

# The National Prevalence of Attention Deficit Hyperactivity Disorder (ADHD) Symptoms and its Comorbidities Among Children in Bahrain

Ahmed Malalla Al-Ansari, MBCHB, FRCPC\* Mohamed K Al-Medfa, MD\*\* Khaldoon A Al-Roomi, MD, M.Sc, Ph.D \*\* Wafa E Al-Sharbati, MD, MSc, DLSHTM\*\*\*Amer Almarabbeh, Ph.D\*\* Eman Haji, MD\*\*\*\* Muna Ahmed Almohri, MD\*\*\*\*\* Nabeel A Sulaiman, Ph.D\*\*\*\*\* Haitham Jahrami Ph.D\*,\*\*\*\*\*

## ABSTRACT

**Background:** The national prevalence of ADHD among school-age children in Bahrain is unknown.

**Objective:** The aim of this study was to determine the prevalence of ADHD and its comorbidities among school-aged children of 6–12 years.

**Methods:** The study used a cross-sectional design with a convenience sample of children attending eight primary health care centers and covering all four governorates in Bahrain. The total sample size needed was calculated using a prevalence rate of 5% (expected number 438). Children attending routine health screening evaluations were recruited into one of two groups. One group (n = 300) comprised children aged 6–7 years, and a second group (n = 150) comprised children aged 10–12 years. The gender representation in both groups was equal. All the children's mothers agreed to participate in the first stage of the interview in which they completed the brief Conners index. Participants whose score was above 15, out of a possible 30, were interviewed by a psychologist, and their mothers were asked to complete the parents' and teachers' Conners test.

**Results:** For both groups, the total ADHD prevalence was 4.22%; in Group 1 it was 5%, and in Group 2 it was 2.22%. The male: female ratio was 2.22:1. The prevalence of oppositional defiant disorder among children with ADHD was 52.6%, and the prevalence of conduct disorder was 36.3%.

**Conclusions:** This is the first national study in Bahrain on the prevalence of ADHD using a two-stage sampling technique. At 4.22%, the prevalence was comparable to that of other studies using similar methods.

**Keywords:** ADHD, Bahrain, comorbidity, prevalence, school-age children

## INTRODUCTION

Attention-deficit hyperactivity disorder (ADHD) is a neurodevelopmental disorder that consists of developmentally inappropriate inattentiveness, hyperactivity, and impulsivity. It is the most common psychiatric disorder encountered in children's outpatient clinics<sup>1</sup>. ADHD significantly impairs school performance, social relationships, and family functioning<sup>2</sup>. Moreover, ADHD exhibits a correlative relationship with other psychiatric disorders, such as anxiety, oppositional defiant disorder, conduct disorder, and substance abuse<sup>3</sup>. The diagnosis of ADHD is a clinical one, made by utilizing the Diagnostic and Statistical Manual of Mental Disorders, 5th edition (DSM-V), the American Psychiatric Association criteria, supported by parents or teachers, or the self-report Conners test<sup>4,5</sup>.

Globally, it has been estimated that approximately 5% of children and adolescents are affected by ADHD<sup>6</sup>. The estimated pooled prevalence of adult ADHD is 2.5%<sup>7</sup>. A systematic review and meta-regression

analysis of 154 original studies that covers 30 years found heterogeneity between studies but no relationship between the estimates of prevalence and the year of study or with the geographical relationship. In addition, there was no evidence suggesting an increase in the number of children who meet the criteria for ADHD<sup>6</sup>. Another review by Willcutt in 2012, in which 86 studies from 9 countries were examined, revealed a pooled estimate of 5.9% to 7.1%. Again, there was great heterogeneity between studies, which was not related to country or region<sup>8</sup>. A study from the United States in 2016, revealed that an estimated 6.1 million U.S. children of 2–17 years of age had, at least once, received an ADHD diagnosis from a healthcare provider, and of those, 5.4 million children currently had ADHD, which is equivalent to 89.4% of all children who had ever been diagnosed, and 8.4% of all U.S. children between 2 and 17 years of age<sup>9</sup>.

