

ORIGINAL ARTICLE

Prevalence of attention deficit hyperactivity disorder symptomatology in Ecuadorian schoolchildren (aged 6–11)

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Abstract

Although the estimated prevalence of ADHD in the school population is 5%, various studies carried out in Latin America have obtained higher figures. This descriptive-cross-sectional research analysed the prevalence of ADHD symptomatology in a random and probabilistic sample of 1535 schoolchildren from Cuenca-Ecuador (aged from 72 to 164 months, 51.3% were female and 50% attended public schools). IQ was evaluated using the Raven's Progressive Matrices Test. The ADHD symptomatology was evaluated using the short version of Conners-3. Descriptive statistics, chisquares and prevalence data were calculated. We found a total prevalence of ADHD symptomatology of 20.3%. A higher prevalence of ADHD symptomatology was reported among girls compared to boys; and in public schools (compared to private schools). These findings may reflect a higher occurrence of ADHD in vulnerable populations that tend to be less well cared for. Although the results do not come from complete individual clinical evaluations, the representativeness of the sample and the simultaneous presence of scores above the cut-off points in the home and school contexts show a worrying situation that should be taken into account by agents responsible for the design of public health and education policies.

KEYWORDS

ADHD, children, gender, Latin America, prevalence, school

Key points

- The prevalence of scores higher than the ADHD symptomatology cut-off points in a sample of Ecuadorian students is 20.3%, a figure higher than that usually found in international literature, although similar to other studies carried out in Latin America.
- Girls are 1.46 times as likely to score above the cut-off point for ADHD diagnosis than boys. This result is contrary to that usually found in the international literature, although, again, it is similar to that obtained in other studies from Latin America.
- The prevalence of ADHD symptomatology presentations in the sample is: 3.1% predominantly inattentive, 6.3% combined and 10.9% predominantly hyperactive-impulsive.

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INTRODUCTION

The prevalence of attention deficit hyperactivity disorder (ADHD) in children is estimated at 5% (APA, 2013). However, studies conducted in Latin America on specific populations report higher prevalence, ranging from 10% in Chile (de la Barra et al., 2015) to 20.4% in Colombia (Pineda et al., 2001). Other studies carried out in Latin America, have also found high prevalence within that range: 14.6% (Cruz et al., 2010) and 16% (Gallardo-Saavedra et al., 2019) in Mexico; 15% in Colombia (Llanos Lizcano et al., 2019), and 16.6% in Ecuador (Ramos et al., 2015). Given the notable variability of results between studies and the small number of studies conducted in Latin American countries, reviews on the subject suggest the need to develop more studies that contribute to more accurately quantify the prevalence figures of ADHD in non-western countries (Cortese & Coghill, 2018).

The prevalence of the disorder has been a topic of discussion among the scientific community during the last decades, mainly for three reasons: (1) the evident variability between the estimates and results of different studies, (2) the higher prevalence of cases in western societies, mainly USA and (3) the apparent increase in rates of the disorder over time (Polanczyk et al., 2014; Thomas et al., 2015).

Current prevalence reports may be due to greater awareness in the population and better access to care spaces. Likewise, the evolution of the diagnostic criteria in the successive versions of the ICD and the DSM, the differences in the methodologies for calculating prevalence (Cortese et al., 2023) and certain social, cultural and individual factors could be driving the differences found in separate studies (Cénat et al., 2021; Polanczyk et al., 2014). The subtype of presentation (Barrios et al., 2016; Huang et al., 2017), gender, age or school level (Huang et al., 2017) and type of school are other factors associated with differences in the distribution of ADHD prevalence (De la Peña et al., 2014).

ADHD according to presentation subtype

According to the DSM-5 (APA, 2013), there are three subtypes of ADHD presentation: combined, predominantly inattentive and predominantly hyperactive-impulsive. Several studies indicate that the combined presentation is the most prevalent, followed by predominantly inattentive, being the predominant hyperactive-impulsive subtype the least frequent (De la Barra et al., 2015; Sánchez et al., 2011; Willcutt, 2012).

ADHD according to gender

Several studies that report male-female ratio agree that there is a higher prevalence of ADHD in male

population, in proportions that range between two and nine males for each female (Bradshaw & Kamal, 2017; Catalá-López et al., 2012; Faraone et al., 2021; Hekim-Bozkurt et al., 2017; Huang et al., 2017; Ramtekkar et al., 2010; Verma & Kushwaha, 2014). This is also suggested by the DSM-5, that report an ADHD male: female ratio of 2:1 (APA, 2013).

ADHD according to the type of school

The prevalence of ADHD is higher in children with a low socioeconomic status (Rowland et al., 2018; Russell et al., 2016), this may be related with the higher amount of children with ADHD in public schools when compared to private schools (Kusi-Mensah et al., 2019); specially in countries like Ecuador were children from lower-socioeconomic-status families tend to be concentrated on public schools (Madrid-Tamayo, 2019).

ADHD by age and school level

The prevalence of ADHD varies by age. There is evidence that during the school stage the percentage of confirmed cases is higher (Huang et al., 2017; Wamulugwa et al., 2017), especially in children between 6 and 9 years old (Bradshaw & Kamal, 2017; Wamulugwa et al., 2017). Moreover, the DSM-5 reports a decrease of the prevalence in adulthood compared to childhood (APA, 2013), in accordance with the evidence suggesting a trend of decrease in symptomatology or symptom severity as age increases (Bradshaw & Kamal, 2017; Wamulugwa et al., 2017; Wang et al., 2021).

