Research Article / Araştırma Makalesi

Clinical Correlations of ADHD Symptoms with Anxiety, Depression, and Self-Esteem in Medical Students: A Cross-Sectional Study

Tıp Öğrencilerinde DEHB Belirtilerinin Anksiyete, Depresyon ve Benlik Saygısı ile İlişkisi: Kesitsel Bir Çalışma

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Özet: Dikkat Eksikliği Hiperaktivite Bozukluğu (DEHB), dikkatsizlik, hiperaktivite ve dürtüsellik belirtileri ile karakterize nörogelişimsel bir bozukluktur. Bu çalışma, tıp öğrencileri arasında DEHB belirtileri ile anksiyete, depresyon ve benlik saygısı sorunları arasındaki ilişkiyi araştırmaktadır. Çalışma 210 tıp öğrencisi ile kesitsel olarak yapılmıştır. Erişkin DEHB Öz-Bildirim Ölçeği (ASRS), Hastane Anksiyete ve Depresyon Ölçeği ve Rosenberg Benlik Saygısı Ölçeği kullanılmıştır. DEHB riski, ASRS'nin ikiye ayrılmış puanlaması kullanılarak değerlendirilmiştir. Lojistik regresyon modelleri DEHB belirtilerinin anksiyete, depresyon ve benlik saygısı üzerindeki etkisini değerlendirmiştir. Çalışmada katılımcıların %24'ünün DEHB için yüksek risk altında olduğu bulunmuştur. Yüksek ve düşük DEHB riski olan gruplar arasında akademik başarı, sigara kullanım alışkanlıkları veya algılanan sosyoekonomik durum açısından anlamlı bir fark bulunmamıştır. Ancak, yüksek riskli DEHB katılımcılarında anksiyete, depresyon ve benlik saygısı puanları anlamlı derecede daha kötüydü. DEHB yaygınlığında cinsiyet farklılıkları gözlemlenmemiştir. Anksiyete ve depresyon ile DEHB belirtileri arasında güçlü bir ilişki tespit edilmiştir. Dikkat çekici olarak, öğrencilerin %47'si depresyon ve %41'i anksiyete için eşik değerinin üzerinde puan almıştır. Lojistik regresyon analizi, yüksek DEHB riskinin anksiyete ve depresyon puanlarını artırdığını ancak benlik saygısı üzerinde anlamlı bir etkisi olmadığını ortaya koymuştur. Tıp öğrencileri arasında DEHB belirtilerinin yüksek yaygınlığı, özellikle artan anksiyete ve depresyon ile olan ilişkisi göz önüne alındığında önemli bir endişe kaynağıdır. Gençlerde DEHB'nin erken tanı ve tedavisi, ruhsal semptomlarının gelişimini hafifletebilir ve benlik saygısındaki düşüşü engelleyebilir.
Anahtar Kelimeler: DEHB, tıp öğrencileri, anksiyete, depresyon, benlik saygısı

Abstract: Attention Deficit Hyperactivity Disorder (ADHD) is a neurodevelopmental disorder characterized by symptoms of inattention, hyperactivity, and impulsivity. This study explores the relationship between ADHD symptoms and the prevalence of anxiety, depression, and self-esteem issues among medical students. A cross-sectional study was conducted with 210 medical students. The Adult ADHD Self-Report Scale (ASRS), Hospital Anxiety and Depression Scale (HADS), and Rosenberg Self-Esteem Scale (RSES) were employed. ADHD risk was assessed using the dichotomized scoring of the ASRS. Logistic regression models evaluating the impact of ADHD symptoms on anxiety, depression, and self-esteem. The study found that 24% of participants were at high risk for ADHD. There was no significant difference in academic success, smoking habits, or perceived socioeconomic status between high and low-ADHD-risk groups. However, high-risk ADHD participants showed significantly worse scores in anxiety, depression, and self-esteem. Gender differences in ADHD prevalence were not observed. A strong relationship was identified between ADHD symptoms and increased anxiety and depression. Notably, 47% of students scored above the threshold for depression and 41% for anxiety. Logistic regression analysis revealed that high ADHD risk increased the scores for anxiety and depression but had no significant effect on self-esteem. The high prevalence of ADHD symptoms among medical students is a significant concern, particularly given their association with increased anxiety and depression. Early identification and treatment of ADHD in youth could potentially mitigate the development of mood symptoms and prevent the decline in self-esteem.
Keywords: ADHD, medical students, depression, anxiety, self-esteem

