are significantly associated with three or more OSA symptoms.

		≥ 3 OSA symptoms	<3 OSA symptoms	Total	p
Chronic medical condition	Positive	17 (53.1%)	15 (46.9%)	32 (100.0%)	<0.001
	Negative	58 (21.5%)	212 (78.5%)	270 (100.0%)	
Overweight-obese (based on self-reports)	Positive	24 (52.2%)	22 (47.8%)	46 (100.0%)	<0.001
	Negative	51 (19.9%)	205 (80.1%)	256 (100.0%)	
Chronic cough or wheezing at nights	Positive	40 (58.8%)	28 (41.2%)	68 (100.0%)	<0.001
	Negative	35 (15.0%)	199 (85.0%)	234 (100.0%)	
Gastro-oesophageal reflux symptoms	Positive	31 (43.1%)	41 (56.9%)	72 (100.0%)	<0.001
	Negative	44 (19.1%)	186 (80.9%)	230 (100.0%)	
Addictive drug use	Ever	6 (66.7%)	3 (33.3%)	9 (100.0%)	0.009*
	Never	69 (23.5%)	224 (76.5%)	293 (100.0%)	
Depressive symptoms	Positive	59 (31.7%)	127 (68.3%)	185 (100.0%)	<0.001
	Negative	15 (13.8%)	100 (86.2%)	115 (100.0%)	
Regular Physical Exercise	Positive	30 (19.9%)	121 (80.1%)	151 (100.0%)	0.04
	Negative	45 (29.8%)	106 (70.2%)	151 (100.0%)	

*Fisher's Exact Test.

OSA: Obstructive sleep apnea.

TABLE 4: The factors which are significantly associated with excessive daytime sleepiness.

	Excessive daytime sleepiness		Total	χ^2	p
	Positive n (%)	Negative n (%)			
Sex	Female	23 (32.4)	48 (67.6)	71 (100,0)	5.604 0,018
	Male	44 (19,0)	187 (82,0)	231 (100,0)	
University entrance exam	This year	51 (26.7)	140 (73.3)	111 (100,0)	6.139
	Next year	16 (14.4)	95 (85.6)	191 (100,0)	
Depressive symptoms	Positive	56 (30,1)	130 (69.9)	186 (100,0)	17.604 <0.001
	Negative	11 (9.5)	105 (90.5)	116 (100,0)	
Current smoker	Positive	29 (32.2)	61 (67.8)	90 (100,0)	7.481 0,006
	Negative	38 (17.9)	174 (82.1)	212 (100,0)	
Accommodation	With family	44 (18.6)	193 (81.4)	237 (100,0)	8.539 0,004
	Dormitory	23 (35.4)	42 (64.6)	65 (100,0)	
Gastrooesophageal reflux symptoms	Positive	28 (38.9)	44 (61.1)	72 (100,0)	15.279 <0.001
	Negative	39 (17,0)	191 (83,0)	230 (100,0)	
Cough or wheezing at nights	Positive	29 (42.6)	39 (57.42)	68 (100,0)	21.284
	Negative	38 (16,2)	196 (83.8)	234 (100,0)	
	Symptoms of sleep disorders				
Insomnia	Positive	20 (32.8)	41 (67.2)	61 (100,0)	4.976
	Negative	47 (19.5)	194(80.5)	241 (100,0)	
OSA	≥ 3 symptoms	40 (53.3)	35 (46.7)	75 (100,0)	56.075
	<3 symptoms	27 (11.9)	200 (88.1)	227 (100,0)	
RLS	≥ 3 symptoms	15 (65.2)	8 (34.8)	23 (100,0)	26.704
	<3 symptoms	52 (18.6)	227 (81.4)	279 (100,0)	

RLS: Restless leg syndrome; OSA: Obstructive sleep apnea.

All factors significantly associated with OSA symptoms in the univariate analysis except having chronic disease and depressive symptoms were in-

cluded in logistic regression model. As having a chronic disease was significantly associated to chronic cough and wheezing ($\chi^2= 19.221$, $p < 0.001$),

TABLE 5: Risk factors for insomnia (experiencing difficulties both in falling asleep and frequent awakenings).