The objective of this study is to analyse the prevalence of ADHD symptomatology and its presentations in a representative sample of Ecuadorian schoolchildren and to compare the results according to school level, gender and type of school.

The starting hypothesis is that the prevalence of ADHD symptomatology will be similar to what is been found on previous studies carried out in the region, between the 14.6% obtained by Cruz et al., (Cruz et al., 2010) in Mexico and the 20.4% obtained by Pineda et al., (Pineda et al., 2001) in Colombia. Furthermore, a higher prevalence of ADHD symptomatology in public schools is expected since students with lower socioeconomic status (a variable related to a greater risk of presenting ADHD) concentrate in these schools (Madrid-Tamayo, 2019). Regarding the gender variable, the hypothesis is aligned with most of the prevalence studies that evidenced a higher prevalence of ADHD in boys than in girls (Bradshaw & Kamal, 2017; Huang et al., 2017).

Addressing this objective is crucial given the implications that this disorder has on public health due to its chronicity, its high prevalence, comorbidity with other conditions, psychosocial consequences and economic

repercussions (Zhao et al., 2019). Knowing the exact prevalence data of ADHD symptoms can be a starting point for the design of sensitive educational policies with attention to diversity that provide adequate human resources to meet the educational needs of all students.

In addition, culture can influence the identification and interpretation of ADHD symptoms, not only by parents and teachers but also by health professionals, so analysing the prevalence of this disorder is essential to understand it from its reality and local culture (Kern et al., 2015).

METHODS

Study design

This retrospective-cross-sectional study was carried out with children from urban schools in Cuenca, the third most populated city of Ecuador, located in the southern Andean region and with the majority of its population living in the urban area (SNI, 2010).

Population and inclusion criteria

Considering that the DSM-5 establishes that the diagnosis of ADHD should be done only when symptoms are present before 12 years old (APA, 2013), this study was carried out with children in the second grade (6- to 7-year-olds), fourth grade (8- to 9-year-olds) and sixth grade (10- to 11-year-olds) of elementary school. In Cuenca for 2015, the total population of these elementary school levels was 19,453 students distributed as follows: second grade: 4289 students from public schools and 2357 from private schools; fourth grade: 4209 students from public schools and 2237 from private schools; sixth grade: 4194 students from public schools and 2167 from private schools.

To determine the sample size needed to be representative of this population ($\geq 1,053$ participants), the criteria contained in the tables of Arkin & Colton (Arkin & Colton, 1967) were used, with a margin of error $\pm 3\%$ (95.5% confidence interval). Probabilistic random sampling was used, randomly selecting courses from each school until the sample size was completed. The total number of evaluated participants was slightly higher than the reference provided by the Arkin and Colton tables, because full courses were assessed to have additional participants available in case of dropouts. The study participants belonged to nine private and six public schools ($n=15$), also selected by random probabilistic sampling. These schools were invited to participate in the study by the Ministry of Education of Ecuador. The total number of participants from public and private schools for the different levels was 2195 students distributed as follows: second grade: public: 378, private: 351;

fourth grade: public: 406, private: 348; sixth grade: public: 363, private: 349. Only those children whose parents or legal guardians gave informed consent and who gave their verbal assent were included. From 2359 legal guardians invited to the study, only 2195 consented.

Instruments

Sociodemographic characteristics

Sociodemographic data of the children were collected. Date of birth, gender, school level or grade and type of school was identified for all the participants. This information was collected by consulting children and confirmed by the administrative staff of the participating schools after inspecting the institutional files.

Intelligence

To assess the intelligence quotient (IQ), the Spanish version of the Raven's Progressive Matrix Test, with reliability indices ranging between 0.65 and 0.93 (Raven et al., 2001), was used. This test provides estimates of the deductive capacity and the 'g' factor. For children aged 6–9 years, the coloured version of the Raven's Test of Progressive Matrices (CPM) was applied, and children aged 10–11 years were assessed using the short version of the general Raven's Test of Progressive Matrices (SPM). This is a not verbal test in which a booklet is used with figures that are missing one part. For each pattern there are six to eight response options and the task of the subject is to select the correct option, which involves skills perceptual observation and analogical reasoning. This screening test was used due to the practicality of the application for large groups such as the sample of this study.

ADHD symptomatology

The short version of the Conners-3 test was used for assessing all participants as it is applicable for subjects from 6 to 18 years old (Conners, 2008). The test consists of two questionnaires asking family members and teachers for relevant information regarding the symptomatology of ADHD in relation to the DSM-IV-TR criteria. The cut-off point $T \geq 60$ indicates that the symptoms of the disorder are present with a clinical significance. This instrument has a high internal consistency (Cronbach's alpha indices of 0.89 for parents' scale and 0.91 for teachers' scale) (Conners, 2008). The scales include the categories of inattention (i.e., 'No pays attention to details and makes careless mistakes'); hyperactivity/impulsivity (i.e., 'Is in constant movement') 0.2.3. Process.

First, support and approval was requested from the Ministry of Education of Ecuador. Subsequently, the directors of the schools were visited to explain the study's objective and scope and organize the potential evaluation dates. Next, the parents/legal guardians were contacted to invite them to the study, explain the informed consent, answer all their questions and obtain their signed consent. While recruitment was taking place, the Spanish version of the two instruments (Raven test and Conners) were reviewed by 10 psychologists with psychometric assessment experience who made suggestions about language particularities in the instructions and content. Once these suggestions were reviewed and included by the research team, the instrument were piloted with a group of children not included in the study sample. The piloted instruments were reproduced for their application.