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1. Introduction

Attention Deficit Hyperactivity Disorder (ADHD) is a neurodevelopmental disorder characterized by symptoms of inattention, hyperactivity, and impulsivity, often recognized during childhood but persisting into adulthood in many cases (1). Globally, ADHD is seen in approximately 5-7% of children and adolescents, and in 3-4% of adults (2-4). However, studies suggest that the prevalence of ADHD among university students might be higher, up to 11% (5, 6), though it's generally thought to be around 2-4% (7). The treatment of ADHD, particularly in adulthood, often faces delays, resulting in socio-economic burdens for countries (8). Despite its prevalence, there is a lack of longitudinal studies in many countries, including ours, that track ADHD from childhood into adulthood.

ADHD often coexists with other psychiatric conditions, complicating its clinical presentation and treatment. According to Barkley and colleagues, 80-84.3% of adults with ADHD have at least one comorbid condition, and 53-60.8% have at least two (9). A multicenter study of American university students revealed that 55% of those with ADHD have at least one psychiatric disorder (10). Anxiety and depression are the most common comorbid conditions, with mood disorders occurring in 38% of individuals with ADHD compared to 11% in those without ADHD (11), and anxiety disorders in 47% compared to 19% (12, 13). Higher levels of anxiety and depression have been observed in the combined type of ADHD (14).

In addition to psychiatric comorbidities, individuals with ADHD are at a higher risk for substance use disorders, including smoking. Research indicates that individuals with ADHD are more likely to start smoking at an earlier age and are at a higher risk of developing nicotine dependence compared to their non-ADHD peers (15). This increased susceptibility is thought to be due to the impulsivity and novelty-seeking behaviors commonly observed in ADHD. Furthermore, nicotine has been found to have a temporary calming effect on some ADHD symptoms, which may lead to self-medication attempts among those affected (15). The high prevalence of smoking in individuals with ADHD underscores the importance of addressing substance use in this population, particularly in high-stress environments like universities.

The situation may be more complex for medical students. Individuals with impaired attention and high impulsivity are at risk for anxiety and depression due to their hindered thinking processes, concentration, memory, organization skills, and other adaptive abilities (16). The academic performance issues arising from executive function difficulties can also contribute to feelings of depression (17). Particularly untreated individuals with ADHD in high-stress academic environments like medical school are at risk for mental health issues. These mental challenges pose potential problems not only for the individuals themselves but also for public health, as they can affect the quality of healthcare service delivery, increase professional errors, and impact communication skills (18).

ADHD individuals, who often face challenges in academic, educational, and social areas, may also experience effects on their self-esteem. Individuals who frequently encounter failure from childhood are at risk of developing low self-efficacy, according to the multi-dimensional self-esteem model (19). Current findings indicate that although individuals with ADHD may have high self-esteem during childhood, it tends to decrease by adulthood, regardless of gender (19-21). Individuals with low self-efficacy throughout their development may be at risk for internalizing symptoms later in life.

Despite the growing prevalence of tertiary education and more individuals with ADHD entering universities, only a small portion of these individuals have access to treatment services (22). Those pursuing academically demanding fields like medicine may have good mental capacities, ongoing medication treatments, or adaptive compensation mechanisms. However, more than these factors might be necessary against the intensive educational programs and social

relationships in adulthood. Moreover, the transition to tertiary education, where individual living is more prominent and family and teacher support decrease, can pose additional challenges, particularly for those with self-regulation difficulties (23).