Variables	OR	95% CI	p
Addictive drug use (baseline never)	7.33	1.67-32.30	0.009
Chronic cough and wheezing (baseline no)	2.43	1.31-4.64	0.005
Depressive symptoms (baseline none)	2.10	1.01-4.10	0.003

OR: Odds ratio.

we did not include this variable in the model. Having depressive symptoms was not included because these symptoms probably were consequence of OSA rather than the cause. By binary logistic regression analysis; the participants who reported addictive drug use had 5 times (OR: 5.23, 95% CI: 0.97-28.23); who reported cough or wheezing at nights had 5 times (OR: 5.07, 95% CI: 2.62-9.84); who reported gastro-esophageal symptoms had 3 times (OR: 2.85, 95% CI: 1.75-4.67) and the participants who perceive themselves as overweight or obese had 4 times (OR: 3.74, 95% CI: 1.747-7.99) greater risk of presenting OSA symptoms (Table 6).

All factors associated with EDS in the univariate analysis were included in the logistic regression analysis. The participants who reported depressive symptoms had 4.5 times (OR: 4.48, 95% CI: 1.42-7.56); who reported three or more OSA symptoms had 4 times (OR: 3.74, 95% CI: 1.73-8.06) and who reported RLS symptoms had 3 times (OR: 2.92, 95% CI: 1.01-8.38) greater risk of excessive daytime sleepiness (Table 7).

DISCUSSION

There is growing evidence that, sleep problems in adolescents are more prevalent than realized by health professionals and they negatively affect behavior, attainment of social competence and quality of life.¹⁵ Authors noted that physicians did not routinely screen for sleep disorders in adolescents and sleep problems were underdiagnosed.¹⁶⁻¹⁸ In our study 40.1% of the participants believed that they had sleep disturbances which was quite frequent. A cross-sectional survey of 1535 school children (aged 5-18) which was conducted in New Orleans, reported sleep disturbance with a frequency of 15.4% but the age group was younger than our

study.⁵ In large international surveys, it was mentioned that 16% of adolescents report daily sleepiness in the mornings.¹⁵

Similar to our study, in a study in Taiwan, which examines similar age group, sleep difficulties were found to be over 48%.¹⁹ In this study, the authors found that age was an important factor for sleep difficulties and they reported that senior students seemed to have longest sleep latency; that is the time needed to fall asleep. Another cross-sectional study, in China, of 1365 subjects, whose ages were between 12-18 years, supported the high frequency of our study as it is reported that insomnia symptoms were 16.9% and older age was significantly associated with insomnia.²⁰ In our study, only excessive daytime sleepiness (EDS) was more frequent among older students. On the other hand, in our study most of the participants' ages were 17-18 (55.6%) and only 5.3% of the participants were 20 years and older. As our study group was considerably homogenous regarding the age compared to this study, the differences between age groups might not be significant.

Several studies reviewed the effect of female sex on sleep difficulties and a female preponderance of EDS was found.²¹⁻²³ Similarly in our study EDS and difficulty in falling asleep were more frequent among girls. Another sleep disorder found to be mo-

TABLE 6: Risk factors for OSA symptoms (≥ 3 symptoms).

Variables	OR	95% CI	p
Addictive drug use (baseline never)	5.23	0.97-28.23	0.055
Cough or wheezing (baseline no)	5.07	2.62-9.84	<0.001
Gastro-oesophageal reflux symptoms (baseline no)	2.85	1.745-4.67	<0.001
Overweight-obese (baseline no)	3.74	1.75-7.99	0.001

OR: Odds ratio.

TABLE 7: Risk factors for excessive daytime sleepiness.

Variables	OR	95% CI	p
Depressive symptoms (baseline none)	4.48	1.42-7.56	0.006
OSA symptoms (baseline 0-2 symptoms)	3,74	1,73-8,06	0,001
RLS symptoms (baseline 0-2 symptoms)	2,92	1,014-8,38	0,047

RLS: Restless leg syndrome; OSA: Obstructive sleep apnea; OR: Odds ratio.

re prevalent among girls was initiating and maintaining sleep (DIMS) in a study, conducted in USA, of girls between 11-14 years.²⁴ Another study with 39,588 citizens aged 15 years or older living in Taiwan, women scored an average of 1.25 points higher than men on the insomnia inventory but after controlling for social roles, the sex discrepancy in insomnia decreased slightly.²⁵ So researchers realized that when age groups and social roles are recognized, gender might be a risk factor more than sex.

