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# Attention-deficit hyperactivity disorder in Egyptian medical students and how it relates to their academic performance

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## Abstract:

**BACKGROUND:** The neurobehavioral disorder, known as attention-deficit hyperactivity disorder (ADHD), is characterized by impulsivity, hyperactivity, and a lack of focus. In addition, it is connected to poor academic performance. The purpose of this study was to determine the prevalence of ADHD and its effect on their academic performance among medical students.

**MATERIALS AND METHODS:** This web-based cross-sectional study was conducted among medical students of four medical colleges during December 2021 and April 2022. Data was collected using a self-administered questionnaire comprising Wender Utah Rating Scale and adult ADHD Self-Report Scale [ASRS]. The link to Google Form survey was distributed to students through academic emails and WhatsApp. Data analyzed using SPSS; Chisquare test or Fisher's exact test as appropriate, were used to determine statistical significance.

**RESULTS:** A total of 990 students filled online questionnaire; 54.7% were females. The estimated prevalence of ADHD in Egyptian medical students was 11%. Students who had childhood ADHD were significantly linked with the present ADHD ( $r = 0.54$ ,  $P < 0.001$ ). There was a negative correlation between the ASRS score for ADHD and students' GPA ( $r = 0.2$ ,  $P < 0.001$ ). No statistically significant association was observed between ADHD and sex, type of university, and academic level. of the students.

**CONCLUSION:** ADHD is prevalent among medical students. Since most of our students with adult ADHD also had preexisting childhood ADHD, it is crucial that the primary care services, especially school health services, have appropriate standards for the early identification and management of ADHD. Health authorities should conduct a comprehensive health education campaign to raise public awareness of ADHD and its risk factors, the clinical picture, and the burden.

## Keywords:

Academic performance, adult attention-deficit hyperactivity disorder, medical students, prevalence, self-report scale

## Introduction

The lack of focus, hyperactivity, and impulsivity are hallmarks of attention-deficit hyperactivity disorder (ADHD), a neurobehavioral disorder more prevalent in males.<sup>[1,2]</sup> Although

historically believed to be an illness that mainly affects children, the signs of ADHD can persist into adulthood.<sup>[3,4]</sup> ADHD patients commonly exhibit the following types of symptoms: inattention (difficulty paying attention), hyperactivity (extreme vigor or moving about and talking), and impulsivity (acting without thinking or difficulty with self-control). Some ADHD

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patients show signs of inattention; others mostly show characteristics of hyperactivity and impulsivity. Only a few people have both types of symptoms.<sup>[5]</sup>

According to the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), ADHD is characterized as a persistent pattern of inattention and/or hyperactivity-impulsivity that clearly impedes social, academic, or occupational functioning in two or more settings, such as at home or school. Inattention (such as having trouble focusing on the task at hand) and hyperactivity-impulsivity (such as restlessness and an inability to wait) are the two core symptoms that define ADHD.<sup>[6]</sup>

Epidemiological studies show that 6.7%–7.8% of children worldwide have ADHD, making it a common disorder.<sup>[7]</sup> This incidence is higher in the Arab world, reaching 9.4%–21.8% in Egypt<sup>[8,9]</sup> and 11.6% in Saudi Arabia.<sup>[10]</sup> Meanwhile, it is estimated that 16% of university students worldwide suffer from ADHD.<sup>[11]</sup> About 60%–70% of children with ADHD will still have symptoms as adults.<sup>[12,13]</sup>

Curatolo *et al.*, cited some environmental factors such as prenatal exposure to alcohol and tobacco smoke, exposure to high levels of lead throughout infancy, and malnutrition as contributors to the etiology of ADHD. Modest levels of dopamine, a neurotransmitter that is essential for the control of mood, movement, and attention, were also detected. These elements combined to create various neurological loads.<sup>[14]</sup>

Interpersonal conflict and job instability were shown to be prevalent among persons with ADHD.<sup>[15]</sup> Low academic performance of students with ADHD was linked to a number who were unable to enroll in college. Those who were accepted into colleges typically had improved cognitive abilities and coping skills for their underlying disease.<sup>[16]</sup> Some researchers reported that college students with ADHD and controls had similar levels of psychological and social well-being; however, other researchers discovered that these students had a poor quality of life, adjustment issues, lower para-academic performance, substance abuse, and depression.<sup>[17]</sup> They struggled to plan, complete tasks on time, and make decisions. They also had issues with self-awareness and self-understanding.<sup>[18]</sup> Previous studies have consistently found that students with ADHD experienced difficulties with inattention-related academic issues, such as procrastination, unfocused attention, and distraction. These issues include organization, planning, as well as time management abilities. Each of these issues with academic performance made it harder for students with ADHD to complete their coursework and acquire their college degrees.<sup>[19,20]</sup>