Although there is a relatively large number of studies on ADHD in adulthood, research focusing on medical students in our country is limited. In light of the above information, our study aims to examine the relationship between ADHD symptoms and depression, anxiety, and self-esteem in medical students. We hope our research, which aims to understand better the relationship between common comorbid conditions and ADHD symptoms, will contribute to our understanding of the relationship between individual characteristics and internalizing symptoms and highlight the need for targeted interventions.

2.Materials and Methods

2.1.Participants and Procedure

This cross-sectional study was conducted with students from a medical faculty between April and May 2023. A total of 210 students aged 18-26 (M=22.3, SD= 2.2), who voluntarily agreed to participate, were included in the study. The participants consisted of 37 first-year, 38 second-year, 14 third-year, 16 fourth-year, 35 fifth-year, and 70 sixth-year students. Among the participants, 98 were male (46.7 %) and 112 were female (53.3%).

Prior to participation, all students were provided with detailed information about the study, and written informed consent was obtained. The study employed a sociodemographic data form, the Adult ADHD Self-Report Scale (ASRS), the Hospital Anxiety and Depression Scale (HADS), and the Rosenberg Self-Esteem Scale (RSES). Ethical approval for the study was obtained from the Non-Interventional Clinical Research Ethics Committee of Eskişehir Osmangazi University (dated 28/03/2023, with the number 2300064834).

2.2.Data Collection Instruments

Demographic Information: A form including age, gender, educational information, socioeconomic characteristics, and family-related details was created by the study authors.

Adult ADHD Self-Report Scale (ASRS): Developed by the World Health Organization for screening mental disorders, the scale consists of 18 items divided into two subscales: 'Inattention' and 'Hyperactivity/Impulsivity', each with nine items (24). Each item is scored on a five-point Likert scale ranging from 'never' to 'very often,' with scores between 0 and 4. It has been indicated that 6 of the 18 questions of the scale better predict ADHD diagnosis, forming part A of the scale, while the remaining 12 questions make up part B (24). In adults, a dichotomized score of 4 or more in part A is highly consistent with an ADHD diagnosis (25, 26). Therefore, in our study, individuals dichotomized scoring four or more on part A of the scale were defined as highly potential ADHD cases. The Turkish reliability and validity of the scale were conducted by Doğan et al., with a Cronbach's alpha value of 0.88 (27).

Hospital Anxiety and Depression Scale (HADS): Developed by Zigmond and Snaith to screen for anxiety and depression symptoms, the scale comprises 14 items (28). The validity of the scale in our country was established by Aydemir et al., with a Cronbach's alpha of 0.85 for the anxiety subscale and 0.77 for the depression subscale (29). Seven items (odd numbers) of the scale assess anxiety, and the remaining seven determine depression. Scores for both subscales range from 0-21, with cut-off points set at 10 for anxiety and 7 for depression (29).

Rosenberg Self-Esteem Scale (RSES): In our study, the self-esteem subscale of the Rosenberg Self-Esteem Scale, developed by Rosenberg, was used (30). This 10-item Likert-type scale has a total score ranging from 0-30, with high scores indicating high levels of self-esteem. Scores between 15-25 are considered normal, while scores below 15 indicate low self-esteem. The Turkish

adaptation of the scale was carried out by Cuhadaroglu (31).

2.3.Statistical Evaluation

Data from the study were analyzed using IBM SPSS statistic software version 25.0. Measurement variables were expressed as mean±standard deviation, and categorical variables as percentages and numbers. The normality of numerical data was assessed using the Kolmogorov-Smirnov test and histograms. The Mann-Whitney U test was used to compare numerical data between groups with high and low risk of ADHD, while the Pearson chi-square test and Fisher's Exact test were employed for categorical variables. The relationship between ADHD symptom severity and self-esteem and mood symptoms was evaluated using Spearman's correlation test. The effect of high ADHD symptoms on the emergence of independent variables was assessed using logistic regression analysis. Odds ratios and 95% confidence intervals were calculated. A p-value of <0.05 was considered statistically significant.