In the Arab world, estimates of the prevalence of ADHD, as drawn from 22 articles, range from 1.3%–16%; the hyperactivity-impulsive

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\* Department of Psychiatry, College of Medicine and Medical Sciences  
Arabian Gulf University, Kingdom of Bahrain.  
E-mail: haitham.jahrami@outlook.com

\*\* Department of Family and Community Medicine  
College of Medicine and Health Sciences  
Arabian Gulf University, Kingdom of Bahrain

\*\*\* Directorate of Health Promotion, Ministry of Health, Kingdom of Bahrain.

\*\*\*\* Directorate of Public Health, Ministry of Health, Kingdom of Bahrain.

\*\*\*\*\* Mother and Child Services, Primary Healthcare Centres, Kingdom of Bahrain.

\*\*\*\*\* Special Education

Bahraini Association for Intellectual Disability and Autism, Kingdom of Bahrain.

\*\*\*\*\* Government Hospitals, Kingdom of Bahrain.

type of ADHD has a prevalence of 1.4%–7.8%, and the inattentive type a prevalence of 2.1%–2.7%. It is evident that the prevalence is higher among males and in those with a history of psychiatric illness, poor school performance, sleep problems, and nocturnal enuresis<sup>10</sup>. A systematic review of the prevalence of ADHD conducted in IRAN, shows a prevalence of 3.17% to 17.3% among school-aged children. This wide range was attributed to the use of different measures<sup>11</sup>. Recent studies from Northern India and Nigeria reveal prevalence's of 8.8% and 12.4%, respectively, among children 6–11 years of age,<sup>12,13</sup>. To the best of our knowledge, no previous attempt has been made to quantify the prevalence of ADHD in the Kingdom of Bahrain.

## METHODS

### Design and Study Sample

A cross-sectional survey design was selected for the study, and convenience sampling was employed. The sample consisted of 450 children who were recruited during routine assessments at local health centers in four governorates in the Kingdom. The sample was split into two groups, which were dictated by the assessment category. The first was the school entry category, which consisted of 300 children aged 6–7 years, who were attending their school entry assessment appointments. The second was the intermediate school entry category, which consisted of 150 children aged 10–12 years, who were attending their intermediate school entry appointments. A total of eight health centers were included in the recruitment process. To ensure robustness, the research team recruited two health centers from each of the four governorates, and it ensured that the two health centers from a particular governorate represented different sub-samples (i.e., one governorate was represented by two health centers: one targeting children 6–7 years of age and the other targeting children 10–12 years of age). Additionally, the researchers ensured equality with regards to gender, with each sub-sample having an equal number of both genders (primary school category: 150 males and 150 females; middle school category: 75 males and 75 females).

### Inclusion Criteria

The following inclusion criteria were applied:

- Bahraini children of age 6–12 years, of both genders, who were attending their local health centers in four different governorates in the Kingdom of Bahrain.
  - The targeted age range was congruent with the health center assessment appointment category.
- Assessment at 6–7 years of age (school entry)  
 Assessment at 10–12 years of age (intermediate school entry)

### Exclusion Criteria

- Non-Bahraini
- Children who were more than 12 years of age or less than 6 years of age

### Sample Size Calculation

The minimum sample size required to estimate the prevalence of ADHD was calculated using the following formula:

$$n = Z^2 \frac{p(1-p)}{d^2}$$

where  $n$  is the desired sample size;  $Z$  is the standard normal deviate, set at 1.96 corresponding to the 95% confidence level;  $d$  is the degree of accuracy desired, set at 0.025; and  $p$  is the expected prevalence of ADHD among children in Bahrain, which was set at 5%. Therefore,  $n = 3.8416 (0.05 \times 0.95) / (0.025^2) = 292$ . To account for the design effect

with multistage sampling, we multiplied the estimated sample size by 1.5 to yield 438.

