



Do Chronotype and Insomnia in Medical Students Give Information About Attention Deficit Hyperactivity Disorder?

Tıp Fakültesi Öğrencilerinde Kronotip ve Insomnia, Dikkat Eksikliği Hiperaktivite Bozukluğu Hakkında Bilgi Verir Mi?

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Abstract

Objective: Many people with attention deficit hyperactivity disorder (ADHD) still receive inadequate identification and treatment today. In this context, given the challenging, competitive nature of medical education based on social and experiential learning, being diagnosed with ADHD may cause difficulties. This study aims to evaluate the associations among sleep problems, individual chronotypes, and symptoms of ADHD in medical students.

Materials and Methods: In this cross-sectional study, 453 university students were included. Sociodemographic data form, Adult ADHD Self-Report Scale (ASRS), Munich Chronotype Questionnaire, Insomnia Severity Index, and Depression-Anxiety-Stress Scale were administered to the participants.

Results: Of the 388 participants who met the inclusion criteria, 222 were female (57.3%), and the mean age of the participants was 20.80±1.89 years. The participants' mean total ASRS score was 29.11±10.08, and 39 (11%) were at high risk for ADHD. We found that 30 (76%) of the 39 participants at high risk for ADHD were intermediate type, eight (20.5%) were evening types, and one (2.5%) was morning type. The findings showed that 34 (87.2%) of the people at high risk for ADHD reported having insomnia. The independent predictors of the ASRS score were insomnia severity, self-injury, depression and anxiety score ($p=0.004$, $p=0.020$, $p=0.001$, $p=0.021$).

Conclusion: Our study found that individuals with a high risk for ADHD revealed specific differences in their circadian rhythm as well as higher levels of insomnia, depression, anxiety, and stress. It was observed that the severity of insomnia, self-induced harm, depression and anxiety scores affected the ASRS score.

Keywords: Attention deficit hyperactivity disorder, insomnia, chronotype, depression, anxiety

Öz

Amaç: Günümüzde dikkat eksikliği hiperaktivite bozukluğu (DEHB) olan pek çok kişiye hâlâ yeterince tanı konamamakta ve tedavi verilememektedir. Bu bağlamda tıp eğitiminin sosyal ve deneysel öğrenmeye dayanan zorlu, rekabetçi doğası düşünüldüğünde DEHB tanılı olmak zorlanmalara sebep olabilir. Bu çalışmada tıp fakültesi öğrencilerinde uyku sorunları ve bireysel kronotipler ile DEHB belirtileri arasındaki ilişkilerin değerlendirilmesi amaçlanmıştır.

Gereç ve Yöntem: Kesitsel tipte tasarlanmış bu araştırmaya, 453 üniversite öğrencisi dahil edilmiştir. Katılımcılara sosyodemografik veri formu, Erişkin DEHB Kendi Bildirim Ölçeği (KBÖ), Münih Kronotip Anketi, Uykusuzluk Şiddeti İndeksi ve Depresyon-Anksiyete-Stres Ölçeği uygulandı.

Bulgular: Çalışmamıza dahil edilme kriterlerini karşılayan 388 katılımcıdan, 222'si kadın (%57,3) olup, katılımcıların yaş ortalaması 20,80±1,89'di. Katılımcıların toplam DEHB-KBÖ puan ortalaması 29,11±10,08 olup, katılımcılardan 39'nun (%11) DEHB açısından yüksek risk altında olduğu saptanmıştır. DEHB açısından yüksek riskli olan 39 katılımcıdan 30 (%76)'nın aratıp, 8 (%20,5)'nin akşamcıl tip, 1 (%2,5)'nin ise sabahçıl tip olduğu görülmüştür. DEHB açısından yüksek riskli bireylerden 34'nün (%87,2) uykusuzluk yaşadığı saptandı. ASRS puanı bağımsız için yordayıcının ise; uykusuzluk şiddeti, kendini yaralama, depresyon ve anksiyete puanı ($p=0,004$, $p=0,02$, $p=0,001$, $p=0,021$) olduğu görüldü.