The medical field has the most difficult courses, and students need to retain a lot of information at the theoretical stage of their studies, despite the fast developments in medical education.<sup>[21]</sup> Recalling information takes a high degree of mental ability.<sup>[22]</sup> Given the intense curriculum, peer pressure, and social pressure that amplify the learning process, even minor distractions can have a negative impact on medical students' educational development, which eventually manifests in their activities both inside and outside of the classroom in such issues as relational functioning.<sup>[23]</sup> Understanding the behavioral trends of medical students engaged in a demanding and busy curriculum is essential for a solution to this issue. The goal of the current study was to address this knowledge gap by determining how prevalent ADHD is in medical students and how it impacts their academic performance.

## Materials and Methods

This cross-sectional web-based study was carried out between December 2021 and April 2022 at four medical schools affiliated with four universities in Egypt (Benha, Suez, Suez Canal, and King Salman). Ethical approval was obtained from the Research Ethics Committee at the Faculty of Medicine, Benha University, vide Letter No. 544 dated 19/12/2021 and informed written consent was taken from all the participants in the study.

Based on a previously reported prevalence of ADHD of 22% in medical students in Egypt,<sup>[24]</sup> we estimated the calculated sample size as 264 students. After adding a nonresponse rate of 10%, the calculated sample size rose to 291; however, we received 990 responses. A convenient sample was used to achieve the sample size with a confidence level of 95% and a 5% margin of error. The link to the Google Form survey was distributed to students belonging to different academic levels through academic emails and WhatsApp until the required sample size was attained. The study included all adult male and female medical students, regardless of academic level, who agreed to participate in the research. Non-Egyptian students, those younger than 18 years old, and those who declined the invitation to participate were excluded from the study.

Data were collected using a designed Google Form questionnaire with sociodemographic data such as age in years, gender, medical school, academic level, academic performance depending on grade point average (GPA), current ADHD symptoms, and a part that measured childhood ADHD symptoms.

A pilot study was performed on 10% of the samples. Since all questions were clear, there was no need

for any modification. The results of the pilot were excluded from the analysis. Informed consent was given in the first part of the online questionnaire; hence, all participants who completed the form agreed to participate in the study.

The students were evaluated for their current ADHD symptoms using the adult ADHD Self-Report Scale (ASRS).<sup>[25]</sup> The ASRS contains 18 questions on the frequency of recent adult ADHD symptoms that meet the DSM-IV criterion A. Six of these 18 questions, chosen using step-wise logistic regression to maximize concordance with the clinical classification, made up the ASRS screener.<sup>[26]</sup> "Part A" of the Symptom Checklist's consisted of six inquiries and the final 12 questions make up Part B of the Symptom Checklist. Based on their experiences over the previous 6 months, the participants were asked to rate each item on a 5-point Likert scale from 0 (never) to 4 (very often).

Four or more marks must appear in the dark-shaded boxes in Part A to indicate that the patient had symptoms that were highly suggestive of adult ADHD and that further investigation was necessary. The Part B frequency scores offered additional hints that could be used to delve deeper into the patient's symptoms. With some questions, the frequency-based response was more accurate. The 12 questions did not use diagnostic likelihood or a total score. The six questions in Part A have been found to be the most accurate at predicting the disorder and the most useful as a screening tool. The Part A score ranged from 0 to 24, while the score for Part B score ranged from 0 to 36.<sup>[23]</sup>

To evaluate the subjects' symptoms of childhood ADHD, the Wender Utah Rating Scale (WURS) was used.<sup>[27]</sup> This is a self-report instrument completed by adults assessing a range of childhood symptoms and behaviors consistent with ADHD persisting into adulthood. The 25-item WURS was created to retrospectively describe ADHD symptoms in children. Each item was scored on a Likert scale of 0 (not at all or very slightly) to 4 (very much) (very much). Both significant current ADHD symptoms and childhood ADHD symptoms must be present for an adult to be diagnosed with ADHD. The subjects who had a WURS score of 46 or higher and at least one ASRS dimension score of 17 or higher were categorized as belonging to the symptomatic group, while the remaining participants belonged to the nonsymptomatic group.<sup>[28]</sup>

