ORIGINAL ARTICLE

Prevalence of attention deficit/hyperactivity disorder in Mexican university students

Prevalencia de trastorno por déficit de atención/hiperactividad en universitarios mexicanos

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Abstract

Introduction: Attention-Deficit/Hyperactivity Disorder (ADHD) in adulthood causes relevant deterioration in daily functioning. Specifically, in educational scenarios, complications including an elevated rate of failed courses and desertion have been found. The reported prevalence of ADHD in adults varies widely, therefore studying specific populations becomes important. Objective: To determine the prevalence of ADHD in students at a public university using screening tools to determine the presence of current and retrospective symptomatology during childhood and to describe their sociodemographic characteristics. Method: The study was conducted with a probabilistic sample of undergraduate students (N = 1837), to whom the Adult Self Report Scale for ADHD (ASRS-6) and the Wender Utha Rating Scale (WURS) were administered to determine current and childhood ADHD symptoms. Results: The prevalence of ADHD in the studied population was 16.2%, with a significantly higher frequency in males (22.14%) than in females (13%). ADHD was most prevalent in Biology students (23.7%) and least in Nursery students (9.9%). Discussion and conclusion: Results indicate a higher frequency of ADHD in Mexican undergraduate students than that reported in adult populations of other countries, but consistent with previous reports of Mexican undergraduate students and children. The association of ADHD and difficulties in academic, work, and social achievement in the studied population should be further investigated.

Key words: ADHD, adults, prevalence, undergraduate students.

Resumen

Introducción: El Trastorno por Déficit de Atención/Hiperactividad (TDAH) en la edad adulta causa un deterioro importante en las actividades de la vida diaria, en ambientes educativos en específico se han encontrado complicaciones como mayor índice de reprobación y deserción escolar, entre otras. La prevalencia reportada para TDAH en adultos es muy variable entre diversas poblaciones por lo que es importante el estudio de poblaciones específicas. Objetivo: Determinar la prevalencia de TDAH en estudiantes de una universidad pública a través de escalas de cribado que permitan determinar la presencia actual y durante la infancia de los síntomas y describir sus características sociodemográficas. Material y método: El estudio se llevó a cabo con una muestra probabilística de estudiantes universitarios (N = 1837), a quienes se les aplicó la Escala de Autorreporte para TDAH en Adultos-6 (ASRS-6) y la Escala Wender Utah (WURS) para determinar la presencia actual y en la infancia de síntomas de TDAH. Resultados: Se encontró una prevalencia de TDAH de 16.2% en la población estudiada, con mayor frecuencia en hombres (22.14%) que en mujeres (13%). La carrera con mayor prevalencia fue Biología (23.7%), mientras que la de menor prevalencia fue Enfermería (9.9%). Discusión y conclusión: La prevalencia del TDAH detectada a través de las escalas de autorreporte fue muy superior a la reportada en estudios de otros países, pero es consistente con estudios previos de estudiantes universitarios y niños mexicanos. Es necesario investigar la asociación del TDAH en esta población con la presencia de dificultades en el rendimiento académico, laboral y social.

Palabras clave: TDAH, adultos, prevalencia, universitarios.

Introduction

According to the DSM-5, attention-deficit/hyperactivity disorder (ADHD) is a neurodevelopmental disorder characterized by a persistent pattern of inattention and hyperactivity/impulsivity, which affects the functionality of individuals that present it [1]. ADHD is usually diagnosed in childhood, but up to 65% of cases have been reported to persist, with clinically significant symptoms, into adulthood [2].

Adults with ADHD show deficiencies in cognitive abilities, particularly in executive functions, the most recurrent being inhibition [3,4] and working memory [5,6]. The disorder has been negatively associated with performance in activities of daily living [7] taking a toll on quality of life [8,9].

Regarding work-related activities, the source of income of adults with ADHD is less frequently an ordinary job, than it is for the general population; they are generally self-employed [9]. In addition, adults with ADHD tend to have a lower occupational status, have significantly worse job performance ratings from employers and are more likely to be fired [8]. In the academic context, it is difficult for adults with ADHD to meet goals [10], they have lower grade averages and greater difficulties in graduating from high school and college [11–13], as well as higher dropout and failure rates [14]. In the undergraduate college population with ADHD, it is also common to find different mental health comorbidities, such as depression and anxiety [15,16], emotional instability [12], increased suicidal ideation and attempts [17,18], and increased consumption of alcohol, tobacco, and other addictive substances [12,19,20].

To date, the prevalence of ADHD in either the child or adult population is not precisely known. Regarding children, the American Psychiatric Association [1] estimates that it is around 5%, while in studies worldwide it has been reported to be between 3 and 7% [21]. In contrast, in Mexico, a higher prevalence, ranging from 9.1 to 16% has been found in primary school children [22,23].