Sonuç: Çalışmamızda, DEHB açısından yüksek riskli olan bireylerin sirkadiyen ritim açısından farklılık gösterdikleri, daha fazla uyku sorunu, anksiyete, depresyon ve stres yaşadıkları görülmüştür. ASRS puanı üzerinde etkili olan faktörün ise uykusuzluk şiddeti, kendini yaralama depresyon ve anksiyete skorları olduğu görülmüştür.

Anahtar Kelimeler: Dikkat eksikliği hiperaktivite bozukluğu, uykusuzluk, kronotip, depresyon, anksiyete

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Introduction

Attention deficit hyperactivity disorder (ADHD) is a neurodevelopmental condition that typically starts in childhood and is characterized by difficulties in paying attention, excessive levels of activity, and impulsive behavior.¹ Although ADHD symptoms are known to decline with age, 4-60% of adults with ADHD still experience symptoms that impair their social interactions, academic achievement, and interpersonal connections.² The estimated cross-country prevalence rate in adults is 2.8 percent.³ Moreover, individuals with ADHD demonstrate a susceptibility to other psychiatric disorders. Major depressive disorder, anxiety disorders, alcohol-substance use disorders, and sleep disorders are some of them.^{4,5}

Sleep is a basic, multifunctional requirement regulated by endogenous circadian rhythms and homeostatic processes. The main regulators of circadian rhythm are the Suprachiasmatic Nucleus and the hormone melatonin.⁶ Humans are divided into different chronotypes, such as morningness (30%), intermediate type (IT) (60%), and eveningness (10%), in terms of temporal differences in circadian rhythm, especially in the sleep-wake cycle, body temperature cycle, and secretion time differences of some hormones. Accordingly, individuals with the morning type (MT) sleep in the early hours, wake up in the early hours and show the best performance in their mental and physical activities in the morning hours. The evening type (ET) is characterized by a tendency to sleep later, difficulty rising in the morning, and the most optimal performance in intellectual and physical endeavors during the afternoon and evening.⁷ Studies have shown that people with ADHD frequently experience sleep issues, such as trouble falling asleep, excessively early morning awakenings, and not feeling sufficiently rested despite sleeping. It has also been reported that the evening chronotype is more common in ADHD than in the normal population and that the ET is more associated with attention, sleep problems, and disruptive behaviors.⁸ Snitselaar et al.⁹ found that prolonged sleep latency, trouble maintaining sleep, waking up late in the morning, and circadian rhythm disturbances were frequently observed in adults diagnosed with ADHD. On the other hand, there are research findings on the relationship between attention deficit symptoms and sleep disorder symptoms in community-based samples. In a study conducted with university students, a significant relationship was found between attention deficit and hyperactivity symptoms, insomnia, and feeling sleepy during the day.¹⁰ Despite substantial information on ADHD clinical signs, neurobiology, the load of sickness, and effective therapy, many people with ADHD are still having trouble with diagnosis and treatment.¹¹ In this context, considering the challenging, competitive nature of medical education based on social and experiential learning, being diagnosed with ADHD may cause difficulties.¹² Thus, it might be helpful to find medical students who are at risk for ADHD. This study aimed to evaluate the associations among sleep problems, individual chronotypes, and symptoms of ADHD in medical students.

Materials and Methods

Ethics Approval

The Non-interventional Research Ethics Committee of the Kırıkkale University Faculty of Medicine acknowledged this study (approval number: 2022.12.15 date: 21.12.2022).