Once all informed consents were obtained, a group of 15 clinical psychologists evaluated the participants. The 15 psychologists were previously trained in the diagnosis of ADHD according to the DSM-5 criteria and in the application of the tests used for this study (irrespective of their previous knowledge about these topics). Data collection process lasted 6 months in total.

The Raven's Progressive Matrix Test was applied in groups of 10 children following the recommendations for group application (Raven et al., 2001). Each group was attended by two evaluators, one guided the whole group and the other one gave personal support to the students who required it (e.g. more inattentive participants).

The Conners-3 test was applied through individual face-to-face interviews with parents and teachers using the respective questionnaire and following the guidelines established in its manual (Conners, 2008).

The group with clinical levels of ADHD symptoms was obtained with the subjects who presented this condition in the Conners-3 report of parents and teachers to comply with the criteria of DSM 5 (APA, 2013), which indicates that the criteria must be present in two or more contexts. Children who scored in the clinically significant range only in one of the two contexts (home or school) were not included in the ADHD group.

This procedure is similar to that of other prevalence studies (e.g. that of Marín-Méndez et al., 2019). 2.4. Analysis of data.

Prior to data analysis, the compliance with the following criteria was reviewed: 1. IQ ≥ 80 , 2. Absence of educational needs associated with disabilities. Participants that did not followed these criteria were excluded from the final analysis. Considering the report of diagnostic criteria according to DSM-5 at school and home (APA, 2013), data obtained from the Conners-3 was used to establish presence or absence of ADH symptoms.

Percentages were calculated for the sociodemographic variables. In order to assess the differences in proportions between gender, type of school and school level,

chi-squared test and prevalence data were calculated. All the analysis was performed using R v4.1.0 (R Core Team, 2022).

Ethical considerations

This study is part of a larger research approved by the University of Azuay, the University of Valencia, the Ministry of Education of Ecuador and financed by SENESCYT (grant no 018-CIBAE).

The parents/legal guardians signed an informed consent to authorize the participation of the children. The children gave their verbal assent before being included in the study. All the personal data were managed with absolute confidentiality. Each participant was assigned a code that represented he/she in the database. The information collected in physical format was stored in the Universidad del Azuay's facilities with the principal investigator access only.

RESULTS

The total number of participants was 2195 students, which is a representative sample of the population of the second, fourth and sixth year of basic education according to the parameters established by Arkin & Colton (Arkin & Colton, 1967). The data from the original sample was reviewed and the subjects who did not meet the inclusion criteria were eliminated, resulting in a final sample of 1535 subjects, whose basic sociodemographic data are presented in Table 1.

The process of selections and results of total participants can be seen in Figure 1.

Prevalence of ADHD symptomatology and its presentations

The total prevalence of clinical levels of ADHD symptoms in the participants of this study considering the DSM 5 clinical criterion that the disorder must present

TABLE 1 Sociodemographic information of participants.

Variable	<i>n</i> = 1535 (%)
Gender	
Boys	747 (48.7%)
Girls	788 (51.3%)
Mean age in months (SD)	106.11 (20.70)
Mean IQ (SD)	102.22 (14.62)
Type of school	
Public	768 (50%)
Private	767 (50%)

in two or more contexts (APA, 2013) was 20.3%. Data for gender, type of school and school grades are presented in Table 2. The prevalence of clinical levels of ADHD symptoms according to presentations was: 3.1% predominantly inattentive, 6.3% combined and 10.9% predominantly hyperactive–impulsive.

N=19,453 students in Cuenca

2th grade: 6,646
 (4,289 public schools; 2,357 private schools)
 4th grade: 6,446
 (4,209 public schools; 2,237 private schools)
 6th grade: 6,361
 (4,194 public schools; 2,167 private schools)



N=2,359 participants invited to the study
N=2,195 participants consented:

2th grade: 729
 (378 public schools; 351 private schools)
 4th grade: 754
 (406 public schools; 348 private schools)
 6th grade: 712
 (363 public schools; 349 private schools)



N=1,535 inclusion criteria

2th grade: 415
 (213 public schools; 202 private schools)
 4th grade: 570
 (298 public schools; 272 private schools)
 6th grade: 550
 (257 public schools; 293 private schools)

FIGURE 1 Process of selections and results of total participants

Comparison of presentations of ADHD according to gender and type of school

Groups were compared using chi-squared tests. Regarding gender, prevalence of clinical levels of ADHD symptoms was significantly higher in girls (see Table 2). There was a significant difference in the prevalence ratio of presenting ADHD clinical levels between girls and boys (PR = 1.46, CI = 95%, 1.19–1.79, $p < 0.001$). Girls are 1.46 times as likely to have ADHD than boys.

Regarding the type of school, clinical levels of ADHD symptoms were more prevalent in public schools (21.51%) compared to private ones (19.16%). However, no significant differences were found between public and private schools. We neither found statistical differences in school grades.

Comparison of presentations of ADHD according to gender, type of school and educational level

Finally, we analysed whether there were statistically significant differences in the three different presentations of ADHD symptomatology (inattentive, hyperactive–impulsive and combined) depending on gender, type of school and grade.

The results indicated that there were differences between public and private schools, but not based on the other two variables (see Table 3).

DISCUSSION

The objective of this study was to analyse the prevalence of ADHD symptomatology and its presentations in a representative sample of Ecuadorian schoolchildren and to compare the results according to grade or school level, gender and type of school.

TABLE 2 Contingency table of variables by presence/absence of ADHD symptoms.

