

## Original Article

## Distribution of Symptoms of Attention Deficit-Hyperactivity Disorder in Schoolchildren of Shiraz, South of Iran

Ahmad Ghanizadeh MD\*

**Background:** This study was conducted to study the prevalence rate of attention deficit hyperactivity disorder symptoms and differences between subtypes in school age children of Shiraz, south of Iran.

**Methods:** A random sample of 2000 school age children from both genders was selected. A parent-completed, DSM-IV-referenced rating scale of attention deficit hyperactivity symptoms was used.

**Results:** About 10.1% of participants obtained screening cutoff scores for attention deficit hyperactivity; 13.6% in boys and 6.5% in girls. The most common type of probable attention deficit hyperactivity in boys and girls was the hyperactive-impulsive type of attention deficit hyperactivity and the least frequent type was the combined type of attention deficit hyperactivity.

**Conclusion:** The rate of probable attention deficit hyperactivity in Shiraz, southern Iran is very similar to other counties and it is more common in boys than girls.

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**Keywords:** Attention deficit hyperactivity disorder (ADHD) • Iran • prevalence • schoolchildren • symptom

### Introduction

Attention deficit hyperactivity disorder (ADHD) is one of the most common psychiatric disorders in children and adolescents. Inattention, hyperactivity, and impulsivity are the three dimensions of ADHD.<sup>1</sup> These dimensions are included in the criterion A for ADHD. It is supposed that the checklist directly based on the diagnostic and statistical manual of mental disorders (DSM-IV) criteria could represent the best available means to determine the symptomatic dimensions conforming to the ADHD syndrome.<sup>2</sup> A community-based study on 1077 elementary schoolchildren in Regensburg, Germany reported a prevalence rate

of 17.8% for ADHD.<sup>3</sup> A study in Ukraine used the parent-completed DSM-IV-referenced rating scale to survey the prevalence of ADHD symptoms on 600 children aged 10 – 12 years. They reported the screening prevalence of ADHD of 19.8%; 7.2% for inattentive (I), 8.5% for hyperactive-impulsive (HI), and 4.2% for combined (C) type of the disease.<sup>4</sup> The rate was much higher than 9.7% for their US sample or 8.3% for 11 – 13-year-old community-based sample, which used a similar parent-completed DSM-IV-referenced symptom checklist.<sup>5</sup> The gender ratios of boys to girls for different types of ADHD were 1.9:1 for ADHD-I, 2.4:1 for ADHD-HI, and 2.6:1 for ADHD-C.<sup>4</sup>

A study on preschool aged children in Iran reported that the prevalence of ADHD is 12.3% (95% confidence interval (CI): 10.3 – 14.2%).<sup>6</sup> The reported boys:girls ratio is 2.6 times. Another study on 428 school age children in Zanjan by a questionnaire, which was completed by the parents revealed a prevalence rate of 9.1%.<sup>7</sup>

The objective of the current study was to survey the prevalence rate of ADHD symptoms in school age children in Shiraz, South of Iran and to

**Author's affiliation:** \*Director, Research Center for Psychiatry and Behavioral Sciences, Shiraz University of Medical Sciences, Hafez Hospital, Shiraz, Iran.

**Corresponding author and reprints:** Ahmad Ghanizadeh MD, Department of Psychiatry, Research Center for Psychiatry and Behavioral Sciences, Hafez Hospital, Shiraz, Iran.

Telefax: +98-711-627-9319

E-mail: ghanizad@sina.tums.ac.ir; ghanizadeha@hotmail.com

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examine the distribution of the symptoms according to ADHD subtypes.

## Materials and Methods

### Subjects

The children were selected from primary schools in Shiraz, south of Iran. The schools were grouped according to four district residential areas. The schools in each area were listed and then selected for the study at a gender stratified random sampling. Then, the classes were also randomly selected by age stratified. The calculated sample size was 1200 (99%CI). The children with special education including mental retardation, cerebral palsy, autism, and significant sensory defects were not included. Children with cerebral palsy and autism are screened before entering primary schools and usually directed to special education groups or special institutions. However, a researcher attended the schools and identified those children with cerebral palsy or severe sensory deficits and excluded them. The data were gathered accompanying a study on pervasive developmental disorders symptoms in the children.<sup>8</sup>

Association between income and education level or job is not so strict in Iran. So, socioeconomic status (SES) scales such as the Four-Factor Hollingshead Scale cannot be used.<sup>9</sup> Therefore, the city was considered as consisting of 4 residential areas. It was supposed that students of a school are usually belonging to similar SES.