Study Design, Setting, and Participants

The Department of Mental Health and Diseases at Kırıkkale University Faculty of Medicine conducted this cross-sectional and descriptive study. This study included 453 students who were actively studying in the 3rd, 4th, and 5th grades of the faculty of medicine in the 2022-2023 academic year. In this study, no sample selection was made, and volunteers who completed and approved the survey form were included. However, this study excluded two students with bipolar disorder and 61 students who used antidepressant medications for any reason. This study included 388 of the remaining 390 students who completely completed the study questionnaires. Sociodemographic data form, Adult ADHD Disorder Self-Report Scale (ASRS), Munich chronotype questionnaire, Insomnia Severity Index (ISI), and Depression-Anxiety-Stress Scale-21 (DASS-21) were applied to the participants. All cases were evaluated according to DSM-5 diagnostic criteria during clinical interview and diagnosis. Following the clinical interview and ASRS application, the patients were divided into groups as "highly probable ADHD," "probable ADHD," and "non-ADHD" according to the scale scores and their clinical findings were compared.

Survey

The researchers developed the sociodemographic data form to record sociodemographic and clinical characteristics.

Adult ADHD Self-report Scale (ASRS): This scale is designed to screen adults for ADHD. The scale consists of two subscales, part A (attention deficit) and part B (hyperactivity/impulsivity). The scale is a five-point Likert-type Rating Scale scored between 0-4. Our country has conducted validity and reliability studies. People who score 24 points or higher on the scale are considered to have "highly probable ADHD", those who score 17-23 points are considered to have "probable ADHD," and those who score 0-16 points do not have ADHD.¹³

The Munich Chronotype Questionnaire (MCTQ): The scale uses three basic parameters to independently assess sleep time during work and free days; (1) the mid-point between the start and finish times of sleep on work days (mid-sleep on work days: MSW), (2) the midpoint of the start and finish times of sleep on free days (mid-sleep on free days: MSF), (3) the mid-point of the start and finish times of sleep on free days with a correction to account for sleep debt on work days (sleep corrected mid-sleep on free-days: MSFsc). When sleep time on work or school days is greater than or equal to sleep time on holidays, we use MSF. When working days are fewer than holidays, MSFsc is applied. Those with MSFsc or MSF values lower than 2.17 are classified as MT; those between 2.17 and 7.25 are IT; and those higher than 7.25 are ET.^{14,15}

Insomnia Severity Index: The self-assess scale was created specifically to measure subjective sleep quality and insomnia.

The scale items, which comprise seven questions, are assigned scores ranging from 0 to 4. If the total score ranges between 15 and 21, it suggests the existence of moderate insomnia. A study on Turkish reliability and validity was carried out.^{16,17}

Depression-Anxiety-Stress Scale (DASS-21): The scale, abbreviated DAS-42, is used to measure anxiety, depression and stress. An individual's score of 5 points and above from the depression sub-dimension, 4 points and above from anxiety, and 8 points and above from stress indicates that he/she has an illness.¹⁸ Sarıçam et al.¹⁹ conducted a validity and reliability study for Turkey. This scale is a 4-point Likert-type scale and consists of seven questions each measuring "depression, stress and anxiety dimensions".

Statistical Analysis

The software "SPSS for Windows v22.0 (SPSS Inc., Chicago, IL, USA)" was preferred for the statistical calculation. Scale data were presented as "mean values (X) and standard deviation (SD)", while nominal variables were presented as "percentages (%)". Normality and homogeneity were observed independently with the "Kolmogorov-Smirnov" or "Shapiro Wilk" tests. After the participants were divided into two groups according to gender, the data were compared using the chi-square test and the independent sample t-test. Then, we used ANOVA and the Tukey multiple comparisons test to compare the demographic data and clinical findings. The relationship between measurement scales was assessed using Pearson's correlation test. The participants were divided into three groups according to the ASRS test scores, and reveal the predictive markers based on the literature information on the clinical features of ADHD. Then, a linear regression analysis was performed. Elimination was performed using the enter method after the variables were inserted into the analysis. Statistical significance was set at $p < 0.05$ and $p < 0.001$.