Statistical analysis of data was done using IBM SPSS Statistics for Windows, Version 22.0 (IBM Corp., Armonk, NY, USA). Categorical data were summarized in terms of mean  $\pm$  SD, while qualitative data were presented

in frequency and proportion. Statistical comparisons between positive and negative ADHD study groups were carried out using univariate tests, including the Chi-square test and Fisher's exact test as appropriate. Statistical significance was defined as  $P < 0.05$ . Students' GPA and the adult ADHD Self-Report Scale (ASRS) were correlated to estimate their relationship.

## Results

The total number of the study participants was 990 students (45.3% of males and 54.7% of females) who belonged to the governmental universities, Benha, Suez, Suez Canal, and the National University, King Salman. Students from Suez University represented 45.4% of the study participants, and 52.6% of the students were freshmen [Table 1].

The prevalence of ADHD according to the WURS was 25.8%, while the prevalence of ADHD according to the Self-Report Scale was 11% as shown in Figure 1. According to the WURS for the estimation of childhood ADHD, 255 students (25.8% of the total study participants) were classified as ADHD-positive cases (43.1% of males and 56.9% of females), with students in grade one significantly higher than other grades. The mean score of the WURS and adult scale was significantly high among the positive cases [Table 2].

According to the calculated score for part (A), the adult ADHD Self-Report Scale (ASRS), which is the most diagnostic part of the scale, 109 students (11% of total study participants) were classified as ADHD positive (44% of males and 56% of females). About 72.5% of students with adult ADHD had preexisting childhood ADHD. There was a positive significant correlation between the childhood score and adulthood score and a negative significant correlation between students' GPA and their ASRS [Table 3]. There was a positive significant correlation between the childhood score and adulthood

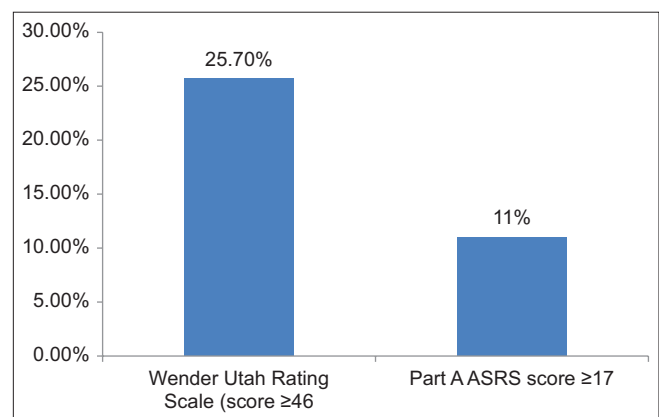


Figure 1: Prevalence of attention-deficit hyperactivity disorder according to different scales (childhood and adulthood)

**Table 1: Demographic characteristics of medical students in Egypt 2021-2022 (n=990)**

Demographic data	N (%)
Gender	
Male	448 (45.3)
Female	542 (54.7)
University	
Benha	344 (34.7)
King Salman	159 (16.1)
Suez Canal	38 (3.8)
Suez	449 (45.4)
Grade	
First	520 (52.6)
Second	343 (34.7)
Third	50 (5.0)
Fourth	23 (2.3)
Fifth	49 (5.0)
Sixth	5 (0.5)
GPA	
A+ (90%–100%)	349 (35.3)
A (85%–89.9%)	188 (19.0)
B+ (80%–84.9%)	142 (14.3)
B (75%–79.9%)	123 (12.4)
C+ (70%–74.9%)	81 (8.2)
C– (65%–69.9%)	54 (5.5)
D (60%–64.9%)	17 (1.7)
F (<60%)	36 (3.6)

GPA=Grade point average

score and a negative significant correlation between students' GPA and their ASRS [Table 4]. Furthermore, we found that students who took sedatives had significantly higher childhood and adult ADHD scores [Table 5].

## Discussion

ADHD is being increasingly identified in adults rather than just in childhood when most cases were either undiscovered, erroneously diagnosed, or treated with other prevalent comorbid illnesses.<sup>[29]</sup> The time spent in college is crucial for social interactions and development and for future careers. However, it can be unnerving due to the adjustment university students must make to their lives in the new unstructured environment. Consequently, academic, psychological, social, and mental issues are common in university students with ADHD.<sup>[30]</sup>

The current study found that one-tenth and a quarter of participants had ADHD according to the ASRS and the WURS, respectively. In addition, nearly three-quarters of students with adult ADHD had preexisting childhood ADHD.