In adults, the APA [1] reports the prevalence of ADHD to be around 2.5%, while in cross-national studies using the World Health Organization interview, a prevalence between 3.4 and 4.2% is reported [24]. In the United States of America, a study using the National Comorbidity Survey (NCS-R) estimated the prevalence to be about 4.4% [25], while in South Korea a study using the Adult ADHD Self-Report Scale (ASRS)[26] reported a prevalence of 1.1%, the latter being well below that reported for other populations [27].

A German study using the Wender Utah Rating Scale (WURS)[28] and the ADHD Self-Report Scale[29], suggests that the prevalence can also vary depending on whether rural or urban population is analyzed, reporting a prevalence of 12.1% and 3.8%, respectively, with the overall prevalence being 4.7% [30].

Regarding the distribution between males and females, the DSM-5 refers a greater predisposition for ADHD in males, with a ratio of 2:1 in children and 1.6:1 in adults [1]. Despite describing a higher prevalence of the disorder in adult males, most studies find no significant differences in comparison to adult females [30–32]. One exception is a study conducted with a Hispanic adult population, which does report statistically significant differences in ADHD prevalence between genders (2.6% in females *vs.* 10.52% in males) [33].

Regarding the prevalence of ADHD in undergraduate university students, a cross-national study conducted in the United States of America, New Zealand, and Italy using the Young Adult Rating Scale (YARS), reported a prevalence of 2.9 to 8.1% in males and 0 to 3.9% in females, with statistically significant differences between countries but not gender [34]. In another study conducted in Venezuela [33] that assessed 411 undergraduate students (73% female and 27% male) using the ASRS v1.1 and the ADHD Screening -Self-ReportingVersion-(FASCT)[35], results indicated that 4.8% of the sample had a positive screening on both scales. A study evaluating the presence of ADHD symptoms in a sample of 1096 college students in the United States of America compared two diagnostic approaches, one based on the clinical criteria of the DSM-IV and the other based on the College ADHD Response Evaluation–Student Response Inventory (CARE) questionnaire. It was found that using the CARE with a cut-off point at the 97th percentile (2nd SD), 20% of the sample could be diagnosed with ADHD, while only 7.48% met the DSM-IV criteria [36]. The same study also found that the prevalence of the disorder increased by two to four times when the cut-off point was changed from 2 SD to 1.5 SD, emphasizing the importance of defining the optimal criteria and cut-off points to differentiate individuals with and without clinical impairment. Another study conducted in the United States using the ASRS in a sample of 1080 students, found that 10.3% had a positive screening for ADHD [37].

To our knowledge, only one study has reported the prevalence of ADHD in Mexican university undergraduate students, finding similar results using two different screening instruments in a sample of 447 participants: 24.61% had a positive screening using the ASRS and 27.75% using the FASC [38].

As evidenced by the aforementioned studies, the prevalence of ADHD can widely vary depending on the studied country and type of population (urban vs rural populations, for example), as well as on the type of instruments used. While there may be environmental and genetic factors that explain some of this variability, methodological factors such as the type and size of the sample, type of population, the age range studied, the instruments used, and the defined cut-off points should also be considered.

Given that many adults with ADHD do not continue on to higher education, those who do are considered to belong to a "high-functioning" group from an academic standpoint [4]. Given this characteristic, it would be expected for the prevalence of the disorder to be lower in the college/university population, however, the previously mentioned studies do not seem to indicate lower prevalences than those of the general population. In addition, most studies on this topic do not clarify the sampling methodology, and, generally, only use screening scales for current symptomatology during adulthood, but do not investigate whether the symptoms were present during childhood, as required by DSM 5 diagnostic criteria [1]. Given the potential negative impact of ADHD on academic and daily life performance of college undergraduate students, epidemiological studies are needed to accurately assess the problem in this population. Therefore, the objective of this study was to describe the prevalence of ADHD (positive screening for ADHD) and the socio-demographic characteristics of undergraduate students at a public university in Mexico, using a probabilistic sampling method and the combination of two scales to assess current (six-item ASRS; ASRS-6) and retrospective ADHD symptomatology during childhood (WURS). The use of both scales allowed us to assess childhood onset, an important DSM 5 diagnostic criteria [1].

Material and method

Study participants consisted of a stratified probabilistic sample of 1837 undergraduate students from a public university in the State of Mexico, whose degree programs are related to the areas of biological sciences, chemistry, and health. Data was collected from all degree programs, semesters, and shifts (morning and afternoon) on the university campus. The statistical program STATS was used to obtain the sample size [39] and the following input was included: **a**) size of the population (total students enrolled per degree program, see Table 1), **b**) margin of error (5% was proposed), **c**) estimated percentage of the sample (expected response rate of 50%), and **d**) desired confidence level (a 95% confidence level was used).