Results

This study was introduced to 453 students who were actively studying in the 3rd, 4th, and 5th grades of the Faculty of Medicine. However, this study only included 388 participants after excluding two students with bipolar disorder, two students who did not complete the scales and sixty-one students who used antidepressant drugs for any reason. The 388 students who met the inclusion criteria were between 19 and 25 years (minimum-maximum); 222 were female (57.3%), and the mean age was 20.80 ± 1.89 years. The economic status of the sample was high at 65.3%, low at 6.2%. Parents' education level was 56.4% university and upper. Twenty-six participants (6.7%) had a history of self mutilation (Table 1 displays the initial characteristics and scores of the participants). The ASRS total mean score was 29.11 ± 10.08 . ISI mean score was 9.61 ± 5.03 . DASS-21 total mean score was 20.96 ± 10.93 , depression subscale mean score was 7.45 ± 4.38 , anxiety subscale mean score was 7.03 ± 3.31 and stress subscale mean score was 6.44 ± 4.32 . According to MCTQ, participants' MSF was 5:53, MSW was 4:44 and MSFsc was 5.22 minutes. Male participants' MSW and MSF values were significantly lower than females ($p = 0.014$). In the subscale of

hyperactivity-impulsivity scores, female participants had higher scores than male participants ($p = 0.042$). Using the ASRS cutoff points of both subscales, 44% of ($n = 174$) participants were classified as a non-ADHD group, 45% ($n = 175$) were classified as probable ADHD group, and 11% of ($n = 39$) students were classified as highly likely ADHD group. The ADHD group had highest mean scores on the DASS-21 and ISI scales although non-ADHD group had significantly lower mean scores in DASS-21 and ISI scales ($p < 0.001$). MSW and MSF times were later in the ADHD group than the probable ADHD and non-ADHD groups (Sleep characteristics and DASS-21 scores of ADHD groups were shown in Table 2). ASRS scores were significantly, positively and moderately correlated with DASS-21 and low with ISI scores. There was a positive and weak correlation between ASRS, MSF and MSW (correlation coefficient: 0-0.29, little if any correlation, 0.30-0.49 low correlation, 0.50-0.69 moderate correlation, Pearson correlation analysis is shown in Table 3). Linear regression analysis was performed to test the possible effect of independent variables on ADHD diagnosed using ASRS. The selection of the independent variables that were thought to be effective in the diagnosis of ADHD was based on the literature information on the clinical features of ADHD. The effects of independent variables (age, gender, DASS-Depression, DASS-Anxiety, self-injury, ISI score and MSFsc) on ADHD were evaluated by linear regression analysis. Linear regression analysis revealed that ISI scores ($B = 0.020$, $Beta = 0.158$, $t = 2.905$, $p = 0.004$), self-injury scores ($B = 0.288$, $Beta = 0.110$, $t = 2.339$, $p = 0.020$), depression scores ($B = 0.034$, $Beta = 0.230$, $t = 3.331$, $p = 0.001$) and anxiety scores ($B = 0.031$, $Beta = 0.159$, $t = 2.319$, $p = 0.021$) were independent predictors of ASRS (Table 4).

Discussion

This study aims to evaluate the associations among sleep problems, individual chronotypes, and symptoms of ADHD in medical students. As a result, persons at high risk for ADHD had different circadian rhythms and experienced increased sleep problems, depression, anxiety, and stress. It was observed that the factors affecting the ASRS score were insomnia severity, self-injury and depression scores. Although ADHD is recognized as a neurodiversity characterized by lifelong differences, it can cause restlessness, sleep problems, occupational failure, and functional disorders due to its ability to affect executive functions.¹¹ In this context, considering the challenging, competitive nature of medical education based on social and experiential learning, being diagnosed with ADHD may cause difficulties. Therefore, it may be beneficial to identify individuals at risk for ADHD among medical students.¹² In this context, 39 (11%) of the 388 participants included in our study were found to be at high risk for ADHD. The prevalence of ADHD among medical students has been reported in the literature to range from 5.5 to 23.7%, depending on the society and measurement used.^{20,21} According to two studies evaluating medical students in their final year that were conducted in our country, the prevalence was 15.5% and 17.2%, respectively.^{22,23} Our results are consistent with the current literature. Chronotype refers to a person's diurnal preference and describes individual differences in activity and