Numerous studies have examined the prevalence of ADHD in children and teenagers under the age of 18, and the estimates of prevalence range from 1%–10% of

school-aged people<sup>[31]</sup> to 5.3% globally.<sup>[31]</sup> There is not much research measuring the prevalence of ADHD in adults, and even fewer studies that estimate the prevalence of ADHD in medical college students. According to Mak *et al.*, (2022), ADHD affects 16% of college students worldwide.<sup>[11]</sup> The frequency of ADHD in kids and teenagers under the age of 18 varies depending on the diagnostic techniques and statistical standards used to evaluate clinical significance.<sup>[32]</sup>

Our results found that the prevalence of ADHD in college students was consistent with those of a prior investigation in Riyadh, which pegged the prevalence at 10%,<sup>[29]</sup> but less than the estimated prevalence of 16% in college students worldwide. In addition, they are in contrast to a prior study in Egypt using the ASRS that claimed that over 20% (21.8%) of medical students displayed symptoms of ADHD.<sup>[9]</sup> Because our online data excluded offline students, the current prevalence of ADHD may be underestimated. In addition, social, cultural, and stigmatization fears may have played a role in this difference.

By using the ASRS screener, females represented a higher percentage of diagnosed cases, a finding which is at variance with Kessler *et al.*,<sup>[33]</sup> who found male predominance in ADHD affection.<sup>[32]</sup> Males may have more, equal, or occasionally less ADHD symptomatology than females, according to various studies, the results of which are inconsistent regarding gender differences in ADHD symptomatology.<sup>[34-36]</sup>

The ASRS score of medical students was not significantly correlated with their academic year ( $P = 0.055$ ), gender ( $P = 0.78$ ), or type of university ( $P = 0.21$ ) in this study; however, students with a history of childhood ADHD were significantly correlated with the current adult ADHD ( $P = 0.001$ ), which was consistent with other studies.<sup>[29]</sup>

Regarding GPA, the current study was unable to identify any differences between participants with high ASRS scores and those without ( $P = 0.069$ ). This is in line with the findings of Sparks *et al.*, who discovered that students with ADHD had GPAs that were comparable to those of students without ADHD ( $M = 2.9$ ).<sup>[37]</sup> Similar to this, Gray *et al.*, in 2016, found no evidence of impairment of academic performance on standardized tests of executive functioning and in the GPAs of adults diagnosed with ADHD.<sup>[38]</sup> In contrast, DuPaul *et al.*, in 2021, discovered that college students with ADHD had lower GPAs, used fewer study skills techniques, and advanced more slowly through their academic programs.<sup>[39]</sup>

However, on examining the correlation between the ASRS score in positive cases and their GPA, we found a



**Table 2: Association between various variables and attention-deficit hyperactivity disorder among medical students in Egypt according to Wender Utah Rating Scale 2021-2022**

Variables	Attention-deficit hyperactivity disorder (ADHD)		P-value
	Positive (score $\geq 46$ ) (n=255) N (%)	Negative (score $\leq 46$ ) (n=735) N (%)	
Gender			
Male	110 (43.1)	338 (46.0)	0.43
Female	145 (56.9)	397 (54.0)	
University			
Benha	75 (29.4)	269 (36.6)	0.058
King Salman	52 (20.4)	107 (14.6)	
Suez	120 (47.1)	329 (44.8)	
Suez Canal	8 (3.1)	30 (4.1)	
Grade			
First	125 (49.0)	395 (53.7)	0.02*
Second	97 (38.0)	246 (33.5)	
Third	6 (2.4)	44 (6.0)	
Fourth	6 (2.4)	17 (2.3)	
Fifth	19 (7.5)	30 (4.1)	
Sixth	2 (0.8)	3 (4.0)	
GPA			
A+	90 (35.3)	259 (35.2)	0.088
A	43 (16.9)	145 (19.7)	
B+	31 (12.2)	111 (15.1)	
B	40 (15.7)	83 (11.3)	
C+	29 (11.4)	52 (7.1)	
C-	14 (5.5)	40 (5.4)	
D	3 (1.2)	14 (1.9)	
F	5 (2.0)	31 (4.2)	
Usage of sedatives			
No	212 (24)	670 (76.0)	<0.01*
Days	25 (29.4)	60 (70.6)	
Weeks	10 (71.4)	4 (28.6)	
Months	6 (100)	0.0	
Years	2 (100)	0.0	
WURS, mean $\pm$ SD	51.8 $\pm$ 5.5	35.6 $\pm$ 6.4	<0.01*
Adult scale, mean $\pm$ SD	7.9 $\pm$ 8.7	28.1 $\pm$ 8.9	<0.01*