### Measurement

The ADHD checklist of child symptom inventory-4 (CSI-4) was used for assessment of ADHD symptoms.<sup>10-12</sup> It is a screening test for behavioral symptoms of many DSM-IV children disorders including ADHD.<sup>1</sup> The ADHD symptoms contained 18 items including nine for ADHD-I, and nine for ADHD-HI; all of the items are used for ADHD-C. Each symptom was scored on a Likert scale consisting of four choices of "never," "sometimes," "often," and "almost always." The scoring procedures for screening is through counting the symptoms (categorical model) with a score of 0 for "never/sometimes," and 1 for "often/ almost always." The maximum score is nine and minimum score is zero for each dimension. It was given to the students to be filled in by their parents. This standard instrument has been used in similar studies for survey of the

prevalence of ADHD symptoms in other countries such as Turkey and Ukraine.<sup>13,4</sup>

### ADHD subtype criteria

Students with total scores of  $\geq 6$  on the "inattention" dimension were considered to have probable inattentive types of ADHD (ADHD-I). Students with scores of  $\geq 6$  on the "hyperactivity-impulsivity" dimension were considered to have hyperactive-impulsive type of ADHD (ADHD-HI). Students with scores of  $\geq 6$  on both dimensions were regarded as having combined type of ADHD. This analysis allowed to estimate the number of cases in each subtype.

Another scoring system is scored on a scale of 0 (never), 1 (sometimes), 2 (often), and 3 (almost always). Total scores ranged from a minimum of 0 to a maximum total of 54. This system of scoring is used to determine the severity of symptoms.

The ADHD checklist of CSI-4 had been translated to Persian and back translated into English. Its content validity had been confirmed by several child and adolescent psychiatrist and psychologists.<sup>14,15</sup> Its convergent and discrimination validities were enough. The alpha coefficients were found to be 0.81, 0.85, and 0.83 for DSM-IV ADHD-I, ADHD-HI, and combined type of ADHD (ADHD-C), respectively.<sup>15</sup> It has an enough sensitivity and specificity for each of the subtypes of predominantly inattentiveness, predominantly hyperactive impulsiveness, and combined type.<sup>14</sup> More information about the factor structures, reliability (internal consistency), discriminative, and convergent validities of the Persian-speaking parents' ADHD rating were mentioned elsewhere.<sup>15</sup>

### Procedure

All of the principals of the selected schools agreed and permitted to contact the students' parents. The purpose of this survey was explained to the principals and the parents ensuring them that the collected information will be used for a better understanding of the characteristics of the schoolchildren and will be confidential. Their taking part in the study was voluntary. The parents were asked to fulfill the DSM-IV ADHD Checklist. They received and returned back the checklist within one week through the school. Oral informed consent was given by the parents.

### Analysis

The data analysis was conducted using SPSS

12.5 program. Association of scores according to gender and age was analyzed. Comparison of the scores between the different groups was analyzed by One-way analysis of variance (ANOVA).

## Results

### Demographic characteristics

1680 out of 2000 the DSM-IV ADHD checklists were returned. About 80 checklists were not included in the analysis because they were not answered completely. The reasons and characteristic of their children of the parents who did not respond were unclear and it was not possible for the author to identify them. Fifty percents of the students were girls (Table 1). Their age groups were 7-year olds, 8-year olds, 9-year olds, 10-year olds, and 11 to 12-year olds. The mean age of the students was 9.1 (SD=1.4) (boys: 9.2±1.4, girls: 9.0±1.5).

### Symptom severity

The results of comparison of scores stratified by gender, educational grade, and residential place are shown in Tables 2 and 3. The total score as well as the hyperactivity-impulsivity score were different between the genders, educational classes, and residential areas. Inattentiveness type score of the ADHD checklist was significantly different between genders and educational classes. However, it was not different between the regional areas.