Variable	No ADHD, $n = 1223$ (79.67%)	ADHD symptomatology scores higher than the cut-off point, $n = 312$ (20.32%)	χ^2	p -Value ^a
Gender				
Boy	624.0 (51.0%)	123.0 (39.4%)	13.39	<0.001
Girl	599.0 (49.0%)	189.0 (60.6%)		
Type of school				
Private	620.0 (50.7%)	147.0 (47.1%)	1.13	0.3
Public	603.0 (49.3%)	165.0 (52.9%)		
School grades				
Second	320.0 (26.2%)	95.0 (30.4%)	2.59	0.3
Fourth	456.0 (37.3%)	114.0 (36.5%)		
Sixth	447.0 (36.5%)	103.0 (33.0%)		

^aPearson's chi-squared test.

TABLE 3 Prevalence of ADHD symptomatology scores higher than the cut-off point subtypes by gender and type of school.

Chi squared test	Inattentive (<i>n</i> = 48)		Hyperactive-impulsive (<i>n</i> = 168)		Combined (<i>n</i> = 96)		χ^2	df	<i>p</i>
Gender <i>n</i> = 312	Male	Female	Male	Female	Male	Female			
	22 (1.4%)	26 (1.7%)	70 (4.6%)	98 (6.4%)	31 (2%)	65 (4.2%)	3.22	2	0.199
Type of school <i>n</i> = 312	Public	Private	Public	Private	Public	Private			
	35 (2.3%)	13 (0.8%)	71 (4.6%)	97 (6.3%)	59 (3.8%)	37 (2.4%)	18.17	2	<0.001
School grade <i>n</i> = 312	Second	Fourth	Second	Fourth	Second	Fourth			
	12(0.8%)	21 (1.4%)	52 (3.4%)	64 (4.2%)	31 (2.0%)	29 (1.9%)	3.28	4	0.512
			15 (1.0%)	52 (3.4%)		36 (2.3%)			

The prevalence of ADHD symptomatology obtained in this study (20.5%) is higher than the one reported in the DSM-5 (5%) (APA, 2013). However, according to what has been reported by other studies from Latin America, the prevalence of ADHD seems to be higher in low-and-middle-income countries (Cruz et al., 2010; de la Barra et al., 2015; Gallardo-Saavedra et al., 2019; Llanos Lizcano et al., 2019; Pineda et al., 2001; Ramos et al., 2015).

In this study, the higher prevalence was obtained for the predominantly hyperactive/impulsive presentation, followed by the combined presentation. The lower prevalence was registered for the predominantly inattentive presentation. This evidence agrees with studies carried out in the United States (Biederman et al., 2005), the United Kingdom (Alloway et al., 2010), Panama (Sánchez et al., 2011) and Chile (De la Barra et al., 2015).

The comparison of the disorder between gender showed higher prevalence of ADHD symptomatology for girls in all ADHD presentations. The clinical levels of ADHD symptoms were 1.46 times more prevalent for the girls than boys. These results are inconsistent with what has been reported in most studies evidencing a higher prevalence of ADHD in boys (Bradshaw & Kamal, 2017; Hekim-Bozkurt et al., 2017; Huang et al., 2017; Verma & Kushwaha, 2014), and with what is reported by the DSM-5 (male: female ratio of 2:1) (APA, 2013). However, some researches have not found differences based on gender (Biederman et al., 2005; De la Barra et al., 2015) following the evidence that men and women have the same genetic risk of presenting ADHD (Martin et al., 2018). Other studies have found a higher prevalence of ADHD in women with and without statistically significant differences compared to men (Cardo et al., 2007; Mora, 2011; Sánchez et al., 2011; Viola & Garrido, 2009; Weiss et al., 2011).

The variability of evidence regarding gender distribution has been explained in the past by the tendency of girls and women with ADHD to adopt compensatory strategies. This translates into a behaviour similar to that of a neurotypical person, in other words, a symptomatology with less visibility but still impairing (Hinshaw et al., 2021). Consequently, ADHD in female groups is overlooked in research and clinical settings (Young et al., 2020).

Interestingly, within the results of this study, the higher prevalence of girls is particularly notorious in the predominantly hyperactive–impulsive and combined presentation. Thus, this evidence is inconsistent with the theory of compensatory strategies in female group that suggests that in girls and women with ADHD, the inattentive symptomatology (associated with internalizing problems) is more common than in boys and men, that tend to present greater levels of hyperactive and impulsive symptoms (associated with externalizing problems) (Hinshaw et al., 2021).

The higher prevalence of ADHD symptoms found in women, particularly in the two subtypes of ADHD that involve hyperactivity-impulsivity symptoms could then be explained at least in part, to cultural stereotypes. Culture can influence the expectations of which behaviour is considered appropriate for each gender (Needham et al., 2015) and therefore it can be involved in higher or lower identification rates in women (Viola & Garrido, 2009; Weiss et al., 2011). Considering that for this research children's ADHD symptomatology was obtained by contrasting parents and teachers report through the application of the Conners-3 questionnaire, the results could be explained by cultural beliefs of the informants.

In Latin America there are still signs of marked sexism and discrimination against women (Castellanos & Lorenzo, 2010). In Ecuador, this translates into high rates of violence that affect 60.6% of women of all ages (Velasco et al., 2014). Under this context, it is likely for certain behaviours to be justified as being properly masculine but to be censured or judged more severely when they occur in girls (Facio, 2005). This is consistent with previous evidence that shows a higher female: male ADHD ratio in Latin American countries such as Uruguay (Viola & Garrido, 2009), Costa Rica (Weiss et al., 2011) and Ecuador (Mora, 2011). This explanation is merely exploratory and more research is necessary.