3.Results

Table 1 displays the demographic characteristics of the participants. The mean age of the 210 students was 22.3±2.2. Of these, 98 were male (46.7%) and 112 were female (53.3%). Three participants did not specify their year of study, but participants from all years were included (Table 1). Twenty-eight participants (13.4%) reported having a psychiatric disorder (Table 1), with 3 (1.4%) diagnosed with ADHD, 9 (4.2%) with Anxiety Disorder, 15 (7.1%) with Depression, and 1 (0.05%) with Bipolar Disorder. None of the participants who reported having ADHD mentioned taking any medication. (Table 1)

Table 1. Characteristics of the Participants

		N	%
Gender	Male	98	(46.7 %)
	Female	112	(53.3 %)
Grade	1th class	37	(17.9 %)
	2nd class	38	(18.1 %)
	3rd class	12	(5.7 %)
	4th class	14	(6.7 %)
	5th class	35	(16.7 %)
	6th class	71	(33.8 %)
Grade Point Average (Mean±SD)		75.73±13.20	
Grade repetition	yes	16	(7.6 %)
	no	194	(92.4 %)
Perceived socioeconomic status	low	18	(8.6 %)
	middle	143	(68.1 %)
	high	49	(23.3 %)
Smoking	yes	78	(37.1 %)
	no	132	(62.9 %)
History of psychiatris disorders	yes	28	(13.3 %)
	no	182	(86.7 %)

There was no significant difference in academic success, perceived socioeconomic level, and psychiatric disorders between genders (p>0.05). However, a higher incidence of smoking was found among male students compared to females (χ^2:5.00, p=0.0031).

The average ASRS score of the participants was 31.2±11.32. The ASRS scores were dichotomized (0: no, 1: yes) to identify individuals at high risk for ADHD. Participants scoring four or above in the dichotomized scoring of the ASRS part A were defined as being at high risk for ADHD (25, 26). Our study found that 50 participants (24.3%) were at high risk for ADHD (Table 2). The ASRS part A scores of 4 participants could not be calculated due to missing data.

The total HAD scores of the participants were 16.15±6.87, with the anxiety and depression scores being 9.33±4.24 and 6.80±3.88, respectively (Table 2). Furthermore, when evaluating participants against the depression (≥7) and anxiety (≥10) cut-off scores of the HAD scale, it was found that 86 participants (41.1%) scored above the cut-off for anxiety, and 98 (47.1%) for depression, indicating they were at risk in these areas (Table 2). The Rosenberg Self-Esteem Scale score of the participants was 19.84±6.00.

Participants were divided into two groups based on high (ASRS dichotomized score ≥4) and low (ASRS dichotomized score ≤4) ADHD risk, and scale scores and certain sociodemographic characteristics were compared. The group at risk of ADHD had significantly worse scores in anxiety, depression, and self-esteem (Table 2). No differences were found in academic success, perceived socioeconomic level, and smoking between the two groups (Table 2).

Table 2. Clinical and demographic characteristics of students at low and high risk of ADHD