\*Significant. SD=Standard deviation, GPA=Grade point average, WURS=Wender Utah Rating Scale, FET=Fisher's exact test

significant negative correlational relationship ( $P = 0.001$ ), which is similar to several previous studies.<sup>[16,40,41]</sup> This could be due to their inability to communicate and learn, which can hinder their academic performance and prolong their study. Students who used sedatives had significantly higher childhood and adult ADHD scores, in line with a previous study that reported that ADHD-positive cases were more prone to addiction and drug abuse.<sup>[42]</sup>

Owing to the lack of studies on the prevalence of ADHD in adults, the current study provides baseline data on the prevalence of ADHD in medical students in Egypt. We used two reliable, valid, and objective diagnostic tools to assess and diagnose ADHD. There are several limitations in this study. First, data were collected online; hence, all offline students were excluded,

which may have resulted in an underestimation of the true prevalence of ADHD. The sample was collected nonrandomly, which also limits the generalization of results. Our study relies on self-reported GPAs, which are prone to response biases, as well as cross-sectional designs, which cannot identify causal relationships. We used the GPA as the only measure of academic success without taking into account other factors (such as graduation rates, length of time to graduation, and course withdrawals). The present study did not investigate on a wide scale the sociodemographic and environmental risk factors associated with ADHD. In addition, the analyses in the current study did not account for several other factors that are known to affect university students' academic success, such as mental health disorders, comorbidities, learning disorders, substance, and IQ.

**Table 3: Association between various variables and attention-deficit hyperactivity disorder among medical students in Egypt according to Self-Report Scale 2021-2022**

Variables	Attention-deficit hyperactivity disorder (ADHD)		P-value
	ASRS score $\geq 17$ (n=109) N (%)	ASRS score $< 17$ (n=881) N (%)	
Gender			
Male	48 (44.0)	400 (45.4)	0.78
Female	61 (56.0)	481 (54.6)	
University			
Benha	48 (44.0)	296 (33.6)	0.21
King Salman	16 (14.7)	143 (16.2)	
Suez	42 (38.5)	407 (46.2)	
Suez Canal	3 (2.8)	35 (4.0)	
Grade			
First	47 (43.1)	473 (53.7)	0.055
Second	47 (43.1)	296 (33.6)	
Third	7 (6.4)	43 (4.9)	
Fourth	3 (2.8)	20 (2.3)	
Fifth	3 (2.8)	46 (5.2)	
Sixth	2 (1.8)	3 (0.3)	
GPA			
A+	28 (25.7)	321 (36.4)	0.069
A	31 (28.4)	157 (17.9)	
B+	19 (14.7)	123 (14.0)	
B	11 (10.1)	112 (12.7)	
C+	9 (8.3)	72 (8.2)	
C	3 (2.8)	51 (5.8)	
D	2 (1.8)	15 (1.7)	
F	6 (5.5)	30 (3.4)	
Childhood ADHD			
Yes (255)	79 (72.5)	176 (20.0)	0.001*
No (735)	30 (27.5)	705 (80.0)	
Usage of sedatives			
No	103 (94.5)	780 (88.5)	0.06
Yes	2 (1.8)	65 (7.4)	
Sometimes	4 (3.7)	36 (4.1)	
WURS, mean $\pm$ SD	42.7 $\pm$ 7.4	39.7 $\pm$ 9.4	0.002*

\*Significant. SD=Standard deviation, ADHD=Attention-deficit hyperactivity disorder, ASRS=ADHD Self-Report Scale, GPA=Grade point average, WURS=Wender Utah Rating Scale, FET=Fisher's exact test

**Table 4: Comparison of evaluation of attention-deficit hyperactivity disorder among medical students in Egypt by Self-Report Scale and by Wender Utah Rating Scale**