alertness throughout the day. There are three basic chronotypes: morning, evening, and intermediate, in which the person feels most energetic and effective.^{6,7} Among the 388 participants in our study, 37 (9.6%) were morning, 323 (83.2%) were intermediate and 28 (7.2%) were evening. As a result, the intermediate chronotype was the most prevalent in our sample. This study coincides with the findings of previous research on the chronotype characteristics of Turkish undergraduates, which reveal that the middle type is the most prevalent and the ET is the least common.^{24,25} Growing data indicates a relationship between ADHD and circadian phase delay.²⁶ In our study, we found that 30 (76%) of the 39 participants at high risk for ADHD were IT, 8 (20.5%) were ET, and 1 (2.5%) were MT. The prevalence of eveningism was significantly higher in ADHD patients than in non-ADHD patients and healthy controls, according to a study of adult patients who were admitted to a psychiatric clinic for the first time and healthy controls.²⁷ In a study of college students based on individual chronotypes, attention deficit and impulsivity, 44 (17.25%) were classified as ET, 54 (21.17%) as MT, and 157 (61.56%) as intermediate.²⁴ Furthermore, our study revealed a positive correlation between the ASRS score and MSF and MSW. It was also reported that

chronotypes were correlated with ASRS mean scores in the study by Yılbaş et al.²⁴ One of the most prevalent sleep problems is insomnia, and medical students are especially sensitive to them.²⁸ An insomnia prevalence of 139 (64.2%) was found among the participants in our study. Recent systematic reviews of 250 studies found that 41.16 percent of college students suffered from sleep disorders.²⁸ Individuals with ADHD are also at risk for sleep disorders. There have been suggestions that a reciprocal connection exists between ADHD and sleep disorders and that sleep problems could be an early predictor of ADHD.²⁹ The hypothalamic-pituitary-adrenal axis can be responsible for that, and changes in cortisol levels have been linked to irregular sleep patterns.¹² Insomnia was identified in 34 (87.2%) of the individuals at high risk for ADHD in our study. Also, it was revealed that the high-risk group in terms of ADHD had higher insomnia severity than the other groups experiencing moderate insomnia. Our study found that the severity of sleeplessness increased as ASRS scores increased. Sleep disorders may appear in up to 83% of individuals with ADHD who have greater primary sleep problems, longer sleep onset latency, and insomnia, according to recent studies.³⁰ Comorbidity rates in ADHD patients have been reported to be 60-80%. A population

Table 1. Baseline characteristics of participants

	Mean ± SD/N (%)			p
	Total (n=388)	Female (n=222)	Male (n=166)	
Age	20.80±1.89	20.85±1.86	20.86±1.93	0.959
Income				0.951
High	254 (65.3%)	145 (65.3%)	108 (65.1%)	
Medium	111 (28.5%)	64 (28.8%)	47 (28.3%)	
Low	24 (6.2%)	13 (5.9%)	11 (6.6%)	
Parental education				0.378
Non	10 (2.6%)	4 (1.8%)	6 (3.6%)	
Primary	69 (17.8%)	42 (18.9%)	27 (16.3%)	
High school	90 (23.2%)	53 (23.9%)	37 (22.3%)	
University	187 (48.2%)	101 (45.5%)	86 (51.8%)	
Msc/PHD	32 (8.2%)	22 (9.9%)	10 (6.0%)	
Presence of family history of psychiatric disorders	52 (13.4%)	33 (14.9%)	19 (11.4%)	0.328
Self mutilation history	26 (6.7%)	14 (6.3%)	12 (7.2%)	0.719
DASS-21	20.96±10.93	21.22±11.23	20.61±10.55	0.595
Depression	7.45±4.38	7.56±4.40	7.30±4.36	0.558
Anxiety	7.03±3.31	6.95±3.36	7.13±3.22	0.597
Stress	6.44±4.32	6.65±4.43	6.16±4.15	0.270
ASRS total	29.11±10.08	29.70±9.41	28.33±10.89	0.192
Inattention	13.81±5.51	13.87±5.18	13.74±5.91	0.829
Hyperactivity- Impulsivity	15.31±5.89	15.84±5.45	14.61±6.37	0.042
ISI	9.61±5.03	9.69±4.99	9.51±5.10	0.725
MSW (hour: minute)	4:44	4:35	4:55	0.054
MSF (hour: minute)	5:53	5:43	6:08	0.014*

