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PREVALENCE OF ATTENTION-DEFICIT HYPERACTIVITY DISORDERS IN STUDENTS

COMPARISON BETWEEN DSM-IV AND NEUROPSYCHOLOGICAL CRITERIA

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ABSTRACT - Attention-deficit hyperactivity disorder (ADHD) is a common childhood condition, recognized as an important social-medical problem. The syndrome is characterized by motor system, perception, cognition and behavioral disturbances, compromising the learning of children with adequate intellectual potential. To investigate its prevalence in first grade pupils 484 children with DSM-IV diagnostic criteria and neuropsychological criteria were examined. The prevalence of ADHD was 18% when the diagnosis was made using DSM-IV criteria; 3.5% when neuropsychological criteria was used, including, in addition to behavioral and psychometric aspects, a discrepancy in the evolutionary neurological examination, and 3.9% when motor persistence was taken into account. The prevalence of ADHD was higher among older children (92.4 months) only when DSM-IV criteria were used. We conclude that the use of DSM-IV criteria probably overestimates the prevalence of ADHD, since it detects another behavioral disorders. In this context, they may be useful as screening, since they have adequate pre-testing performance.

KEY WORDS: attention-deficit hyperactivity disorder, diagnostic efficiency.

Distúrbio de hiperatividade com déficit de atenção em estudantes: comparação entre os critérios do DSM-IV e neuropsicológicos

RESUMO - O distúrbio de hiperatividade com déficit de atenção é uma condição frequente em crianças, sendo considerado importante problema médico-social. Caracteriza-se por distúrbios motores, perceptivos, cognitivos e comportamentais, que comprometem o aprendizado de crianças intelectualmente normais. Investigamos a prevalência do distúrbio em 484 estudantes de primeiro grau utilizando os critérios do DSM-IV e neuropsicológicos. A prevalência do distúrbio é 18% considerando-se os critérios do DSM-IV; 3,5%, considerando-se os critérios neuropsicológicos, incluindo, em adição aos aspectos psicométricos e comportamentais, a discrepância no exame neurológico evolutivo, e 3,9% considerando-se a persistência motora. A prevalência da síndrome foi maior nas crianças com mais idade (92,4 meses)com os critérios do DSM-IV e provavelmente foi superestimada, já que podem detectar outros distúrbios do comportamento. Neste contexto, o DSM-IV pode ser usado como rastreamento, desde que apresente adequada performance pré-teste.

PALAVRAS-CHAVE: distúrbio de hiperatividade com déficit de atenção, eficiência diagnóstica.

Attention-deficit hyperactivity disorder (ADHD) is a common condition in childhood. It is recognized as an important social-medical problem, being subject of vast investigation as to its determinants, diagnostic approaches, treatment and prevention strategy[1]. The syndrome is characterized by motor system deficit, low perception, and cognition and behavioral disturbance, compromising the learning of children with adequate intellectual potential[2-4].

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Table 1. Diagnostics criteria of ADHD, in the scholar period, according to neuropsychological aspects.

1. Hyperactivity
2. Poor motor coordination
3. Difficulty in concentration
4. Difficulty to maintain attention
5. Kept seat, mixing in small objects
6. Interferes on the activities of other children
7. Explosive temper
8. Fear not be accepted by school mates
9. Disturbs other children
10. Difficulty in learning
11. Evolutionary neurological examination without asymmetry
12. Altered tone: hypotonia or paratonia
13. Discrepant evolutionary neurologic examination, development, below the expected, at static equilibrium, appendicular coordination, sensibility and gnosis, motor persistence
14. Alteration at the subtest numbers, complete figures and the scale code WISC
From the items 1 until 10, at least, five may be present
The items 11, 13 and 14, may be always present
The motor persistence changed may be always present

This disorder has had different designations over time. Strauss and Lehtinen (1947) called it "minimal cerebral lesion". In a symposium held in Oxford (1962), the expression "minimal cerebral dysfuntion" was officialized. It was coined with the expression "attention disorder" with or without hyperactivity (DSM-III, 1980), changing to "attention-deficit hyperactivity disorder" (DSM-III-R, 1987), designation that has been maintained in DSM-IV (1994)[5-7]. However the recent revision of DSM-IV(1994)[7] mention three subtypes of ADHD: prevailing inattention; prevailing hyperactivity and combination of both. New diagnostics are proposed such as the "children's global assessment scale"[8] and the "ADHD knowledge and opinion scale"[9]. August and Garfinkel in a epidemiologic study with 1490 students observed that patients with ADHD diagnosis, according to DSM-III-R, could fit well in other diagnosis, such as behavioral disorder, challengeable oppositional disturbs and anxiety disorder, concluding that this criteria is not enough to make a precise diagnostic[10]. Baumgaertel et al. (1995) compared the different criteria of DSM-III, DSM-III-R and DSM-IV to conclude that many children diagnosed by these criteria need further evaluation, aimed at confirming ADHD and warranting an appropriate management.[11]

In the absence of homogeneous diagnostic criteria, and defective Brazilian epidemiological data related to prevalence of ADHD syndrome, we carried out this study, proposing a new diagnostic criteria, which considers neuropsychological aspects, in addition to DSM-IV criteria (1994) including findings of the evolutionary neurological examination (ENE)[12], psychometric aspects of behavior and difficulty in learning (Table 1).