		Low ADHD Risk	High ADHD Risk*			
				Total	P	Z/t/ x^2
HADS-Total		14.88±6.48	19.90±6.85	16.15±6.87	<0.001	-4.14[a]
HADS-A		8.66±4.11	11.07±3.78	9.33±4.24	0.001	-3.44[b]
HADS-A	≥10 ≤10	54 (34.6 %) 102 (65.4 %)	31 (60.8 %) 20 (39.2 %)	85 (41.1 %) 122(58.9 %)	0.001	10.87[c]
HADS-D		6.21±3.50	8.83±4.41	6.80±3.88	<0.001	-3.48[b]
HADS-D	≥7 ≤7	63 (40.6 %) 92 (59.4 %)	35 (68.6 %) 16 (61.4 %)	98 (47.6 %) 108 (52.4 %)	0.001	12.05[c]
RSES		20.56±5.75	17.97±6.14	19.84±6.00	0.048	-1.97[b]
Grade sucess		76.04±12.13	73.87±16.03	75.72±13.20	0.354	-0.927[b]
Perceived socieconomic status	low middle high	13 (8.4 %) 105 (67.7 %) 37 (23.9 %)	5 (9.8 %) 36 (70.6 %) 10 (19.6 %)	18 (8.7 %) 141 (68.4 %) 47 (22.8 %)	p=0.519	0.439[c]
Smoking	no yes	98 (62.8 %) 58 (37.2 %)	33 (64.7 %) 18 (35.3 %)	131 (63.3 %) 76 (36.7 %)	p=0.86	0.06[c]

[a] Student's t-test, [b]Mann-Whitney U test, [c] Chi -Square test
HADS: Hospital Anxiety Depression Scale; HADS-A: Hospital Anxiety Depression Scale Anxiety subscale; HADS-D: Hospital Anxiety Depression Scale Depression subscale; RSES: Rosenberg Self Esteem Scale
**ASRS dichotomized score ≥ 4*

When evaluating the scale scores by gender, only the HAD Anxiety subscale showed a difference (Mann Whitney U test, Z=-3.07 p=0.002). Females had higher levels of anxiety compared to males. No significant differences were found in other scale scores between genders (p>0.05).

Significant correlations were found between ADHD scores and anxiety, depression, and self-esteem scores (Table 3). This correlation was consistent across both genders.

Table 3. Bivariate analysis between study variables in high risk ADHD students

	ASRS	HADS	HADS-D	HADS-A	RSES
ASRS	1				
HADS	.57**	1			
HADS-D	.46**	.80**	1		
HADS-A	.51**	.87**	.44**	1	
RSES	-.38**	-.64**	-.46**	-.61**	1

**p<0.01

ASRS: Adults ADHD Self-Report Scale; HADS: Hospital Anxiety Depression Scale; HADS-A: Hospital Anxiety Depression Scale Anxiety subscale; HADS-D: Hospital Anxiety Depression Scale Depression subscale; RSES: Rosenberg Self Esteem Scale

Binary logistic regression analysis was conducted to determine the risk of occurrence of variables measured in our study in individuals with a high risk of ADHD. In the regression model, individuals with a dichotomized score ≥4 in ASRS part A were added as dependent variables. Data significantly associated with ADHD scores (HAD A, HAD-D, and Rosenberg Self-Esteem Scale) were included as independent variables. Variables were added to the model as categorical or numerical data. Stepwise regression analysis was performed. The model's predictability was determined to be 77.6% (-2 Log likelihood:205.7, Nagelkerke R Square:0.125, Hosmer-Lemeshow p=0.576). The regression analysis found that a high risk of ADHD increased anxiety and depression scores but had no significant effect on self-esteem (Table 4).

Table 4. Final model of logistic regression analyses for predicting ADHD

	Coefficient (B)	Standard Error (SE)	Wald	p	Exp(B)	95% CI
RSES	-.447	.460	.942	0.332	.64	.259-1.577
HADS-A	.102	.050	4.127	0.042	1.108	1.004-1.222
HADS-D	.138	.049	7.83	0.005	1.147	1.042-1.263

HADS-A: Hospital Anxiety Depression Scale Anxiety subscale; HADS-D: Hospital Anxiety Depression Scale Depression subscale; RSES: Rosenberg Self Esteem Scale

4.Discussion and Conclusion

In this study, we examined the relationship between ADHD symptoms, depression, anxiety, and self-esteem among medical students. Our findings revealed that 47% of the students scored above the threshold for depression, and 41% for anxiety, with high-risk ADHD students showing significantly worse scores in anxiety, depression, and self-esteem. Additionally, high ADHD risk was influential in the emergence of anxiety and depression symptoms but did not significantly predict self-esteem levels.