*p<0.05,

DASS-21: Depression-Anxiety-Stress Scale, ASRS: Adult Attention Deficit Hyperactivity Disorder Self-Report Scale, ISI: Insomnia Severity Index, MSW: Mid-sleep on work days, MSF: Mid-sleep on freedays

analysis in twenty countries revealed that having three or more problems increased the likelihood of having ADHD by tenfold.³ Our study found that the high-risk group for ADHD had much greater levels of depression, anxiety, and stress than the probable and non-risk groups. Anxiety, depression, and stress levels increased as the ASRS score increased. In a study, 5693 medical students were evaluated in terms of ADHD symptoms, depression, suicidal behaviours and anxiety. Consequently, it

was found that anxiety and depression levels were considerably greater for students with high ASRS scores.²¹ A study assessing the prevalence of ADHD and related conditions in medical students found that those with ADHD scored higher on anxiety and depression scales than people in general.²³ The presence of anxiety and depression concomitant with ADHD has been shown in other studies.³⁰ ADHD is undertreated because it is not adequately recognized and may persist for a lifetime. This

Table 2. Sleep features and DASS-21 scores of ADHD groups

	Highly likely ADHD (n=39)	Likely ADHD (n=175)	Non-ADHD (n=174)	p
MSW (hour:minute)	5:24	4:46	4:32	<0.001**
MSF (hour:minute)	6:48	5:54	5:40	<0.001**
MSFsc (hour:minute)	6.01	5.18	5.16	0.026*
DASS-21 (mean ± SD)	32.91±10.41	23.24±10.31	16.12±8.75	<0.001**
Depression	11.48±4.55	8.38±4.15	5.59±2.91	<0.001**
Anxiety	10.35±3.31	7.59±3.01	5.76±2.91	<0.001**
Stress	10.76±3.85	7.27±4.29	4.46±3.44	<0.001**
ISI (mean ± SD)	15.26±5.27	10.11±4.77	8.08±4.51	<0.001**

p<0.005*, p<0.001**,
DASS-21: Depression-Anxiety-Stress Scale, ASRS: Adult Attention Deficit Hyperactivity Disorder Self-Report Scale, ISI: Insomnia Severity Index, MSW: Mid-sleep on work days, MSF: Mid-sleep on freedays, SD: Standard deviation

Table 3: Evaluation of the relationships between the scales by pearson correlation analysis

		MSF	MSW	ASRS _{total}	ISI	DASS _{total}
MSF	Pearson correlation	1	0.677**	0.170	0.261	0.147
	Sig. (2-tailed)		<0.001	<0.001	<0.001	0.002
MSW	Pearson correlation	0.677**	1	0.146	0.260	0.157
	Sig. (2-tailed)	<0.001		0.003	<0.001	0.001
ASRS _{total}	Pearson correlation	0.170	0.146	1	0.365*	0.514**
	Sig. (2-tailed)	<0.001	0.003		<0.001	<0.001
ISI	Pearson correlation	0.261	0.260	0.365*	1	0.483*
	Sig. (2-tailed)	<0.001	<0.001	<0.001		<0.001
DASS _{total}	Pearson correlation	0.147	0.157	0.514**	0.483*	1
	Sig. (2-tailed)	0.002	0.001	<0.001	<0.001	

p<0.005, p<0.001,
DASS-21: Depression-Anxiety-Stress Scale, ASRS: Adult Attention Deficit Hyperactivity Disorder Self-Report Scale, ISI: Insomnia Severity Index, MSW: Mid-sleep on work days, MSF: Mid-sleep on freedays, *Low correlation, **Moderate correlation