METHOD

An observation study was performed based on a total number of 35,521 first grade students in elementary school, 64.7% of them registered in state-owned public schools, 11.9% in municipal schools and 23.4% in private

schools; a proportional random sample of 484 children was selected. This provided a 3% measurement precision (for 95% confidence) for an estimated prevalence of 10%.

The children were submitted to individual assessment performed at school: gender, age, color, weight, nutritional status, characteristics of the parents, neurological examination, ENE, performance in the numbers, completing figures and codes subtests from the WISC scale.

Neurological examination was perfomed in every child, considering psychism, language, facies, attitude, equilibrium, tonus, voluntary motricity, reflex and passive motricity, sensibility and cranial nerves. Children who did net fit normal neurological examination, were excluded.

ENE evaluates developmental neurological functions, and consists of: static (at rest) equilibrium, dynamic equilibrium, limb coordination, integrated brain sensory and motor activity, motor persistence, impulse control, gnosias, and body-limbs coordination, body-limbs synergy. ENE was considered normal when all tests for the seven year old children (middle age of first grade students in elementary school) were normal.

Behavior was evaluated by DSM-IV criteria (1994) and a quiz, answered by the teacher.

Three diagnostic criteria were used: the first one was called ADHD 1, and was based on the suggestion of the DSM-IV (1994); the second one ADHD 2, was based on the neuropsychologic criteria showed at Table 1, considering the ENE, psychometric behavioral changes and learning disorders. ADHD 3 followed the same criteria as ADHD 2, except for item 13 that considers motor persistence.

Consents were obtained from the State Education Bureau, Municipality and Private Schools Administration, and parents.

Children were tested individually in their own school and the evaluations took around 60 minutes. Examination were performed by a group of 10 medical doctors. Chi-square testing was used to determine the significance of associations among different variables. ANOVA was used for continuous variable. A two tailed p-alpha of 0.05 was considered significant.

Associations between gender, age, color and parental education with ADHD 1, ADHD 2 and ADHD 3 were tested.

RESULTS

Four hundred eighty four children were studied, 310 (64.7%) in state schools, 58 (11.9%) in municipal schools and 116 (23.4%) in private schools; 239 (49.4%) were male and 245 (50.6%) were female (Table 2). The mean age was 89.5 months, the oldest children being in municipal schools (mean age = 105.1 months) and the youngest in private schools (mean age = 83.5 months).

Weight and height were similar for boys and girls, but the first group was older. Four hundred (82.6%) children were white and 84 (17.4%) were not white (Table 3), this being the same proportion observed in Porto Alegre's population.

All children had normal neurological examination except for muscle tone, 35 children (7.2%) presented paratonias and 4 (0.8%) hypotonia, and language disturbance, 20 (8.4%) boys and 10 (4.1%) girls had dyslalia.

Table 2. Distribution of 484 Children by school and gender.

Gender	male		Female		Total	
School	N	%	N	%	N	%
State	145	46.8	165	53.2	310	64.7
Municipal	25	43.1	33	56.9	58	11.9
Private	69	59.5	47	40.5	116	23.4
Total	239	49.4	245	50.6	484	100

x2= 6.49; P= 0.039

Table 3. Color of children by school.

Color	White		Not White		Total	
School	N	%	N	%	N	%
State	258	83.2	52	16.8	310	100
Municipal	37	63.8	21	36.2	58	100
Private	105	90,5	11	9.5	116	100
Total	400	82,6	84	17.4	484	100

x2 = 19.46; p = <0.001

Table 4. Prevalence of ADHD according to the different diagnostic criteria in 484 children.

Criteria	N	%	CI
ADHD 1	87	18,0	14.7-21.7
ADHD 2	17	3,5	2.1-5.6
ADHD 3	19	3,9	2.4-6.1

Table 4 shows the prevalence of ADHD according to the diagnostic criteria. Table 5 shows the prevalence of ADHD-1, ADHD-2, ADHD-3 by school type, showing that in municipal schools there were more children ADHD-3. Table 6 shows the distribution of ADHD by gender, showing predominance of ADHD- 1 among boys. Table 7 shows that children with ADHD 1, according to the DSM-IV, were older.

Table 5. Prevalence of ADHD according to the different diagnostic criteria by school.

