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Prevalence of ADHD in Mexican schoolchildren through screening with Conners scales 3

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Introduction. The prevalence of Attention Deficit Hyperactivity Disorder (ADHD) in children varies due to the methodology used. In Mexico, the health sector recognizes difficulties in measuring and treating it, so the WHO recommends carrying out screening in populations with a probability of presenting it. The objective was to measure the prevalence of ADHD for screening purposes in second-grade students, their comorbidity, and to describe the experience using version 3 of the Conners scale.

Method. Descriptive observational study, with the purpose of screening, applying the short versions to parents and teachers of 3,985 schoolchildren in a sample of 55 public schools obtained at random from two delegations in Mexico City, the cases were referred to psychology and psychiatry to corroborate diagnosis and treatment. Results We detected 458 (16%) cases, both informants, the prevalent subtype was hyperactive in both sexes, predominantly male, learning problems and executive functions more frequent in girls with hyperactive and combined subtype, only completed the psychological evaluation 150 schoolchildren and 127 attended with the paidopsiquiatra, who confirmed 72% of the cases.

Conclusions. The prevalence for screening purposes, subtype of ADHD and affected gender is similar to that reported in the literature, the comorbidity identified by both informants is an advantage offered by the Conners scale 3, the limiting factor to corroborate the diagnosis was the resistance of the parents to go with the specialists. It is necessary to guide and inform parents more about the disorder to achieve better participation.

Key Words: ADHD, Child, Comorbidity

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Prevalencia de TDAH en escolares mexicanos a través de un cribado con las escalas de Conners 3

Introducción. La prevalencia del Trastorno de Déficit de atención e hiperactividad TDHA en población infantil varía debido a la metodología empleada, en México el sector salud reconoce dificultades para medirla y tratarla, asi la OMS recomienda realizar cribados en poblaciones con probabilidad de presentarla. El objetivo fue medir la prevalencia de TDAH con propósitos de cribado en escolares de segundo grado, su comorbilidad, y describir la experiencia utilizando la versión 3 de la escala de Conners.

Método. Estudio observacional descriptivo, con propósito de cribado aplicando las versiones cortas a padres y maestros de 3,985 escolares en una muestra de 55 escuelas públicas obtenidas al azar de dos delegaciones en la Ciudad de México, los casos fueron referidos a psicología y Psiquiatría para corroborar diagnóstico y tratamiento.

Resultados. Se detectaron 458(16%) casos, por ambos informantes, el subtipo prevalente fue hiperactivo en ambos sexos con predominio masculino, los problemas de aprendizaje y funciones ejecutivas más frecuentes en niñas con subtipos hiperactivo y combinado, solo completaron la evaluacion psicológica 150 escolares y 127 acudieron con el paidopsiquiatra, quien confirmó 72% de los casos.

Conclusiones. La prevalencia con fines de cribado, subtipo de TDAH y género afectado es semejante a la reportada en la literatura, la comorbilidad identificada por ambos informantes es una ventaja que ofrece la escala Conners 3, la limitante para corroborar el diagnóstico fue la resistencia de los padres para acudir con los especialistas. Es necesario orientar e informar más a los padres sobre el trastorno para lograr una mejor participación.

Palabras clave: TDAH, Niños, Comorbilidad

INTRODUCTION

Attention Deficit-Hyperactivity Disorder (ADHD) is a common neuropsychiatric disorder in child population; its prevalence at the worldwide level is referred at between 3 and 7%[1]. ADHD prevalence in Latin America for the school population is reported as between 2.4% and 19.8%, predominantly in masculine gender with a ratio of 4:12[2]. In girls, a lesser degree of aggression and impulsivity is observed at a lesser degree renders its diagnosis difficult[3].

Among the factors that explain the variation of prevalences of 1-2% in Europe, 20% in North America, and more than 20% in developing countries, we find the following: the historical variability of the criteria utilized for defining cases, the type of instrument employed, whether it is carried out with purposes of screening or diagnosis, cut-off points, type of population to evaluate (clinical or community), age of those evaluated children, adolescents, or adults), or those who provide the information (parents, teachers, the subject him/herself).

Some authors mention that a high prevalence of 17% can include a considerable number of false positives[4], while other authors refer that on utilizing the Diagnostic and Statistical Manual of Mental Disorders-IV edition (DSM-IV) in schoolchildren, prevalence is expected to be above 15%[5].