The severity of symptoms in the boys with ADHD-I or ADHD-HI was more than that in girls. Also, the severity of symptoms in grade I with ADHD-I or ADHD-HI was more than that in the other grades (Table 2).

Regarding to ADHD-C, the severity of

symptoms in boys was significantly more than girls. Furthermore, the severity of symptoms in grade I is higher than the other groups. The mean total score of the ADHD checklist in boys was more than girls (Table 3).

### Probable ADHD

The frequency of students who diagnosed as “probable ADHD” is shown in Table 4. ADHD was found in about 10.1% of the students. The rate was 13.6% in boys and 6.5% in girls ( $\chi^2=22.4$ ,  $df=1$ ,  $P<0.001$ ). The most common type of probable ADHD in boys and girls was ADHD-HI and the least frequent type was ADHD-C type.

The prevalence of ADHD subtypes was 5.0% (n=80) for ADHD-HI, 3.6% (n=57) for ADHD-I, and 1.5% (n=24) for ADHD-C.

### Children who have “probable ADHD”

The most frequent symptoms in children with “probable ADHD” were the 14<sup>th</sup> and the eighth symptoms: “Is often on the go or often acts as if driven by a motor” (77.6%) and “Is often easily distracted” (74.5%).

### Children who have “probable ADHD-I”

The most frequent symptoms in probable ADHD-I children were the sixth, first, and fifth symptoms: “Often avoids, dislikes, or doesn’t want to do things that take a lot of mental effort for a long period of time (such as schoolwork or homework)” (86.0%), “Often does not give close attention to details or makes careless mistakes in schoolwork, work, or other activities” (84.2%), “Often has trouble organizing activities” (84.2%). The order of the frequency of symptoms for inattentiveness was 6>1=5>8>2>4>3>7=9.

### Children who have “probable ADHD-HI”

The most frequent symptoms in children with probable ADHD-HI were the 14<sup>th</sup> and the 15<sup>th</sup> symptoms: “Is often on the go or often acts as if driven by a motor” (87.5%), and “Often talks excessively” (86.3%). The order of the frequency of symptoms for hyperactivity-impulsivity was 5>6>3>4>7>8>2>9=1.

### Children who have “probable ADHD-C”

The most frequent symptoms in children with probable ADHD-C were the fifth, the 11<sup>th</sup>, and the 14<sup>th</sup> symptoms: “Often has trouble organizing activities” (87.5%), “Often gets up from seat when remaining in seat is expected” (87.5%), and “Is

**Table 1.** The characteristics of the schoolchildren.

Characteristics	n	%
Gender		
Boys	800	50
Girls	800	50
Grade		
I	320	20.0
II	322	20.1
III	319	19.9
IV	318	19.9
V	321	20.1
Residency region		
I	400	25.0
II	402	25.1
III	399	24.9
IV	399	24.9

**Table 2.** Score severity of the students on the probable inattentive and hyperactive-impulsive types of ADHD checklist stratified by gender, educational level, and residential area.

Variable	Mean	SD	95% Confidence interval		P value
			Lower	Upper	
Inattentive type ( <i>n</i> =57)					0.001
Boys	7.2	5.4	6.8	7.6	
Girls	5.8	4.6	5.5	6.1	
Educational grade					0.04
I	7.2	5.2	6.6	7.8	
II	6.3	4.8	5.7	6.8	
III	6.5	4.8	5.9	7.0	
IV	6.5	5.2	5.9	7.1	
V	6.0	5.1	5.4	6.6	
Residential region					0.1
I	6.8	4.6	6.3	7.3	
II	6.0	4.5	5.5	6.4	
III	6.6	5.4	6.1	7.1	
IV	6.6	5.3	6.0	7.1	
Hyperactive-impulsive type ( <i>n</i> =80)					0.001
Boys	7.9	6.1	7.5	8.3	
Girls	6.0	5.3	5.6	6.4	
Educational grade					0.04
I	7.9	5.8	7.2	8.5	
II	6.5	5.5	5.9	7.1	
III	7.1	5.5	6.5	7.7	
IV	6.8	5.8	6.1	7.4	
V	6.5	6.1	5.8	7.1	
Residential region					0.03
I	7.2	5.6	6.7	7.8	
II	6.2	5.0	5.7	6.7	
III	7.1	6.2	6.5	7.7	
IV	7.2	6.1	6.6	7.8	

often on the go or often acts as if ‘driven by a motor’” (87.5%).