24% of our participants were found to be at high risk for ADHD, which seems high compared to recent research (16, 32). Although the small sample size and the use of self-report scales, which may lead to false positives (33), should be considered, this finding suggests that a significant portion of undergraduate students might experience difficulties related to ADHD. It is crucial to note that a high risk for ADHD does not necessarily equate to a full diagnosis, as structured clinical interviews were not conducted in this study. Symptoms of internalizing that may be associated with attention problems could have contributed to the high rate of ADHD risk detected by self-report scales. Indeed, the association of ADHD-like symptoms with increased depression, anxiety, and stress has been shown (34, 35). Future research should incorporate clinical assessments to validate these findings.

While ADHD in adulthood has been reported to be more common in males, similar to childhood (36, 37), our findings are in line with studies by Das et al. (38) and Kwak et al. (35), which suggest no gender difference in adulthood. This result indicates possible gender differences in the course of ADHD in adulthood and suggests a decrease in gender differences in ADHD symptoms. We also observed that the intensity of ADHD symptoms did not make a difference in academic success in our sample of medical students, suggesting that students with ADHD in a challenging field like medicine might have better cognitive functionalities and coping skills, possibly affecting their academic performance.

Our study confirmed a strong relationship between ADHD symptoms and anxiety and depression. ADHD symptoms were significantly correlated with higher anxiety and depression scores, supporting previous findings that ADHD increases the risk for internalizing symptoms. The persistence of ADHD symptoms into adulthood affects functional areas, and the addition of comorbid conditions complicates matters further. Anxiety and depression, commonly accompanying ADHD, are among the most frequent psychiatric disorders in adulthood. Clinically significant ADHD symptoms can lead to productivity issues and anxiety about failing to meet academic expectations (39). Evidence suggests that individuals with ADHD symptoms demonstrate less emotional coping, higher negative affect, and lower problem-solving skills in challenging and emotionally demanding situations (40, 41). These characteristics, which may pose a risk for internalizing symptoms, could play a role in the development of psychosocial difficulties in individuals with ADHD. In our study, 41% of the students were at risk for anxiety and 47% for depression, consistent with another study we conducted on medical students in our country (42), but higher than recent meta-analyses on anxiety and depression prevalence in medical students (43, 44). The high ADHD symptoms found in our study are thought to contribute to this. Furthermore, anxiety and depression were more prevalent in the group with ADHD symptoms. While some studies have shown no relationship between anxiety, depression, and ADHD (45, 46), our findings are consistent with previous research indicating that ADHD increases the risk of internalizing symptoms (47-49). These findings underscore the importance of early identification and treatment of ADHD to mitigate the development of mood disorders.

Early internalizing symptoms associated with ADHD may be related to emotional regulation difficulties due to ADHD symptoms (49). Levy (50) suggested that the strong relationship between ADHD and anxiety symptoms could be explained by similar brain structure pathologies characterizing both

disorders, a proposal that may also apply to depression (49). Nigg and Casey (51) mentioned that ADHD symptoms could play a role in affective response and cognitive control. The frequent co-occurrence of anxiety and depression with ADHD may also be due to these individuals living with the disorder for a long time, as ADHD symptoms typically emerge in childhood and often continue into adulthood. Especially in untreated cases, difficulties in sustaining attention can lead to feelings of failure and disappointment, which might be related to the high levels of anxiety and depression found in our sample. Indeed, while 4.2% of participants reported a diagnosis of ADHD, none were receiving regular treatment, underscoring the importance of continued treatment for ADHD, not only for the disorder itself but also for comorbidities. Understanding the similarities and differences between ADHD and other common clinical conditions will significantly contribute to clinical practice.