Table 4. Predictors of ADHD by linear regression analysis

Variable		B	S.E	Beta	t	p	95% CI
MSFsc		4.053	0.000	0.035	0.709	0.479	0.000-0.000
ISI		0.020	0.007	0.158	2.905	0.004	0.007-0.034
DASS-21	Depression	0.034	0.010	0.230	3.331	0.001	0.014-0.054
	Anxiety	0.031	0.013	0.159	2.319	0.021	0.0-0.057
Age		-0.003	0.016	-0.009	-0.185	0.853	-0.035-0.029
Sex		0.034	0.061	0.026	0.557	0.578	-0.086-0.154
Self-injury		0.288	0.123	0.110	2.339	0.020	0.046-0.530

p<0.005, p<0.00,
DASS-21: Depression-Anxiety-Stress Scale, ASRS: Adult Attention Deficit Hyperactivity Disorder Self-Report Scale, ISI: Insomnia Severity Index, MSW: Mid-sleep on work days, MSF: Mid-sleep on freedays, CI: Confidence interval

condition causes difficulties in many aspects of their lives (e.g., academic and social) and comorbid conditions.¹¹ In this context, the factors that may be associated with the ASRS score were evaluated in linear regression analysis in our study. This analysis revealed that ISI, self-injury, depression and anxiety score were independent predictors of ASRS. These findings suggest that students with insomnia, self-harm, anxiety, and depression may have a higher likelihood of having ADHD. However, no association was observed between ASRS and chronotype. This may be explained by the fact that sleep problems are specific to ADHD, and symptoms of insomnia are a component of ADHD's presentation. ADHD symptoms, such as inattention, difficulty planning, or nocturnal activity, can directly lead to poor sleep hygiene and insomnia. In ADHD, insomnia is frequently associated with depressive symptoms.^{9,31} A longitudinal study revealed a strong correlation between symptoms of sleeplessness at age 18 and ADHD persistence throughout early adulthood.³²

Study Limitations

Among the study's strengths is that it has a larger sample size than comparable studies and that its participant group is homogeneous. A limitation of this study is that the participants were not given a structured interview, and all of the assessments were based on their subjective ideas.

Conclusion

Our study found that individuals with a high risk for ADHD revealed specific differences in their circadian rhythm as well as higher levels of insomnia, depression, anxiety, and stress. It was observed that the severity of insomnia, self-induced harm, and depression scores affected the ASRS score. Many individuals with ADHD are still undiagnosed and undertreated. In this context, considering the challenging, competitive nature of medical education based on social and experiential learning, being diagnosed with ADHD may cause difficulties. Our study aimed to increase awareness of ADHD among medical students and identify individuals at risk. In this context, the ASRS may be a reliable aid for clinicians diagnosing ADHD in adults, but a clinical interview should be supplemented.

Ethics

Ethics Committee Approval: The Non-interventional Research Ethics Committee of the Kırıkkale University Faculty of Medicine acknowledged this study (approval number: 2022.12.15 date: 21.12.2022).

Informed Consent: The individuals who volunteered to participate in our investigation were provided with comprehensive information regarding this study, and their approval was obtained.

Footnotes

Authorship Contributions

Concept: H.K., Design: H.K., H.M.Ö., Data Collection or Processing: H.K., H.M.Ö., Analysis or Interpretation: H.M.Ö., Literature Search: H.K., H.M.Ö., Writing: H.K.

Conflict of Interest: No conflict of interest was declared by the authors.

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