Regarding the analysis of the clinical levels of ADHD symptoms prevalence according to the type of school, higher percentages were found in public schools. While consistent evidence has been reported previously showing a higher prevalence in public than in private schools (Kusi-Mensah et al., 2019), some other studies obtained a uniform distribution of the disorder among the entire school population irrespectively of the school type (Cruz et al., 2010; Jiménez et al., 2012).

The higher prevalence identified in public schools within this research, may be closely related to the socio-economic conditions of its population (Banaschewski et al., 2017; Viola & Garrido, 2009). In some low-and-middle-income countries like Ecuador, public schools tend to concentrate children with lower socioeconomic statuses (Madrid-Tamayo, 2019). Socioeconomic status is a variable closely related to the presence of ADHD in children due to its diverse implications (Russell et al., 2016). For example, incomplete primary or secondary education in parents, which is common in low-income families, is associated with a higher prevalence of the disorder (Rowland et al., 2018). Likewise, a history of delinquency, common in poor contexts, has been associated with ADHD (Lilly et al., 2018). Finally, for low-socioeconomic-status families, paying for quality education is less likely because of the lack of economic resources (Bradshaw & Kamal, 2017), which is decisive in the disorder's diagnosis, evolution and prognosis (Lindly et al., 2021; Wamulugwa et al., 2017). The interaction

between childhood adversity and the onset and persistence of ADHD should be deeper studied (Rowland et al., 2018).

No statistically significant differences were found when comparing the prevalence of ADHD symptomatology according to the school level, similar to what's been found in other studies (Jiménez et al., 2012; Mora, 2011). However, a high prevalence has been reported in older schoolchildren (Danielson et al., 2018). This is consistent with the effect that age seems to have over ADHD symptomatology (i.e., remission or reduced symptoms are expected in many of cases during adulthood) (Kim et al., 2019) mainly as an outcome of brain (prefrontal cortex) maturation (Alexander & Farrelly, 2018).

Limitations and future studies

The present study considered and contrasted the assessment of children's ADHD symptomatology in two scenarios (home and school) through the application of the Conners questionnaire to parents and teachers but did not use a complete clinical assessment of the child to confirm the presence of these symptoms. This must be taken into account when analysing these results, since the informants may maximize or minimize the frequency and intensity of the symptoms they report. In this regard, it is recommended that future research on prevalence in Ecuador consider the possibility of conducting complete clinical evaluations of students who present scores above the cut-off points in home and school contexts.

Furthermore, even if the used scales were reviewed by experts who suggested language adaptations and piloted with a group of children, they were originally developed for a US population and adapted for a Spanish population, a situation that could affect the result obtained since it is not the same context and culture. It is recommended that future studies in the Ecuadorian population consider these observations and, if possible, validate the instruments in advance.

Additionally, this study was carried out in the city of Cuenca, so a future analysis at the national level, which includes other regions of the country, would be valuable for a more accurate understanding of the prevalence of ADHD in Ecuador.

The evidence of a higher prevalence of ADHD in girls compared to boys is contradictory to what is usually reported internationally, although it coincides with some previous studies carried out in Ecuador and Latin America. Future research should study the possible causes of higher prevalence rates in girls in the region, considering possible cultural biases in assessing the behaviour of boys and girls.

Our research did not ask the participants, once identified, whether they had previously been diagnosed with ADHD and whether they used pharmacological treatment. This situation should be reviewed in future work,

mainly with children diagnosed with the disorder, in order to analyse possible disparities in pharmacological treatment (Glaser & Dingley, 2022). In Ecuador, pharmacological treatment is not free and limitations in access could generate social and family consequences with which the disorder is associated.

Finally, the relationship between socioeconomic status and the prevalence of ADHD in general and according to school type should be studied among Ecuadorian schoolchildren.

CONCLUSIONS

The prevalence of clinical levels of ADHD symptoms identified in this study is higher than what is reported in the DSM-5, which could respond to cultural aspects of Ecuador. However, further evidence is needed to confirm or rule out the contextual and cultural considerations discussed in this study. The findings also reflect a higher prevalence of ADHD symptomatology in vulnerable populations that tend to be overlooked, such as girls and public-school students. Therefore, local public strategies in health and education should consider these results to guarantee an adequate response to the needs of the entire child population with ADHD, including those who are most vulnerable.

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CONFLICT OF INTEREST STATEMENT

All authors declare that they have no conflicts of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the first author, [X. V-C.], upon reasonable request.

ETHICS STATEMENT

All procedures were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments.

INFORMED CONSENT

Informed consent was obtained from parents of all students involved in the study.