ADHD symptoms in adulthood also result in decreased self-esteem, affecting psychological adjustment (52). Academic difficulties, social challenges, and negative feedback from the environment experienced in earlier life stages of individuals with ADHD can be risk factors for the development of this feeling. The reason for the more noticeable decrease in self-esteem during young adulthood is likely due to the critical phase of self-perception and identity formation in the university environment. This risk may increase in an academic environment like medical school, which requires high levels of organization, follow-up, and time management skills. Therefore, when assessing individuals with ADHD, it is crucial to evaluate anxiety and depression, as anxiety can increase feelings of inadequacy and fear of failure, while depression can lead to a more widespread sense of hopelessness and negative self-view. Hence, any intervention aimed at improving self-esteem in students with ADHD should address these comorbid conditions. However, while ADHD symptoms were related to lower self-esteem, our regression analysis did not find a significant predictive effect of ADHD on self-esteem. This may be due to the high cognitive abilities and coping mechanisms of medical students, which help them manage their symptoms effectively. Nonetheless, addressing self-esteem issues in students with ADHD is crucial, as low self-esteem can exacerbate other mental health problems.

The relationship between cigarette smoking and ADHD symptoms was not clearly established in our study. Smoking has been associated with higher rates of psychiatric symptoms, including ADHD, anxiety, and depression (53,54). However, our analysis did not find a significant difference in smoking rates between high and low ADHD risk groups. Future studies should explore this relationship further, considering the intensity and duration of smoking habits and their direct impact on psychiatric symptoms.

While evaluating the findings of our study, its limitations should also be considered. Firstly, our sample consisted only of students from a single university. Our sample being composed of medical students also limits the generalizability of the results to the entire population. Secondly, although no differences were found in academic success, smoking, and perceived social support between groups with high and low ADHD symptoms, further investigation into more environmental and familial factors might have been beneficial. Thirdly, our study used self-report scales and did not conduct clinical interviews. The use of self-report scales might have led to higher reported rates of the measured parameters and could affect the validity of the results. Furthermore, the use of self-report scales, especially in the presence of comorbid conditions with overlapping symptoms, could lead to positive ADHD symptom reports. Fourthly, the cross-sectional nature of the study limits the generalizability of the results. Lastly, Our study is not adequately addressing confounding factors such as participants' past psychiatric history and medication use should be acknowledged. These factors can significantly impact the severity of ADHD symptoms and associated conditions like anxiety and depression. Including these variables in future analyses could provide a more comprehensive understanding of the relationship between ADHD symptoms and mental health outcomes.

In conclusion, our findings indicate that symptoms of ADHD, depression, and anxiety are highly prevalent among medical students. Although internalizing symptoms may increase self-reported ADHD symptoms, consistent with the literature, our study found that increased ADHD symptoms measured by the ASRS in young adulthood increase the risk for the development of mood symptoms. While the mechanisms underlying the relationship between ADHD and various comorbid conditions are still being studied, early treatment of ADHD seems to reduce the risk of developing mood symptoms and decrease in self-esteem. Moreover, untreated conditions will undoubtedly affect the professional lives of these future doctors. Therefore, it is important to assess young individuals with ADHD symptoms for internalizing symptoms, particularly anxiety and depression. Future research should incorporate longitudinal designs and consider a wider range of confounding factors to better understand the complex interplay between ADHD and mental health outcomes.

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Ethics

Ethics Committee Approval: The study was approved by Eskişehir Osmangazi University Noninterventional Clinical Research Ethical Committee (Decision no: 21 Date: 21.03.2023).
Informed Consent: Informed consent was obtained from all individual participants included in the study.
Authorship Contributions: Conceptualization, methodology, and writing – original draft, ME, BD and DE, formal analysis, investigation, supervision, DA, and AEA, data curation, methodology, ME, BD,DE, and AEA. All authors contributed to the interpretation of data and approved the final version.
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