Research Report

Journal of INTERNATIONAL MEDICAL RESEARCH

Journal of International Medical Research
2018, Vol. 46(1) 122–134
© The Author(s) 2017
Reprints and permissions:
sagepub.co.uk/journalsPermissions.nav
DOI: 10.1177/0300060517712865
journals.sagepub.com/home/imr
SAGE

Prevalence of attention-deficit/hyperactivity and other disruptive behaviour disorder symptoms among primary school-age children in Kayseri, Turkey

Vesile Senol[1], Demet Unalan[1], Raziye Peksen Akca[2] and Mustafa Basturk[3]

Abstract

Objectives: This study aimed to determine the prevalence of attention-deficit/hyperactivity disorder (ADHD), oppositional defiant disorder (ODD), and conduct disorder (CD), and their influencing factors on primary school-age children.

Methods: This cross-sectional study was conducted among 2045 students, 7–15 years old, who were randomly selected from seven schools in Kayseri, Turkey, in 2012. Participants were stratified by socioeconomic status. Data were collected using the Turgay DSM-IV-Based Child and Adolescent Behavioural Disorders Screening and Rating Scale (T-DSM-IV-S). For statistical analyses, the *t*-test and analysis of variance were used.

Results: Rates of disruptive behaviour disorders (DBDs) among children were as follows: ADHD, 6.2%; CD, 14.4%; and ODD, 6.7%. The prevalence of ADHD was higher in boys and children whose mothers were homemakers and from poorly-educated and low-income families, compared with their peers. CD was more prevalent among boys and children 13–15 years old, whose parents had low income levels and were separated. ODD was higher in boys and children whose mothers were homemakers.

Conclusions: Our findings suggest that the overall prevalence of DBDs in our study area is 27.4%, which is similar to the pooled worldwide prevalence. Adverse family factors are closely associated with the prevalence of DBDs.

[1]Health Services Vocational College, Erciyes University, Kayseri, Turkey
[2]Develi Hüseyin Şahin Vocational School, Erciyes University, Kayseri, Turkey
[3]Department of Psychiatry, Erciyes University, Kayseri, Turkey

Corresponding author:
Vesile Senol, Health Services Vocational College, Erciyes University, Kayseri, Turkey.
Email: vsenol@erciyes.edu.tr

Creative Commons CC BY-NC: This article is distributed under the terms of the Creative Commons Attribution-NonCommercial 3.0 License (http://www.creativecommons.org/licenses/by-nc/3.0/) which permits non-commercial use, reproduction and distribution of the work without further permission provided the original work is attributed as specified on the SAGE and Open Access pages (https://us.sagepub.com/en-us/nam/open-access-at-sage).

Keywords
Primary school children, attention-deficit/hyperactivity disorder, oppositional defiant disorder, conduct disorder, prevalence

Date received: 22 September 2016; accepted: 9 May 2017

Introduction

Attention-deficit/hyperactivity disorder (ADHD) is a neurodevelopmental disorder defined by impairing levels of inattention, disorganization, or hyperactivity/impulsivity (HAI). Inattention and HAI are considered when six or more characteristic symptoms have persisted for at least 6 months, to a degree that is inconsistent with developmental level and negatively impacts directly on social and academic/occupational activities. ADHD is assessed according to the current level of severity, as follows. Mild: Few, if any, symptoms in excess of those required for a diagnosis of ADHD are present, and symptoms result in no more than minor impairment in social or occupational functioning. Moderate: symptoms or functional impairment between "mild" and "severe" are present. Severe: many symptoms in excess of those required for a diagnosis of ADHD are present, or several symptoms that are particularly severe are present, or the symptoms result in marked impairment in social or occupational functioning.[1] In diagnosing ADHD, there are three sub-types: "predominantly inattentive type", "predominantly hyperactive/impulsive type", and "combined type" with characteristics of the first two subtypes. The subscales of ADHD are based on the predominating symptoms in the last 6 months.[2]

Today, it is widely accepted that the effects of mental problems experienced during childhood are not only limited to the periods of childhood and puberty but they continue and can lead to secondary problems during adulthood.[3] Population-based surveys have reported that the prevalence ADHD is about 5% among children and 2.5% among adults in most cultures.[4] For this reason, it is considered to be a major health problem owing to the considerable lifelong effects of ADHD and related disorders.[5]

ADHD is characterized by behavioural disorders and difficulties during childhood or puberty that are inappropriate for developmental age. ADHD may manifest as antisocial personality disorders and may adversely affect social and academic life, social relationships, and communication. As with any medical condition, the development of health strategies directed toward early diagnosis and treatment of ADHD depends on robust epidemiological data.[1]

ADHD is one of the most diagnosed and investigated disorders among children worldwide, and its prevalence has increased explosively in countries throughout the world. The American Psychiatry Association has reported that the proportion of children diagnosed with ADHD in 1995 was 3–7%, and 5% of school-age children; this rate increased to 8–12% in 2000.[6,7] Similarly, meta-analyses have documented a pooled worldwide prevalence of ADHD at 5.29% and 5.71%.[4,8,9] As some studies have pointed out, the prevalence of ADHD ranges from as low as 1% to as high as 20% among school-age children.[4,10] The increase in the prevalence of ADHD among school-aged children in Turkey is similar to the global trend, with current studies reporting am ADHD prevalence of about 13% in that population.[11,12] However, some studies have observed oppositional defiant disorder (ODD), which often accompanies ADHD, in 46% of adolescents and 33% of children.[13,14] While the role of ADHD in the development of disruptive behaviour disorders (DBDs) is a controversial issue, the relationship between ODD and ADHD

may be an indicator of the early onset of DBD symptoms.[13,15]

The differences in the reported prevalence of DBDs among published epidemiological studies may be the result of different methodologies used (e.g., parent-, teacher-, or child-based, strict criteria, or clinical evaluation of impairment), sampling differences (different age ranges, stratified cluster sampling, school sampling, clinical sampling), different scales applied (e.g., ICD, DSM-IV, DISC-IV, PIC-GAS, or CBLC), and cultural differences.[16] The references cited in our study may also include these kinds of variations.