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REFERENCES

- Alexander, L. & Farrelly, N. (2018) Attending to adult ADHD: a review of the neurobiology behind adult ADHD. *Irish Journal of Psychological Medicine*, 35(3), 237–244. Available from: <https://doi.org/10.1017/ipm.2017.78>
- Alloway, T., Elliott, J. & Holmes, J. (2010) The prevalence of ADHD-like symptoms in a community sample. *Journal of Attention Disorders*, 14, 52–56. Available from: <https://doi.org/10.1177/1087054709356197>
- American Psychiatric Association. (2013) *Diagnostic and statistical manual of mental disorders*. American Psychiatric Association: 5th.
- Arkin, H. & Colton, R.R. (1967) *Tables for statisticians*. New York: Barnes & Noble.
- Banaschewski, T., Becker, K., Döpfner, M., Holtmann, M., Rösler, M. & Romanos, M. (2017) Attention-deficit/hyperactivity disorder. *Deutsches Ärzteblatt International*, 114, 149–159. Available from: <https://doi.org/10.3238/arztebl.2017.0149>
- Barrios, O., Matute, E., Ramírez-Dueñas, M., Chamorro, Y., Trejo, S. & Bolaños, L. (2016) Características del trastorno por déficit de atención e hiperactividad en escolares mexicanos de acuerdo con la percepción de los padres. *Suma psicológica*, 23(2), 101–108. Available from: <https://doi.org/10.1016/j.sumpsi.2016.05.001>
- Biederman, J., Kwon, A., Aleardi, M., Chouinard, V., Marino, T., Cole, H. et al. (2005) Absence of gender effects on attention deficit hyperactivity disorder: findings in nonreferred subjects. *American Journal of Psychiatry*, 162, 1083–1089. Available from: <https://doi.org/10.1176/appi.ajp.162.6.1083>
- Bradshaw, L. & Kamal, M. (2017) Prevalence of ADHD in Qatari school-age children. *Journal of Attention Disorders*, 21, 442–449. Available from: <https://doi.org/10.1177/1087054713517545>
- Cardo, E., Servera, M. & Llobera, J. (2007) Estimation of the prevalence of attention deficit/hyperactivity disorder among the standard population on the island of Majorca. *Revista de Neurología*, 44, 10–14. Available from: <https://doi.org/10.33588/rn.4401.2005475>
- Castellanos, L. & Lorenzo, A. (2010) Desigualdad de género en Latinoamérica desde la perspectiva de los indicadores de Desarrollo Humano. *Revista Galega de Economía*, 19(2), 1–15. <http://www.redalyc.org/articulo.oa?id=39115730004>
- Catalá-López, F., Peiró, S., Ridao, M., Sanfélix-Gimeno, G., Gènova-Maleras, R. & Catalá, M. (2012) Prevalence of attention deficit hyperactivity disorder among children and adolescents in Spain: a systematic review and meta-analysis of epidemiological studies. *BMC Psychiatry*, 12(1), 1–13. Available from: <https://doi.org/10.1186/1471-244X-12-168>
- Cénat, J., Blais-Rochette, C., Morse, C., Vandette, M., Noorishad, P., Kogan, C. et al. (2021) Prevalence and risk factors associated with attention-deficit/hyperactivity disorder among US black individuals: a systematic review and meta-analysis. *JAMA Psychiatry*, 78(1), 21–28. Available from: <https://doi.org/10.1001/jamapsychiatry.2020.2788>
- Conners, K. (2008) *The Conners 3rd edition (Conners 3)*. Toronto: Multi-Health Systems.
- Cortese, S. & Coghill, D. (2018) Twenty years of research on attention-deficit/hyperactivity disorder (ADHD): looking back, looking forward. *BMJ Mental Health*, 21(4), 173–176. Available from: <https://doi.org/10.1136/ebmental-2018-300050>
- Cortese, S., Song, M., Farhat, L.C., Yon, D.K., Lee, S.W., Kim, M.S. et al. (2023) Incidence, prevalence, and global burden of ADHD from 1990 to 2019 across 204 countries: data, with