In meta-analyses, it is considered that there can be overdiagnosis and overtreatment in the prevalence of mental health problems in children and adolescents[6] but, in relation to ADHS, even when the weight of the prevalence has ranged from 1.7% to 17.8%[7] the number around 3% is considered medium prevalence, which has increased from 3% to 4% when Diagnostic and Statistical Manual of Mental Disorders (DSM) criteria are applied in population aged from 5 to 17 years[8].

In Mexico, ADHD is considered a public health problem. The Health Secretariat has manifested its difficulty in measuring it; in 2001, it was estimated in that 1,500,000 children under 14 years of age. The Community Centers of Mental Health (CECOSAM) in Mexico refer that one in three children who go for a consultation do this because they present ADHD. At the Dr. Juan N. Navarro Children's Psychiatric Hospital, ADHD is the first reason for a consultation and there is a continual demand for care at Mexican National System Integral Familial Development (DIF) care centers[9].

According to the reports of the Juan. N. Navarro Children's Psychiatric Hospital, the rate of ADHD is 28.6% in children, and the rate of ADHD is 40% in adolescents at the Ramón de la Fuente National Institute of Psychiatry. Some studies in the states of the Mexican Republic show rates such as 23.4% in Durango, in Ciudad Obregón, Sonora, 19.5%; Jalisco, 14.6%, and of Tlalnepantla, Estado de México, 15%[10-13].

The high demand of schoolchildren with probable ADHD oversaturates the chidren's mental health care services, in that generally, the children are referred by their teachers, who manifest having 3-5 students with behavioral problems, and that one only of these children can alter the dynamic of the class and interfere with the teaching-learning of the group[14].

To detect pathologies in apparently health populations in terms of the probability of presenting these, the World Health Organization (WHO) recommends carrying out screening through simple tests[15] and ones that cover Wilson and Jurgen criteria[16]. The majority of instruments utilized for the evaluation are based on DSM criteria in its various versions (II, III, IV, and V) with broad acceptance due to its solid psychomotor properties[17]. In these versions, the following are highlighted: the symptoms should have presented prior to the age of 7 years; at least 6 months before the evaluation, and the symptoms should manifest themselves in both contexts (school and home). Criteria covered by second-grade primary-school students in the present study, as well as diverse investigations, refer that parents and teachers are reliable sources for the identification of behaviors coinciding with this disorders[18].

The Conners scales comprise a very much utilized instrument for the identification of ADHD in activities such as the screening, diagnosis, and investigation through formats for parents and teachers[19]. Conners 3 scale version, sustained on DSM-IV criteria of the American Society of Psychiatry (2000) permits the evaluation of subjects between 6 and 18 years of age, individualized by age group and gender evaluation. The short version for parents and teachers contain 45 and 41 identifying subtypes, by means of subscales as follows: Hyperactive (impulsive, hyperactive, and restless behavior) and inattention (difficulty in concentrating, staying alert in order to initiate or terminate activities), and they additionally evaluate the following: learning problems (low academic achievement); executive functions (difficulty in beginning and ending activities, organizing, planning); problems of aggression (defiant, destructive, threatening behaviors), and problems in socializing (difficulty in integrating him/herself with schoolmates and relatives). The version for teachers does not evaluate the executive functions[20].

Scoring the items is performed according to the frequency of the behavior, with "0" if never present, "1" if occasionally present, "2" if frequently present, and "3" if very frequently present. The natural numbers become the T-Score, which ranges from 40-90, and the cut-off point for consid-

ering a case is a T-Score above 65 in both of the parents-teachers scales.

The internal consistency coefficient in the parents' version presents a Cronbach alpha of 0.91 (range, 0.85-0.94), and for teachers, of 0.94 (range, 0.83-0.93) compared with the symptoms of the DSM-IV TR, whose coefficients for parents were 0.90 (range, 0.83-0.93) and for teachers, 0.90 (range, 0.77-0.95) as determined in validation of the scale[20].

Considering that the prevalences in Mexico have been measured in schoolchildren of different grades employing DSM-IV criteria that only detect cases and subtypes, we decided to study a population that was more uniform in age and grade than those who attend public schools in urban zones with similar socioeconomic conditions by means of a screening utilizing the Conners scales, which allow to identify cases, subtypes, and the most frequent comorbility, and problems of learning, aggression, and socialization, facing the problematic leading to the study design and the participation of parents and teachers.

MATERIALS AND METHODS

Design

Descriptive type, transversal, and observational study.