The different types of probable ADHD were not associated with the educational class ( $\chi^2=5.7$ ,  $df=4$ ,  $P=2.1$ ).

Probable ADHD was associated with residential areas of the students. It was found less frequent in the second residential area ( $\chi^2=8.8$ ,  $df=3$ ,  $P<0.03$ ).

While it was about 6.2% in the second residential area, the rates in the other three areas was about 11.0%. Of course, none of the subtypes of the probable ADHD was associated with the residential area.

## Discussion

Only one DSM-IV criterion of ADHD was

**Table 3.** Score severity of the combined-type of ADHD stratified by gender, educational level, and residential area.

Variable	Mean	SD	95% Confidence Interval		P value
			Lower	Upper	
Gender					0.001
Boys	15.1	10.4	14.4	15.8	
Girls	11.9	8.9	11.2	12.5	
Educational grade					0.001
I	15.2	9.8	14.1	16.2	
II	12.8	9.3	11.8	13.8	
III	13.6	9.1	12.6	14.6	
IV	13.3	10.2	12.6	14.5	
V	12.5	10.3	11.4	13.5	
Residential region					0.03
I	14.1	9.3	13.1	15.0	
II	12.3	8.5	11.4	13.1	
III	13.7	10.6	12.7	14.8	
IV	13.9	10.6	12.8	14.9	

**Table 4.** Prevalence of probable ADHD in the different groups of the students ( $n=1600$ ).

	Combined		Inattentive		Hyperactive-impulsive		Total	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Gender								
Boys (800)	20	2.5	40	5	49	6.1	109	13.6
Girls (800)	4	0.5	17	2.1	31	3.9	52	6.5
Grade								
I	6	1.9	15	4.7	20	6.3	41	12.8
II	4	1.2	10	3.1	13	4	27	8.4
III	3	0.	12	3.8	19	6	34	10.7
IV	4	1.3	11	3.5	19	6	34	10.7
V	7	2.2	9	2.8	9	2.8	25	7.8
Residential areas								
I	7	1.8	14	3.5	25	6.3	46	11.5
II	2	0.5	11	2.7	12	3	25	6.2
III	8	2	14	3.5	22	5.5	44	11.0
IV	7	1.8	18	4.5	21	5.3	46	11.5

included in the current study. Therefore, it should be emphasized that the results of this study only refer to the ADHD symptoms and not to the ADHD disorder. The results should be considered as the estimated or screening prevalence and many false positive results may be included.

The rate of probable ADHD according to the evaluations of the parents was 10.1%. This is very close to the results of a similar study done in Turkey on the primary school age students. They reported a prevalence rate of 9.55% for ADHD, 3.03% for ADHD-I, 4.38% for ADHD-HI, and 2.14% for ADHD-C.<sup>13</sup> The similar studies in Colombia and Ukraine also reported that ADHD-HI was more frequent than ADHD-I and ADHD-C. In addition, ADHD-I was less frequent than the other two types in the both studies.<sup>2,4</sup> The prevalences of ADHD subtypes were also very similar to our findings. In another words, in the all of the above mentioned studies, ADHD-HI type is the most common type and the prevalence of ADHD-C was lower than the other types.<sup>2</sup> ADHD-I has been reported as the most common in some other studies from US and Australia.<sup>16,17</sup> This difference might be related to the different age group of the subjects.