Once the size of the total sample was determined, the number of students to be assessed in each semester of each degree program (strata) was determined. The formula Ksh = n/N 40 was used for this purpose, in which the sample obtained through the STATS program is divided by the population size (total students enrolled per degree program), resulting in a constant. Finally, the constant was multiplied by the number of students enrolled in each semester of each degree program to determine the number of participants in each stratum. This process was carried out with each of the degree programs (Table 1).

Table 1. Population and sample of the study

Program	Total Students	Required sample (Stratum)	Studied sample
Biology	1858	305	325
Nursing	1169	289	352
Psychology	2830	338	323
Optometry	547	226	259
Medicine	3769	349	208
Dental Surgeon	2337	330	370

Assessment instruments

Adult Self-Report Scale for ADHD Short Version (ASRS-6)[26]. This scale was created by the authors along with the WHO to identify ADHD in adults. Based on their original 18-item scale, they created a six-item screening version (ASRS-6), which demonstrated a better sensitivity (68.7%) and specificity (99.5%) than the longer version, in relation to clinical criteria. The scale requires participants to judge how often particular symptoms of ADHD have occurred in the past six months. As proposed by the authors, a dichotomous rating for each item was used, in which the polytomous scale is divided into a positive (frequently and very frequently) or negative (never, rarely, and sometimes) ADHD score; four or more points are considered consistent with ADHD.

Wender Utah Rating Scale (WURS)[28].
The scale retrospectively assesses the presence of ADHD symptoms during childhood. The WURS has 61 items that evaluate symptoms of inattention, impulsivity, and emotional and behavioral problems. For the present work, a cut-off point of 36 was used [41]. A study in Mexican population found an internal consistency greater than 0.80 and a test-retest reliability of 0.80 for the scale [42].

Procedure
Once the sample and the strata were calculated according to the procedure described above, the classrooms were visited to apply the ADHD scales and collect socio-demographic data. Filling out the scales and collecting the data took the participants approximately 30 minutes.

Statistical analysis
Data analysis was performed using *SPSS Statistics 23*. Descriptive statistics including central tendency measures were used to analyze the prevalence of ADHD, as well as sociodemographic aspects such as age, sex, and shift of participants. In addition, a chi-square (χ^2) test was applied to analyze the existence of significant differences between degree programs, sex, and shifts.

Ethical considerations
The study was approved by the institution's Ethics Committee (CE/FESI/112017/1186). All participants consented to completing the scales, however, the objectives of the study were not explicitly expressed, to avoid biasing the results.

Results

The sample consisted of 1837 students between the ages of 17 and 35. Table 2 shows the socio-demographic characteristics of the sample.

In the WURS, 28.7% of participants (527 cases) exceeded the cut-off point, indicating symptoms consistent with ADHD during childhood. Meanwhile, 35.5% of students (654 cases) exceeded the cut-off point for the ASRS-6, indicative of current ADHD symptomatology.

Table 2. Sociodemographic characteristics of the sample

		N	Percentage	Mean (SD)
Undergraduate students		1837	100	
Age				20.54 (2.26)
Sex				
	Male	637	34.67	
	Female	1200	65.32	
Shift				
	Morning	1206	65	
	Afternoon	631	35	
Scales				
	WURS			29.14 (13.84)
	ASRS-6			2.76 (1.65)
WURS, Wender Utha Rating Scale; ASRS-6, Adult Self-Reporting Scale for ADHD six item version				

For this work, only those cases that exceed the cut-off point in both scales were considered as having a positive ADHD screening. That is, they had symptoms since childhood (WURS) and reported persistent symptoms of ADHD in the last six months (ASRS-6). The criteria were met by 16.2% of the sample (297 cases).

Table 3 shows the number and percentage of students with and without a positive screening for ADHD in the different degree programs and shifts. There was a statistically significant difference in the proportion of students with ADHD among the different degree programs; we found that the program with the highest percentage of students with the disorder was Biology (23.7%), while the one with the lowest number of students with ADHD was Nursing (9.9%). Regarding sex, a statistically significantly higher proportion of males (22.14%) than females (13%) were found to have ADHD, representing a ratio of 2:1.2. Regarding the shift, the afternoon shift showed a higher percentage of students with ADHD (17.3%) than the morning shift (15.6%), although the difference was not statistically significant.

Table 3. ADHD prevalence in the undergraduate student sample.