Population and sample

Due to that at the beginning of the academic period the number is not known of the second-grade groups and students, and only a fixed variable is available, which comprises the schools, we calculated a sample size considering the number of schools in both delegations, utilizing the proportions of finite populations formula: $n = N Z^2 p*q/d^2 (N-1)+Z^2 p*q$, with the following values: N= 151 schools; Z= 1.96 (95% Confidence Interval [95% CI]); d= with a sampling error of 5%; p= a proportion of 50% (when the school prevalence), and a q that is = 1-p, the size of 49 schools plus 10%, expecting losses, made for a total of 55. Taking as the sampling framework the list of schools by school zones, we applied a simple and proportional random selection to the school zones of each delegation, obtaining 25 schools from 21 school zones, for Delegation "A" and 30 schools from 24 school zones for Delegation "B". The study units comprised the total number of parents and teachers of second-graders in the selected schools during the 2010-2011 academic year.

Inclusion criteria comprised the following: being parents and teachers of second-graders in primary school; both genders; ages between the ages of 7 and 8 years, and without prior ADHD diagnosis and treatment. Exclusion criteria are as follows: being the parents and teachers of second-graders; genders, and not being diagnosed with ADHD and/or found to be in treatment for other neurological and psychiatric disorders in treatment.

Evaluation instruments

The short Conners version 3 scales translated into Spanish, parents' and teachers' version, with 45 and 41 items, respectively, scored with different formats by gender and for subjects between the ages of 6 and 12 years of age.

Statistical analysis

We carried out statistical analysis with SPSS ver. 19 software utilizing descriptive statistics, percentages, and contingency tables to depict the results of the subscales between behavior informants and between Delegations.

Procedure

After being granted authorization and with prior knowledge of the study by the authorities of the Mexican Secretariat of Public Education (SEP), the principals of the schools selected, and the second-grade teachers, the visit was programmed of 12 Psychologists, who went to 7-5 academic centers each, and to 5-4 academic centers to orient the second-grade teachers regarding the filling out of the Conners 3 scale of each of the students and to support the patents in responding to the corresponding scale at each meeting programmed at each school. The teachers were given 60 days to complete that activity with the support of 2-3 visits by the Psychologists.

The scales were applied in all of the schools; they were scored and captured in a primary database by school and afterward in a global database. Both formats (parents-teachers) were matched, considering a "case" when both formats presented T-score scorings higher than 64 in inattention dimensions, in hyperactivity, or in both, which also permitted determining the ADHD subtypes and to evaluate the other dimensions of the scale (learning problems, problems of aggression and of socialization, as well as problems with executive functions).

Only schoolchildren identified as cases were referred to the medical institution responsible for the investigation delivering, at each academic center, a reference format of each student detected to their parents and programming their appointments with the Psychology and Child Psychiatry area on up to three occasions, and with a telephone reminder on up to 3.5 occasions. The parents of the schoolchildren taken to continue their evaluation were requested to provide a

signed consent form. The IQ of these schoolchildren was evaluated with the Wechler Intelligence Scale for Children Version IV (WISC-IV) in the area of Psychology, apply for programming in the test in two results on the Children Psychiatry Service of the Juan N. Navarro Children's Psychiatric Hospital in order to confirm the diagnosis and to initiate his/her treatment.

At the end of the investigation, a global report was delivered of the results on the cases and non-cases to the SEP authorities and to the principals and teachers of every academic center. These latter informed the participating parents, independently of whether or not a prior report had been delivered to the cases. The data were captured in a global database for their analysis.

RESULTS

The parents and teachers of 3,985 primary-school second-graders participated in the present study of a randomized sample 55 federal public schools (morning rotation) of Delegations in Mexico City; these Delegations were denominated "A" and "B": for Delegation "A", there were 25 (45.4%) schools, and there were 30 (54.5%) for Delegation "B", age of the schoolchildren was between 6 and 8 years, with an average age of 6.94±2.91 for the first and of 6.97±2.41 in the second. Responding to the questionnaires was higher on the part of the teachers of both Delegations, while the participation of parents and teachers was greater in Delegation "B", as well as the percentage of matched questionnaires (Table 1).

Of 2,832 matched questionnaires in both Delegations, 458 (16%) cases were positive, the hyperactive subtype was more frequent in both genders, and in both Delegations the masculine gender predominated, followed in frequency by the combined subtype in masculine gender in Delegation "A" and feminine gender in Delegation "B"(Table 2).