## Survey Instruments

### The Conners ADHD Index - Arabic Version

The Conners ADHD index consists of 10 items. It has been proven to be the best for differentiating children with ADHD from children in the general population. Moreover, it is particularly useful as a quick check for determining whether further evaluation is warranted, and also for screening purposes.

A total score is derived from the scale, and if the cutoff score of 15 is met, a positive case is established<sup>14</sup>.

### The Long Form of the Conners 3 Rating Scale: The Parent and Teacher Report Forms

This scale provides a thorough and focused assessment of ADHD and its most common comorbid disorders. Conners 3 is a multi-informant assessment of children and adolescents between 6 and 18 years of age, which considers home, social, and school settings. Scales that relate directly to the DSM-V diagnostic criteria for ADHD are included, and also for the comorbid disorders most frequently occurring. The parent report form contains 10 items (108 points) and focuses on the child's behavior, both at home and in other environments where the parent has the opportunity to observe the child.

The teacher report form covers 113 points that elucidate the child's academic, social, and emotional behaviors in the school setting. The ratings on both these forms are on a 4-point scale ranging from 0 (not at all/seldom, never), to 3 (very much true/very often/very frequent)<sup>5</sup>.

### Procedures and Ethical Considerations

An Arabic version of the Conners ADHD index screening test, which has been used in similar studies, was distributed to the parents of children attending the routine assessment appointments. Written informed consent was obtained from all parents before commencement of the survey, and the purpose of the study, its voluntary nature, and their right to withdraw at any time were all explained. The participants were also assured that the information would be treated as confidential and that their identities would be concealed. When children scored 15 or above on the Conners ADHD Index, their parents were given the Arabic version of the parents' and teachers' long forms of the Conners 3 rating scale. The parents were asked to give the teachers' form to the child's teacher to complete. A member of the research team was tasked with following up with the parents for the collection of the teachers' forms.

Ethical approval was obtained from the Ethical and Research Committee of the College of Medicine and Medical Sciences at the Arabian Gulf University and from the Ethical Committee of the Primary Health Care Department at the Ministry of Health, dated 28 December 2021, reference no E34-PI-12-21.

### Statistical Analysis

The data were analyzed using the statistical package for social science, version 28<sup>15</sup>. Descriptive statistics were utilized for the demographic characteristics and outcome measures. The mean and standard deviation were reported as continuous variables, and the applicable count and percentage were reported as categorical variables. The Pearson Chi-Square and the independent samples t-test were used as appropriate measures for investigating the difference between groups. The odds

ratios and 95% confidence intervals were calculated, and all tests were two-tailed.

## RESULTS

Four hundred and fifty (450) children aged 6–12 years were recruited for the study. The mean age was 7.7 years. About 66.6% of the children were in the 6–7 years age group, and 33.3% were in the 10–12 years age group. Males made up 51.0% and females 49.0%. Of the total 450 participants, and using the parents' and teachers' scale, 19 met the criteria for ADHD, giving a prevalence rate of 4.22%.

The mean age of the pupils with ADHD was 7.5 years; males constituted 68.4%, and females constituted 31.5%. According to the teachers' scale, about 36.8% of children with ADHD had the hyperactive impulsive type, 31.6% had the inattentive subtype, and 26.3% had the combined type. On the parents' scale, 47.4% of the children with ADHD had the hyperactive impulsive type, 26.3% had the in-attentive sub-type, and 26.3% had the combined type.

The prevalence rate of ADHD among children in the age group 6–7 years was 5%, while in the age group 10–12 years, it was 2.22% (see Table 1). The children were distributed almost equally between the four governorates ( $p = 0.75$ ), and the distribution of children with ADHD between the governorates showed no significant difference ( $p = 0.63$ ).