The most familiar adverse effect of caffeine is disruption of sleep. Previous studies have shown that higher caffeine intake and smoking was negatively associated with sleep duration.²⁶ In our study, however we found no relationship between insomnia and tea-coffee consumption.

Liu et al. found that lack of habitual physical exercise, poor physical health, longer distance from home to school, and life stress experienced during the past 12 months were significantly associated with an increased risk of insomnia.²⁰ Murdey et al concluded that greater time spent in sedentary behavior is associated with reduced sleep time.²⁷ Similar to these results, the subjects in our study who had regular physical exercise reported insomnia symptoms less frequently, but by logistic regression analysis, physical exercise was not a significant factor.

As it was mentioned in the literature, adolescents who were experiencing disturbed sleep, experienced a range of deficits in functioning, and chronic poor sleep was significantly associated with emotional problems²⁸ and the strongest correlates of insomnia were disturbed mood, fatigue and suicidal ideation.²⁹ Parallel to these studies, in our study population, reporting depressive symptoms as expected, was found to be an important risk factor for insomnia (OR: 2.10, 95% CI: 1.01-4.10) and seemed to be very frequent. This finding was very much worth of concern. Other risk factors for insomnia were addictive drug use (OR: 7.33, 95% CI: 1.67-32.30) and cough and wheezing at nights (OR: 2.43, 95% CI: 1.31-4.64).

When we analyzed OSA symptoms; we found that they were more frequent among the partici-

pants who reported that they were overweight or obese, had a chronic medical condition and had difficulties in maintaining sleep because of cough or wheezing or gastro-esophageal reflux symptoms (GER), as well as the ones using addictive drug. The participants who were doing regular exercise were experiencing OSA symptoms slightly less frequently. Among these factors, cough or wheezing at nights seemed to be an effective risk factor (OR: 5.07, 95% CI: 2.62-9.84). These findings were quite similar to another study with clinically stable bronchial asthmatic 30 university students and a similar group of 30 healthy students resulted, 93% of the patients experienced sleep disturbances as compared to 33% of the subjects in the control group.³⁰ Daytime sleepiness and tiredness (63%) and difficulty in maintaining sleep were also very frequent among asthmatic participants.³¹ However, it is known that sleep disordered breathing is to be considered in children and adolescents with snoring those who don't qualify OSA criteria. So focusing only to the adolescents who snore or have OSA symptoms may cause to underestimate the subject.³²

Similar to a study which was conducted in the United Kingdom, the authors concluded that symptomatic GER was very common among the subjects with a breathing sleep disorder,³³ we found a relationship between OSA symptoms and gastro-esophageal reflux symptoms in our study (OR: 2.85, 95% CI: 1.75-4.67).

In a prospective study including 1001 patients, it is found that overweight and obese patients slept shorter than patients with a normal body mass index.³⁴ Another study, in which 78 severely obese and 40 healthy sex and age matched adult participants were included, sleep patterns with full-night polysomnography were examined. It was concluded that; severe obesity even in absence of OSA symptoms, is associated with sleep related disorders and EDS.³⁵ In our study, we found that; experiencing OSA symptoms (OR: 3.74, 95% CI: 1.73-8.06), experiencing RLS symptoms (OR: 2.92, 95% CI: 1.01-8.38) and depressive mood (OR: 4.48, 95% CI: 1.42-7.56) were risk factors for excessive daytime sleepiness and sleep disturbances.

CONCLUSIONS

Since OSA symptoms were very much related to wheezing, adolescent patients with these symptoms should be asked for sleep disorders. As depressive symptoms were observed very frequently, we concluded that depression might be screened among adolescents who have insomnia. However it is worrisome that educators continue to fail to recognize students who may have disrupted sleep patterns and that; physicians fail to ask about sleep. The students who were going to take a university entrance exam were experiencing neither sleep dif-

ficulties nor depressive symptoms but only excessive daytime sleepiness significantly. Primary health-care providers can assist in assessing sleep in adolescents and educating them about the importance of adequate sleep and the consequences of sleep deprivation. Students with excessive daytime sleepiness and difficulty in maintaining attention should be informed about sleep hygiene and when needed counseling should be given.

As a result, although sleep difficulties seemed to be very common at this age, this finding was not related to the given stressing factor but EDS was an emerging problem.

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