Variable	Wender Utah Rating Scale Score		Self-Report Scale Score	
	Mean $\pm$ SD	P-value	Mean $\pm$ SD	P-value
Gender				
Male (48)	42.3 $\pm$ 6.8	0.5	33.6 $\pm$ 10.0	0.7
Female (61)	43.0 $\pm$ 7.9		32.8 $\pm$ 11.2	
University				
Benha (48)	42.6 $\pm$ 7.8	0.9	33.6 $\pm$ 11.6	0.9
King Salman (16)	43.5 $\pm$ 6.1		32.7 $\pm$ 11.9	
Suez (42)	42.3 $\pm$ 8.2		33.0 $\pm$ 9.6	
Suez Canal (3)	43.7 $\pm$ 1.2		32.0 $\pm$ 2.6	
Grade				
1 <sup>st</sup> grade (47)	40.5.0 $\pm$ 7.8	0.1	30.0 $\pm$ 7.8	0.15
2 <sup>nd</sup> grade (47)	43.8 $\pm$ 6.9		35.1 $\pm$ 6.9	
3 <sup>rd</sup> grade (7)	46.0 $\pm$ 6.2		38.7 $\pm$ 6.2	
4 <sup>th</sup> grade (3)	43.0 $\pm$ 6.1		37.0 $\pm$ 6.1	
5 <sup>th</sup> grade (3)	49.3 $\pm$ 10.2		35.0 $\pm$ 9.0	
6 <sup>th</sup> grade (2)	45.5 $\pm$ 0.7		34.5 $\pm$ 7.7	
Correlation between adult ASRS and students' GPA		$r=-0.2, P<0.001^*$		
Correlation between adult ASRS and WURS		$r=0.54, P<0.001^*$		

\*Significant. ADHD=Attention-deficit hyperactivity disorder, ASRS=ADHD Self-Report Scale, SD=Standard deviation, GPA=Grade point average, WURS=Wender Utah Rating Scale

**Table 5: Comparison between the study levels and their use of sedatives among medical students in Egypt 2021-2022**

Variables	No sedatives used N (%)	Sedatives used N (%)	P-value
Gender			
Male	397 (88.6)	51 (11.4)	0.61
Female	486 (89.7)	56 (10.3)	
Grades			
1 <sup>st</sup> grade	464 (89.2)	56 (10.8)	0.076
2 <sup>nd</sup> grade	308 (89.8)	35 (10.2)	
3 <sup>rd</sup> grade	48 (96.0)	2 (4.0)	
4 <sup>th</sup> grade	21 (91.3)	2 (8.7)	
5 <sup>th</sup> grade	38 (77.6)	11 (22.4)	
6 <sup>th</sup> grade	4 (80.0)	1 (20.0)	
GPA			
A+	318 (91.1)	31 (8.9)	0.001*
A	170 (90.4)	18 (9.6)	
B+	133 (93.7)	9 (6.3)	
B	109 (88.6)	14 (11.4)	
C+	70 (86.4)	11 (13.6)	
C	43 (79.6)	11 (20.4)	
D	11 (64.7)	6 (35.3)	
F	29 (80.6)	7 (19.4)	
WURS, mean±SD	38.9±8.9	46.5±10.5	<0.01*
Adult scale, mean±SD	29.8±9.6	37.5±9.3	<0.01*

\*Significant. SD=Standard deviation, GPA=Grade point average, WURS=Wender Utah Rating Scale

## Conclusion

According to our findings, one-tenth and a quarter of college students – which is regarded as high – had adult ADHD and preexisting childhood ADHD, respectively. There is an association between ADHA and lower GPA. Additional large-scale follow-up studies using objective ADHD diagnostic instruments are advised to better understand the behavior of this condition and the risk variables that demonstrate how symptoms affect academic progress. ADHD is a mental health condition that has the potential to be misdiagnosed and has a negative impact on a student's academic performance. To assess the academic success of college students with ADHD, more longitudinal studies should be carried out using a variety of objective academic success indicators as well as more representative samples. Students with ADHD should be taught to manage their time effectively, be encouraged to stop worrying, and express their emotions in a healthy way to improve their academic performance in college. Since most of our students with adult ADHD also had preexisting childhood ADHD, it is crucial that primary care services, especially in school health services, have appropriate standards for the early detection and management of ADHD, and integrate mental health services, including the prevention and management of ADHD. The health authorities should launch a thorough health education campaign to increase public awareness of ADHD, its risk factors, clinical profile, and burden.

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## Conflicts of interest

There are no conflicts of interest.

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