- critical re-analysis, from the Global Burden Of Disease Study. *Molecular Psychiatry*, 1-8. Available from: <https://doi.org/10.1038/s41380-023-02228-3>
- Cruz, L., Ramos, A., Gutiérrez, M., Gutiérrez, D., Márquez, G., Ramírez, J. et al. (2010) Prevalencia del trastorno por déficit de atención e hiperactividad en escolares de tres poblaciones del estado de Jalisco. *Revista Mexicana de Neurociencia*, 11, 15–19. <https://www.medigraphic.com/cgi-bin/new/resumen.cgi?IDARTICULO=44546>
- Danielson, L., Bitsko, H., Ghandour, M., Holbrook, R., Kogan, D. & Blumberg, J. (2018) Prevalence of parent-reported ADHD diagnosis and associated treatment among US children and adolescents, 2016. *Journal of Clinical Child & Adolescent Psychology*, 47, 199–212. Available from: <https://doi.org/10.1080/15374416.2017.1417860>
- De la Barra, F., Vicente, B., Saldivia, S. & Melipillan, R. (2015) Epidemiología del TDAH en niños y adolescentes chilenos. *Revista Chilena de Psiquiatría y Neurología de la Infancia y Adolescencia*, 26(1), 34–46. https://www.sopnia.com/wp-content/uploads/2021/05/Revista-SOPNIA_201501.pdf
- De la Peña, F., Gómez, C., Heinze, G. & Palacios-Cruz, L. (2014) Adversidad social y trastornos psiquiátricos: estudio comparativo entre estudiantes de secundarias públicas y privadas. *Salud Mental*, 37(6), 483–489. Available from: https://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S0185-33252014000600006
- Facio, A. (2005) Feminismo, género y patriarcado. *Género y Derecho*, 27, 3–37. <http://repositorio.ciem.ucr.ac.cr/handle/123456789/122>
- Faraone, S.V., Banaschewski, T., Coghill, D., Zheng, Y., Biederman, J., Bellgrove, M.A. et al. (2021) The world federation of ADHD international consensus statement: 208 evidence-based conclusions about the disorder. *Neuroscience & Biobehavioral Reviews*, 128, 789–818. Available from: <https://doi.org/10.1016/j.neubiorev.2021.01.022>
- Gallardo-Saavedra, G., Martínez-Wbaldo, M. & Padrón-García, A. (2019) Prevalencia de TDAH en escolares mexicanos a través de un cribado con las escalas de Conners 3. *Actas Españolas de Psiquiatría*, 47(2), 45–53. <https://www.actaspsiquiatria.es/repositorio/21/118/ESP/21-118-ESP-45-53-879145.pdf>
- Glaser, A. & Dingley, C. (2022) Diagnostic and medication treatment disparities in African American children with ADHD: a literature review. *Journal of Racial and Ethnic Health Disparities*, 9, 2027–2048. Available from: <https://doi.org/10.1007/s40615-021-01142-0>
- Hekim-Bozkurt, Ö., Dirik, E. & Üneri, Ö. (2017) Prevalence of ADHD in Northern Cyprus. *Anatolian Journal of Psychiatry*, 18(5), 478–484. Available from: <https://doi.org/10.5455/apd.250504>
- Hinshaw, S., Nguyen, P., O'Grady, S. & Rosenthal, E. (2021) Annual research review: attention-deficit/hyperactivity disorder in girls and women: underrepresentation, longitudinal processes, and key directions. *Journal of Child Psychology and Psychiatry*, 63(4), 484–496. Available from: <https://doi.org/10.1111/jcpp.13480>
- Huang, Y., Zheng, S., Xu, C., Lin, K., Wu, K., Zheng, M. et al. (2017) Attention-deficit hyperactivity disorder in elementary school students in Shantou, China: prevalence, subtypes, and influencing factors. *Neuropsychiatric Disease and Treatment*, 13, 785–792. Available from: <https://doi.org/10.2147/NDT.S126100>
- Jiménez, J., Rodríguez, C., Camacho, J., Afonso, M. & Artiles, C. (2012) Estimación de la prevalencia del trastorno por déficit de atención con o sin hiperactividad (TDAH) en población escolar de la Comunidad Autónoma de Canarias. *European Journal of Education and Psychology*, 5, 13–26. Available from: <https://doi.org/10.30552/ejep.v5i1.77>
- Kern, A., Amod, Z., Seabi, J. & Vorster, A. (2015) South African foundation phase teachers' perceptions of ADHD at private and public schools. *International Journal of Environmental Research and Public Health*, 12, 3042–3059. Available from: <https://doi.org/10.3390/ijerph120303042>
- Kim, M., King, M. & Jennings, J. (2019) ADHD remission, inclusive special education, and socioeconomic disparities. *SSM-Population Health*, 8, 100420. Available from: <https://doi.org/10.1016/j.ssmph.2019.100420>
- Kusi-Mensah, K., Gordon, D., Wemakor, S., Owusu-Antwi, R. & Omigbodun, O. (2019) Prevalence and patterns of mental disorders among primary school age children in Ghana: correlates with academic achievement. *Journal of Child & Adolescent Mental Health*, 31(3), 214–223. Available from: <https://doi.org/10.2989/17280583.2019.1678477>
- Lilly, J., Cullen, F. & Ball, R. (2018) *Criminological theory: context and consequences*. London: Sage publications.
- Lindly, O., Nasol, E., Tarazi, C., Chavez, A. & Zuckerman, K. (2021) Toward equitable health outcomes for diverse children with ADHD and their families. *Academic Pediatrics*, 21(4), 617–619. Available from: <https://doi.org/10.1016/j.acap.2021.01.020>
- Llanos Lizcano, L.J., García Ruiz, D.J., González Torres, H.J. & Puentes Roza, P. (2019) Trastorno por déficit de atención e hiperactividad (TDAH) en niños escolarizados de 6 a 17 años. *Pediatría Atención Primaria*, 21(83), e101–e108. http://scielo.isciii.es/scielo.php?script=sci_arttext&pid=S1139-76322019000300004&lng=es&tlng=es
- Madrid-Tamayo, T. (2019) El sistema educativo de Ecuador: un sistema, dos mundos. *Revista Andina de Educación*, 2(1), 8–17. Available from: <https://doi.org/10.32719/26312816.2019.2.1.2>
- Marín-Méndez, J.J., Borra-Ruiz, M.C., Álvarez-Gómez, M.J., McGoey, K.E. & Soutullo, C. (2019) Normative ADHD-RS-preschool data in a community sample in Spain. *Journal of Attention Disorders*, 23(6), 615–623. Available from: <https://doi.org/10.1177/1087054715625300>
- Martin, J., Taylor, J., Rydell, M., Riglin, L., Eyre, O., Lu, Y. et al. (2018) Sex-specific manifestation of genetic risk for attention deficit hyperactivity disorder in the general population. *Journal of Child Psychology and Psychiatry*, 59, 908–916. Available from: <https://doi.org/10.1111/jcpp.12874>
- Mora, L. (2011) *Prevalencia de hiperactividad y factores asociados en escolares de Cuenca*. [Tesis de especialista en pediatría, Universidad de Cuenca]. <http://dspace.ucuenca.edu.ec/handle/123456789/3980>
- Needham, L., Smith, A., Zhao, W., Wang, X., Mukherjee, B., Kardina, L. et al. (2015) Life course socioeconomic status and DNA methylation in genes related to stress reactivity and inflammation: the multi-ethnic study of atherosclerosis. *Epigenetics*, 10, 958–969. Available from: <https://doi.org/10.1080/15592294.2015.1085139>
- Pineda, A., Lopera, F., Henao, C., Palacio, D., Castellanos, X. & Fundema, I. (2001) Confirmación de la alta prevalencia del trastorno por déficit de atención en una comunidad colombiana. *Revista de Neurología*, 32, 217–222. Available from: <https://doi.org/10.33588/rn.3203.2000499>
- Polanczyk, G., Willcutt, G., Salum, A., Kieling, C. & Rohde, A. (2014) ADHD prevalence estimates across three decades: an updated systematic review and meta-regression analysis. *International Journal of Epidemiology*, 43, 434–442. Available from: <https://doi.org/10.1093/ije/dyt261>
- R Core Team. (2022) R: a language and environment for statistical computing. R Foundation for Statistical Computing. <https://www.R-project.org/>
- Ramos, A., Bolaños, F. & Ramos, A. (2015) Prevalencia del trastorno por déficit de atención con hiperactividad en estudiantes ecuatorianos. *Revista Científica y Tecnológica UPSE*, 3(1), 13–19. Available from: <https://doi.org/10.26423/rctu.v3i1.72>
- Ramtekkar, U., Reiersen, A., Todorov, A. & Todd, R. (2010) Sex and age differences in attention-deficit/hyperactivity disorder symptoms and diagnoses: implications for DSM-V and ICD-11. *Journal of the American Academy of Child & Adolescent Psychiatry*, 49(3), 217–228. Available from: <https://doi.org/10.1016/j.jaac.2009.11.011>
- Raven, J., Court, J. & Raven, J. (2001) *Test de matrices progresivas*. Madrid: TEA.