	Without ADHD (N=1540)	With ADHD (N=297)	Total	Percentage ADHD	χ^2	p
Program						
Biology	248	77	325	23.7		
Psychology	256	67	323	20.7		
Optometry	212	47	259	18.1		
Medicine	180	28	208	13.5		
Dental Surgeon	327	43	370	11.6		
Nursing	317	35	352	9.9		
Total			1837	16.2	36.14	.001
Sex						
Females	1044	156	1200	13		
Males	496	141	637	22.14	25.77	.001
Shift						
Morning	1018	188	1206	15.6		
Afternoon	522	109	631	17.3	.868	.351

The age range studied was between 17 and 37 years old, the highest number of cases concentrated in the range of 18 to 22 years old. Table 4 shows the distribution of cases with ADHD according to the age ranges of the population studied.

Table 4. ADHD prevalence in the undergraduate student sample by age group

Age	Without ADHD	With ADHD	Total	Percentage ADHD
17	21	2	23	8.69
18	214	46	260	17.69
19	327	56	383	14.62
20	301	60	361	16.62
21	297	54	351	15.38
22	163	31	194	15.97
23	94	20	114	17.54
24	51	11	62	17.74
25	25	5	30	16.66
26-37	34	12	46	20.68
Total	1539	297	1836	16.2

Discussion

The objective of this study was to determine the prevalence of ADHD in undergraduate students at a public university in Mexico. The results indicate a positive screening for ADHD, requiring that symptoms were present starting in childhood and persisted into adulthood, in 16.2% of the total sample. This figure is higher and in contrast with most data from other countries, both for the general adult population [24,25] and for the undergraduate university/college population[34,36,37].The finding is even more contrasting if we consider that for the present study a person was considered to have a positive screening for ADHD only if the symptoms were present since childhood, while most other studies required only the presence of symptoms in adult life [34,36,37]. Nonetheless, our results are consistent with a previous study of Mexican undergraduate university students also showing a higher prevalence than that reported in other countries (24.61%)[38]. Therefore, the existence of a higher prevalence of ADHD in the Mexican undergraduate university population compared to other countries should be considered. Consistent with these results, studies on Mexican children also show a higher prevalence of ADHD than in other populations[22,23], which supports the above-mentioned hypothesis.

Another possibility is that the results could be attributed to methodological differences between studies, although this is not very feasible because, as mentioned above, the criteria used in this study were stricter than in others. Such methodological differences in ADHD assessment need to be considered when comparing studies, as they may be associated with reported variability.

As shown in the study conducted by McKee[36], which found that 20% of students met the diagnosis of ADHD when evaluated using a self-report inventory standardized in college population, and 7.48% when the evaluation was made based on DSM-IV diagnostic criteria; in addition, two to four times more cases are observed when the cut-off point is changed from 2 SD to 1.5 SD. These data lead us to reflect on the importance of establishing clear criteria for diagnosis and having adequately standardized instruments.

The high prevalence of the disorder found in this study could also be attributed to a problem with the validity of the scales used (ASRS-6 and WURS) for the population studied, and it will be necessary to consider the presence of possible false positives; Kessler et al. [26] report a sensitivity of 68% for ASRS-6, therefore it is possible that about 30% of the cases detected in this study are false positives. However, a study by Reyes-Zamorano et al.[38] assessing the concurrent validity of the ASRS with the FASC in the Mexican university undergraduate population found a high concordance rate. Moreover, the WURS has shown adequate psychometric properties in the Mexican population[42].

Some studies report that in adulthood, the difference between males and females decreases compared to childhood[30,32]. However, the differences found in this study coincide with the higher prevalence in males than in females reported by the APA[1] and various studies[31,33].

The degree program with the highest prevalence of ADHD in the studied sample was Biology, followed by Psychology and Optometry. A possible explanation for these results is that the acceptance requirements for these programs have a lower level of difficulty than those required for programs such as Dental Surgeon or Medicine, where ADHD was less frequent. However, this explanation would not apply to the case of Nursing, a program in which the entry criteria are lower and there is less prevalence.

Analyzing the shift (afternoon or morning), no statistically significant differences were found in the percentage of students with ADHD symptoms, which shows the need for mental health support programs in both shifts.

One limitation of the study was the difficulty in obtaining a completely randomized sample of the undergraduate students, since some groups were assigned based on their availability (in order not to affect their academic activities) by school authorities.

The second limitation is the lower number of Medicine students assessed, because after the fourth semester these students attend clinical practices and take classes in different hospitals in the metropolitan area, which did not allow the initially planned sample to be obtained. Despite this limitation it was possible to obtain enough data to indicate the presence of ADHD symptoms in students of this career program.

Conclusion

· The prevalence of ADHD found in this study is higher than that reported in several previous international studies, although it coincides with other studies conducted in Mexico, and is identified as an important academic and mental health problem in the university undergraduate population.
· Prevalence of ADHD was higher amongst male students in comparison to females.
· The degree program with the highest prevalence of students with ADHD was Biology.
· There were no statistically significant differences in prevalence between shifts.

Funding

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