School	Total		State		Municipal		Private		x^2	p
ADHD	N	%	N	%	N	%	N	%		
ADHD 1	87	18.0	56	18.1	15	25.9	16	13.8	4.50	0.212
ADHD 2	17	3.5	12	3.9	4	6.9	1	0.9	4.48	0.106
ADHD 3	19	3.9	13	4.2	5	8.6	1	0.9	6.33	0.042

Table 6. Prevalence of ADHD according to the different diagnostic criteria by gender.

Gender	Total		Male*		Female**		x^2	p
ADHD	N	%	N	%	N	%		
ADHD 1	87	18.0	60	25.1	27	11.0	15.33	<0.001
ADHD 2	17	3.5	8	3.3	9	3.7	0.00	1.000
ADHD 3	19	3.9	10	4.2	9	3.7	0.00	0.956

*Total of male: 239; **Total of female: 245.

Table 7. Mean age, in months, of children with ADHD.

ADHD	Condition (n)	Age	F	p
ADHD 1	Yes (87)	92.4 (10.7)	8.62	0.003
	No (397)	88.6 (10.9)		
ADHD 2	Yes (17)	87.5 (3.9)	0.48	0.488
	No (467)	89.4 (11.11)		
ADHD 3	Yes (19)	88.7 (5.2)	0.06	0.808
	No (465)	89.3 (11.1)		

On Tables 8, 9 and 10, DSM-IV diagnostic performance was analysed using the neuropsychological criteria as gold standard.

DISCUSSION

Paine[13] pointed out that minimal brain dysfunction is the most common neurologic illness of childhood, presenting a 5% to 10% incidence, being more frequent than cerebral palsy (0.5%), epilepsy (0.5%), and mental retardation. Attention disorder has a prevalence of approximately 3% to 10% in children and is 10 times more common in boys[14-17].

Table 8. Table of contingency used to guess diagnostic performance of DSM-IV criteria

		ADHD 2		ADHD 3		Total
		Present	Absent	Present	Absent	
ADHD 1	Present	14	73	16	71	87
	Absent	3	394	3	394	397
Total		17	467	19	465	484

Table 9. Sensitivity and specificity (%) of ADHD DSM-IV dignosis, taking neuropsychological criteria as gold-standard.

Gold-Standard	Sensitivity %	Specificity %
ADHD 2	82	84
ADHD 3	84	85

Table 10. Predictive values for ADHD 2 and ADHD 3 diagnosis by DSM-IV ADHD diagnosis.

Gold-Standard	Positive predictive value	Negative predictive value
ADHD 2	16	99
ADHD 3	17	99

Bird at al.[8], in an epidemiological study of 386 children in Puerto Rico, found that 49.5% of them met some of the DSM-III-R diagnostic criteria for ADHD. Stanford at al.[18], found a prevalence of 1% to 18% of psychiatric disease, school and social impairment in children from Ontario between ages 6 and 16 years old. However the studied population was not homogeneous, since it had children with attention disorder and either psychiatric problems or not. Faraine et al.[J9], using different evaluation criteria for ADHD report more accurate diagnoses. August and Garfinkel[10] reinforced that is very important to include other diagnostic criteria for ADHD in addition to the ones listed by DSM-III-R. They pointed that other disturbances, most frequently conduct disorder, oppositional defiant disorder, and anxiety disorder, may be included.

Several different approaches were used in our study or ADHD diagnosis, being the neurological aspects the most important[12,20-24].

A significant difference in the prevalence of ADHD was found in first grade children of Porto Alegre when DSM-IV and neuropsychological criteria were used. It was felt that the ADHD diagnosis is overestimated by DSM-IV. This interpretation agrees with August and Garfinkel [10]. They recommend to use DSM-III-R criteria only as screening for ADHD.

In this study the DSM-IV criteria were compared with neuropsychological criteria, and it was found that DSM-IV would be more useful as a screening tool, based on its sensitivity and specificity. However its positive predictive value is low, meaning that many children diagnosed by DSM-IV criteria would be excluded by neuropsychological tests. The prevalence of ADHD diagnosis, using DSM-IV, was 18% (CI= 14.7-21.7) and 3,5 % using the neuropsychological criteria. This shows that DSM-IV criteria overestimate the prevalence, probably by including other behavioral disorders. ADHD is more prevalent in boys when DSM-IV criteria are used. This difference was not seen in our study when children were evaluated using neuropsychological criteria. Although boys probably respond more with hyperactivity and inattention to psychological and environmental stresses than girls, they actually do not present more ADHD.

The study measured with significant acuity the prevalence of ADHD in first grade scholars in Porto Alegre, concluding: the prevalence of ADHD measured by neuropsychological criteria is smaller than measured by behavioral criteria (DSM-IV); in combination with the neuropsychological diagnostic criteria, the altered motor persistency always detect children with ADHD; the increased prevalence of ADHD in boys is seen only when DSM-IV criteria are used; children age is higher when DSM-IV criteria are used.

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