- Rowland, S., Skipper, J., Rabiner, L., Qeadan, F., Campbell, A., Naftel, J. et al. (2018) Attention-deficit/hyperactivity disorder (ADHD): interaction between socioeconomic status and parental history of ADHD determines prevalence. *Journal of Child Psychology and Psychiatry*, 59, 213–222. Available from: <https://doi.org/10.1111/jcpp.12775>
- Russell, E., Ford, T., Williams, R. & Russell, G. (2016) The association between socioeconomic disadvantage and attention deficit/hyperactivity disorder (ADHD): a systematic review. *Child Psychiatry & Human Development*, 47, 440–458. Available from: <https://doi.org/10.1007/s10578-015-0578-3>
- Sánchez, Y., Velarde, S. & Britton, B. (2011) Estimated prevalence of attention-deficit/hyperactivity disorder in a sample of Panamanian school-aged children. *Child Psychiatry & Human Development*, 42, 243–255. Available from: <https://doi.org/10.1007/s10578-010-0213-2>
- Sistema Nacional de Información, SNI. (2010) Consultas de Indicadores y Datos. SNI. <https://menucloud.sni.gob.ec/web/menu/>
- Thomas, R., Sanders, S., Doust, J., Beller, E. & Glasziou, P. (2015) Prevalence of attention-deficit/hyperactivity disorder: a systematic review and meta-analysis. *Pediatrics*, 135, e994–e1001. Available from: <https://doi.org/10.1542/peds.2014-3482>
- Velasco, M., Álvarez, S., Carrera, G. & Vázconez, A. (2014) *La niñez y adolescencia en el Ecuador contemporáneo: avances y brechas en el ejercicio de derechos*. Quito: Observatorio Social del Ecuador.
- Verma, S. & Kushwaha, S. (2014) Prevalence of ADHD symptoms in 12–13 year old school-going children. *Journal of Psychosocial Research*, 9(1), 121–129. <https://www.proquest.com/openview/931d68da4386b10f850e8cd05f70a522/1?cbl=506336&pq-origsite=gscholar>
- Viola, M. & Garrido, G. (2009) Características epidemiológicas del trastorno por déficit atencional en los escolares uruguayos. *Revista de Psiquiatría del Uruguay*, 73(2), 157–168. http://www.spu.org.uy/revista/dic2009/03_TO.pdf
- Wamulugwa, J., Kakooza, A., Kitaka, B., Nalugya, J., Kaddumukasa, M., Moore, S. et al. (2017) Prevalence and associated factors of attention deficit hyperactivity disorder (ADHD) among Ugandan children; a cross-sectional study. *Child and Adolescent Psychiatry and Mental Health*, 11, 1–18. Available from: <https://doi.org/10.1186/s13034-017-0155-6>
- Wang, Y., Zuo, C., Xu, Q., Hao, L. & Zhang, Y. (2021) Attention-deficit/hyperactivity disorder is characterized by a delay in subcortical maturation. *Progress in Neuro-Psychopharmacology and Biological Psychiatry*, 104, 1–10. Available from: <https://doi.org/10.1016/j.pnpbp.2020.110044>
- Weiss, N., Schuler, J., Monge, S., McGough, J., Chavira, D., Bagnarello, M. et al. (2011) Prevalencia y tamizaje del Trastorno por Déficit de Atención con Hiperactividad en Costa Rica. *Vertex*, 22, 337–342. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4431996/>
- Willcutt, G. (2012) The prevalence of DSM-IV attention-deficit/hyperactivity disorder: a meta-analytic review. *Neurotherapeutics*, 9, 490–499. Available from: <https://doi.org/10.1007/s13311-012-0135-8>
- Young, S., Adamo, N., Ásgeirsdóttir, B., Branney, P., Beckett, M., Colley, W. et al. (2020) Females with ADHD: an expert consensus statement taking a lifespan approach providing guidance for the identification and treatment of attention-deficit/hyperactivity disorder in girls and women. *BMC Psychiatry*, 20(404), 1–27. Available from: <https://doi.org/10.1186/s12888-020-02707-9>
- Zhao, X., Page, F., Altszuler, R., Pelham, E., Kipp, H., Gnagy, M. et al. (2019) Family burden of raising a child with ADHD. *Journal of Abnormal Child Psychology*, 47, 1327–1338. Available from: <https://doi.org/10.1007/s10802-019-00518-5>

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