In relation to the other dimensions that permit the identification of the Conners 3 scale, both informants coincided with a greater percentage for "learning problems" and "for socialization", as well as for "learning problems and ex-

Table 1 Sociodemographic profile of the participants in the ADHD screening in two Mexico City Delegations

Socio-demographic variables		Delegations of Mexico City	
		"A"	"B"
Schools by delegation		25(45.4%)	30(54.5%)
Students by Delegation		2,034(51%)	1,950(49%)
Age			
	6 years	153(4%)	87(2%)
	7 years	1,854(46%)	1,835(46%)
	8 years	27(1%)	28(1%)
	Mean and Standard Deviation (SD)	6.94±0.291	6.97±2.41
Gender			
	Male	1,054(51.8%)	996(51.1%)
	Female	980(48.2%)	954(48.9%)
Questionnaire answered by parents		1,522(74.8%)	1,469(75.3%)
Questionnaire answered by teachers		1,672(82.2%)	1,725(88.5%)
Questionnaires paired by Delegation		1,416(69.6%)	1,416(72.6%)
Students with ADHD by Delegation		237(16.5%)	221(15.9%)

Table 2 Results of 458 cases detected with ADHD by 2,832 pairs of informants distributed by delegation, sex and subtype

ADHD subtype	Delegation "A"			Delegation "B"			
	male	female	subtotal	male	female	subtotal	total
Inattentive	32(1.10%)	35(1.21%)	67(2.31%)	31(1.09%)	26(0.91%)	57(2.00%)	
Hyperactive	50(1.72%)	49(1.69%)	99(3.41%)	45(1.58%)	42(1.48%)	87(3.07%)	
Combined	31(1.07%)	40(1.38%)	71(2.45%)	44(1.55%)	33(1.16%)	77(2.71%)	
Total			237(8%)			221(8%)	458(16%)

Table 3 Percentage of problems detected by both informants in four dimensions of the Conners 3 Scale

Conners 3 Scale dimensions	ADHD subtype	male	female
Learning problems			
	Inattentive	13(22%)	7(10.6%)
	Hyperactive	12(13.6%)	15(15.2%)
	Combined	10(13%)	14(20%)
Aggression problems			
	Inattentive	10(16.9%)	9(13.6%
	Hyperactive	24(27.3%)	15(15.2%)
	Combined	15(19.5%)	4(5.7%)
Problems with socializing			
	Inattentive	15(25.4%)	4(5.7%)
	Hyperactive	14(15.9%)	29(29.3%)
	Combined	21(27.3%)	25(35.7%)
Learning problems + Executive Function			
	Inattentive	18(30.5%)	11(16.7%)
	Hyperactive	18(20.5%)	19(19.2%)
	Combined	16(20.8%)	20(28.6%)

Table 4 Results of IQ level measured with Weschler Intelligence Scale for Children Version IV (WISC-IV) to 150 schoolchildren coming from the ADHD Screening using the short scales of Conners 3

Score level obtained by the WISC-IV	Núm.	%
High average (110-119)	3	1
Average (90-109)	70	47
Low average (80-89)	43	29
Border (70-79)	28	19
Very low average (less than 69)	6	4

ecutive functions in subjects of feminine gender with the hyperactive subtype, and "problems of aggression" in male schoolchildren with the hyperactive subtype (Table 3).

The 458 schoolchildren detected were referred to the Institution responsible for this study. Only 351 (76%) parents accepted to schedule an appointment with the specialists. In the end, only 150 completed their psychological evaluation. The IQ obtained in 70 (47%) of these was "average", with scores between (90-119) and low average (80-89) in 29% (Table 4).

Finally, only 127 subjects were taken to the Child Psychiatry Service; 91 (72%) received confirmation forms; their diagnosis of ADHD, 18% presented neurological problems, 13% other psychiatric disorders, and 5%, famil-

Table 5 Results of the evaluation by the Paidopsiquiatra of 127 students from the ADHD Screening

Affected area	Diagnosis	Results
	Confirmed ADHD	91(72%)
Neurological		
	Convulsive crises	2
	Enuresis	2
	Learning problems	6
	Language problem	6
	Mental retardation	2
Psychiatric		18(14%)
	Major depression	1
	Adjustment disorder	1
	Anxiety disorder	3
	Emotional disorder	3
	Nutritional disorder	1
	Other	4
Family		13(10%)
	Familial dysfunction	2
	Poor family management	3
		5(4%)
	Total	127(100%)

ial problems. No schoolchild without ADHD was evaluated by the Service in order to corroborate his/her diagnosis of non-case (Table 5).