The male-to-female ratio was 2.22 to 1. The rate of comorbidity oppositional defiant disorder (ODD) among the children with ADHD was 52.6%, and that for conduct disorder (CD) was 36.8%. The prevalence of ODD according to parents was 7 (36.84%) among age group 6-7 years and 1 (5.62%) among age group 10-12 years, the prevalence of CD reported by parents was 8 (42.1%) among age group 6-7 years and 2 (10.52%) among age group 10-12 years. (See Table 1).

**Table 1.** Prevalence of ADHD, ODD, and CD among the sample

Item	No [%]	Total number
<b>ADHD prevalence</b>		
Group 6–7 years	15 [5]	300
Group 10–12 years	4 [2.2]	150
Total	19 [4.22]	450
<b>Comorbidity</b>		
ODD	10 [52.6]	19
CD	7 [36.8]	19

ODD: Oppositional defiant disorder. CD: Conduct disorder.

## DISCUSSION

This was the first community estimate of ADHD prevalence among school-age children (6–12 years) in the Kingdom of Bahrain, and it showed an overall rate of 4.2% with a high incidence of comorbidities ODD and C.D. These results accord with published reports from different parts of the world<sup>16-19</sup>. The prevalence rate in Bahrain was lower than in other studies from India (8.8%)<sup>12</sup>, U.S.A (9.6%)<sup>18</sup>, Algeria (25%)<sup>17</sup>, China (8%)<sup>19</sup>, Qatar (14%)<sup>18</sup>, U.A.E and Nigeria (12%)<sup>18</sup>. It is assumed that these studies either used different assessment instruments, different methodologies, or studied different populations. The number of parents who refused to participate was very low (only six). The distribution of children who scored a positive result on the Conner index form was similar across the four governorates in Bahrain. In addition, the distribution of the negative sample was not significantly different among the four governorates. The positive cases were not assessed clinically by clinical interviews but only by completing the teachers' and parents' forms of the Conners 3 test. ADHD was more prevalent among boys than girls, a finding that has

been shown repeatedly in published research<sup>17,19</sup>. The only exception to this gender representation has come from two studies in the Kingdom of Saudi Arabia (K.S.A), but no explanation has been given for this result<sup>19,20</sup>.

The prevalence dropped with increasing age in the study sample, with 5% in the age group 6–7 years and 2.2% among those aged 10–12 years. Similar findings have been reported from other studies, both in the region and in other parts of the world<sup>19,21</sup>.

The prevalence of comorbidities, namely ODD and CD, was high (52.6% & 36.8%). This comorbidity rate is comparable to that in other studies from the region<sup>17,21</sup>. It was noticed that the studies using the Conner tests showed higher levels of comorbidities. It may be that these instruments are designed to detect these comorbidities more sensitively than other instruments. The Prevalence of ODD was higher in age group 6-7 years compared to 10-12 years which was expected, however the prevalence of CD was higher in age group 10-12 years, this was not expected and authors do not have any explanation for it. It might be that conduct problems were encountered within the status of hyper activity and irritability according to parents.

## Study Limitations

This study is the first attempt to identify the prevalence of a commonly encountered disorder among school-age children in Bahrain. The authors can state with confidence that the sample was representative of children attending government schools. The results have an impact on planning services and obtaining the necessary privileges for these children. However, the study suffered from a few limitations or weaknesses, such as its dependency on memory and subjective answers, without checking these for accuracy. Children attending private schools were not included in the study; however, they do not constitute a large percentage of the school-age population.

## CONCLUSIONS

**The prevalence of ADHD among children aged 6–12 years was 4.22%; in the 6–7 years age group, it was 5%, and in the 10–12 years age group, it was 2.22%. Males with ADHD symptoms outnumbered females by 2.2 to 1. The prevalence of ODD and CD among children with ADHD was 52.6% and 36.8%, respectively. These rates are similar to those from several other studies, both in the region and internationally. These basic statistics are made available for the first time to authorities in the educational, health, and social services sectors. These figures can assist in organizing rehabilitation and educational programs and planning future services. These basic statistics will fill a gap in the information currently available for strategic planning concerning children with ADHD in Bahrain.**

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**Competing Interest:** None

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