The prevalence of "probable ADHD" in boys was reported as almost two times that in girls. All the types of the "probable ADHD" were more common in boys than girls. There are many studies which reported a higher percentage of ADHD in boys.<sup>16-18</sup> The reported male:female ratio in two Turkey's studies was 1.8 and 1.5 times.<sup>13,2</sup> Another similar study using a checklist reported that 54 of 272 (19.8%) boys and 33 of 268 (12.3%) girls received a tentative diagnosis of ADHD.<sup>2</sup> The rate of ADHD in the current study was also lower than

the rate reported from Ukraine. Those rates were much higher than the current study. The first study included preschool age children and there is a higher rate of ADHD in preschool than school age.<sup>16</sup> However, the study from Ukraine used the same checklist but the children aged from 10 to 12 years. The lower rate in the current study may show that the symptoms included in the ADHD checklist may be more acceptable in Iran than in Colombia. The similar rate with Turkey may show that the acceptability of the symptoms in Iran and Turkey is similar. In another words, the pattern of ADHD symptoms in Iran is more similar to Turkey rather than Colombia. The other possible explanation for the lower rate in Iran might be the actual lower rate in the culture in this country.

In the Turkey's study, the most frequent symptom in ADHD children was "Is often easily distracted." It was also one of the two most common symptoms in the current study. In both studies, the symptom of "Often does not give close attention to details or makes careless mistakes in schoolwork, work, or other activities" was one of the most common symptoms in children with ADHD-I. In the current study, the most frequent symptoms in children with ADHD-HI were "Is often on the go or often acts as if driven by a motor" and "Often talks excessively." However, in the Turkey's study the most frequent symptoms in the hyperactivity-impulsivity symptom list of 46 students with ADHD-HI were "Often fidgets with hands or feet or squirms in seat" and the sixth symptom: "Often talks excessively." It is interesting that the Turkey's study used the same instrument on the same age group of the children and both of the countries are in the same region.

There is a recently published study on pre-

school age children in Iran which reported a higher rates than current study's findings.<sup>6</sup> Of course, if the four additional ADHD DSM-IV criteria (B through E) were also included, the prevalence would obviously further decreased. Also, in young children it is especially difficult to establish the diagnosis of ADHD.<sup>1</sup>

One of the limitations of our study was that we used only one measuring instrument. The criteria from the DSM pertaining to impairments, pervasiveness of symptoms in different settings, and age at onset were not included in this study. Therefore, the findings are only about the level of symptoms. However, the instrument was the standard ADHD DSM-IV diagnostic criteria checklist that has been used in many similar studies.<sup>13,2</sup> On the other hand, a study about children with school refusal using DSM-IV diagnostic criteria reported that ADHD was one of the most common co-morbid psychiatric disorders and its rate was 50%.<sup>19</sup> The demographic characteristics of the subjects who did not completely fill in the questionnaire were not indicated. So, the author could not compare their characteristics with those who responded. Of course, the rate for these subjects was not high and therefore, its possible effect on the results could be small. Interpersonal and parent child relationship in family of children with ADHD is more conflicting and less organized.<sup>20</sup> Even, these children experienced more accidental injuries than the general population.<sup>21</sup> It is possible that some of the parents who had not returned back the questionnaire had children with ADHD and the actual rate might be even more than the presented findings. Meanwhile, many of the parents of children with ADHD do not believe that their child behavior is not normal and there is a significant delay to refer them for treatment.<sup>22</sup> It is possible that some children with ADHD may have other disorders masquerading as ADHD. About two-thirds of the children with ADHD had co-morbid oppositional defiant disorder. Previous study indicated that ADHD without co-morbid psychiatric disorder is rare and only 7.6% of the boys and 21.7% of the girls manifested ADHD without any other psychiatric co-morbidity.<sup>23</sup> Diagnostic confounds may arise halo effects resulting in over identification of ADHD symptoms in children who are oppositional and disruptive or children with anxiety disorders may appear inattentive, but may not actually have ADHD.<sup>24,25</sup> Pediatric bipolar disorder and ADHD can occur concomitantly. Their differentiation is challenging and contro-

versial because there is overlap of their symptoms.<sup>26</sup> This limitation is applicable for nearly all of the above-mentioned studies.<sup>2,4,13</sup> However, the clinical assessment in accompany with this instrumental assessment was done before in Iran and it has shown that the instrument have an enough validity, reliability, sensitivity, and specificity.<sup>14</sup> There are few studies about the distribution of symptoms of ADHD in school age children from Iran. In addition, studying of the cultural differences of the ADHD finding might be important.

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