DISCUSSION

The application of the Conners 3 scales to the entire population of parents and teachers of same-grade schoolchildren in a sample of 55 randomly selected schools implied a great, but feasible, effort, with the advantage that the instrument utilized contains 18 items that employ the DSM-IV for ADAH detection and some others to detect comorbility[18,19]. In addition to that the information obtained from parents and teachers is considered reliable[20], the participation of 75% for parents and of 85% for teachers was higher than that reported in other studies that is considered good, in that 100% has never been reached and, while this was reduced by matching the formats at 71%, this percentage also surpassed the reports made previously in this respect, considered as good[21].

The schoolchildren from both delegations present similar data with regard to number, age, and gender. Although the participation of the parents and teachers was discretely higher for Delegation B, with fewer schoolchildren, in terms of percentage, the rate of cases was similar, with a prevalence of 16%, similar to that published on Latin-American schoolchildren aged between 4 and 17 years, as well as an expected rate of higher than 15%, predicted for studies that were conducted for screening purposes with scales utilizing DSM-IV[5] criteria, as is the case of the Conners 3 scales.

Likewise, we coincide with other authors about the ADHD subtype denominated hyperactive with predominant repercussion in masculine gender, although the majority of studies refer that the inattentive subtype predominates in feminine gender. In this study, feminine gender was highlighted with the hyperactive subtype, followed by the combined subtype. This can be due to that currently, there are fewer restrictions the behavior of girls, which allows to identify hyperactivity, as other authors have referred[22-27]. Likewise, these ADHD subtypes are observed to be associated with a greater frequency of problems of learning, behavior, and socialization[28].

With respect to the decision to carry out the screening only in second-grade schoolchildren, it was taken into consideration that these comply with the criteria for detecting ADHD mentioned in the DSM-IV and that their age is the most favorable for detecting the disorder since, according to some authors, detection is not recommended at earlier ages due to the characteristics of the children's neurobiological development, the prefrontal cortex, and the executive functions, such as inhibition in the motor-control response, are not well developed, impeding clarity in the diagnosis[29].

Other authors have included in their ADHD screening studies, primary schoolchildren from first to sixth grade, or even from secondary school, causing a diminution in prevalence. However, the number of cases detected is greater in schoolchildren between the ages of 7 and 8 years, which correspond to the second grade[30]. The participating population in the two delegations was similar in relation to age and gender, and even though there were more children in Delegation "A", the cases of ADHD are similar in terms of percentage in both delegations. Similarly, there are reports that indicate that second-graders diminish their hyperactivity with respect to that demonstrated in first grade when they are not probable e candidates for suffering from the disorder[31].

Even when agreement in terms of identifying learning problems, executive functions, aggression, and socialization among the informants was poor in this study, these manifestations were more frequent for the hyperactive subtype with predominance in boys, as referred in other studies that reported comorbility that accompany the disorder[32-35], in addition to a poor quality of life, a situation that they share with the inattentive subtypes and the problems of learning and executive function, which predominate in the same subtypes[36].

The most important limitation in this study was the low participation of the parents presenting to corroborate the diagnosis, despite that 85.4% of parents recognize the disorder as a disease, even when symptoms of ADHD are detected in their children, they reject that their children are afflicted with the disorder, as reported by other authors[37].

In some investigations, the Intelligence Quotient (IQ) has been utilized for completing the identification of ADHD[31]. In this study, 47% presented an average and low average IQ of 27%, which can be related with deficit in executive functions, we consider our agreement with that the problem of these subjects is their lack of availability when faced with the task and not their lack of capacity[38].Thus, it is recommendable to evaluate, together with the detection of ADHD.

With even greater resistance, the parents refused to continue with their evaluation with the Child Psychiatrist, and only one third of the cases presented, that is, 127 (28%), confirming the diagnosis is 91 (72%) of the cases; the remainder also presented disorders related with the treatment of this specialty. The scarcity of the data and the lack of evaluation of the schoolchildren identified as non-cases impeded us from measuring the sensitivity and specificity of the positive Predictive Values (PPV) and Negative Predictive

Values (NPV), the scale, as had been done with other instruments[39].

Although the Psychiatrist is the ideal profession for treating these cases, there is evidence that the parents consider that the treatment should be conducted by a Psychologist and later, in order of frequency, by a Psychiatrist, or by a Pediatrician, and in addition the parents prefer a psychological treatment, which they consider to be more useful, exhibiting fear of seeing a Psychiatrist with the child: this could help to explain the low attendance with the latter specialist, to inform and further orient the parents and teachers on the diagnosis and treatment of the disorder, as is the case of the use of drug alternatives, such as Atomoxetin, which is accompanied by good efficacy and safety[40], thus rendering a screening task more efficient.

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CONFLICT OF INTEREST

We declare that there are no conflicts of interest.

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