The aetiology of ADHD is not well understood. Biologic, genetic, and environmental factors have been implicated in the development of the disorder. The rate of inherited ADHD is between 55% and 92%.[17] Ercan et al.[11] explained that a high prevalence of ADHD in the Turkish population (1500 cases randomly selected from 12,667 students) is related to migration and presence of the *DRD4* gene. Although some studies[5,8] have reported that ADHD is seen 2–5 times more frequently in boys than in girls, recent studies have argued that the disorder is present equally in both sexes. Differences related to sex mostly show up in ADHD and other DBDs; therefore, certain symptoms come to the forefront, such as HAI in boys and attention deficit (AD) in girls.[6]

The prevalence of ADHD also differs according to age and socioeconomic status. Some researchers have stated that the disorder is most often seen among school-age children[18] and may potentially be more present among populations with lower socioeconomic status.[19–22] ADHD can be well-managed with medication; however, its early diagnosis is critical owing not only to the behavioural, social, and psychological problems that arise during childhood but also to the secondary problems ADHD may cause during adulthood, once the disorder has become chronic.

In Turkey, there have been limited comprehensive, population-based studies on ADHD and other DBDs[23,12,24]. Therefore, to better plan health services and implement strategies for detection and early intervention, targeted epidemiologic data must be obtained through population-based research on ADHD prevalence and its associated risk factors in Turkey. The present study aimed to obtain the frequency of ADHD and other DBDs and to examine the relationships with sociodemographic factors among schoolchildren aged 7–15 years old in Kayseri.

Material and methods

Participants

This cross-sectional study was conducted in Kayseri, Turkey between February and April 2012. A multistage sampling method was applied in the study. In the first stage, 99 primary schools were classified into subgroups of low, middle, and high socioeconomic level, using a randomized stratified sampling method and considering the socioeconomic level of the families of students, as defined by the Ministry of National Education, Provincial Directorate of Kayseri.

In the second stage, 7 of 21 socioeconomically similar schools were included in the sample, with a 33% sampling rate in each stratum, to facilitate accessibility to the target population. The sample included three schools classified as low socioeconomic level (Seyrani, İstiklal, Sehit Jandarma Komando Er Hacı Aydıncı), two as middle socioeconomic level (Mehmet-Cemile Ogulcuklu, Cumhuriyet), and two schools classified as high socioeconomic level (Osman Hilmi Kalpaklioglu, Refika Kucukcalık). We assumed a prevalence of ADHD in Turkey of about 20%, a confidence interval (CI) of 95%, an alpha error of 0.05, beta error of 0.80, and difference (d) of 2.5%. The sample size was estimated at 2135 children, using means of NCSS statistical software and PASS sample size software (NCSS, LLC, Kaysville, UT, USA). Using a random sampling method, 2300 students

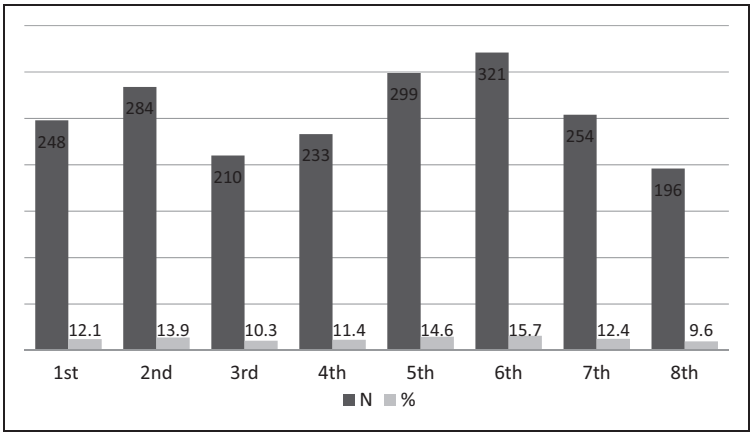

Figure 1. Distribution of the sample group according to grade level.

from grades 1 to 8 were selected: 605 students from low socioeconomic level schools, 735 from middle-level schools, and 760 from high-level schools (Figure 1).

Data collection

The data were collected using a questionnaire comprising two parts. The first part was related to demographic characteristics of students (age, sex, and number of siblings) and parents (age, marital status, education level, average monthly income, employment status, and family type).

The second part of data collection was done using the Turgay DSM-IV Disruptive Behavioural Disorders Rating Scale (T-*DSM-IV-S*)[25], to assess symptoms of DBDs. The T-*DSM-IV-S* and demographic data form were delivered by school administrators in a sealed envelope to the parents of the randomly selected children. One week later, 2045 of 2300 (response rate: 89%) questionnaires were returned. Completed forms were received in a sealed envelope by the researchers from the school administrators.

The T-*DSM-IV* is a 4-point Likert-type scale based on DSM-IV diagnostic criteria for inattention, HAI, ODD, and CD. It consists of a total 41 items, with items on the scale being identical to the list of symptoms defined as the DSM-IV criteria for ADHD (AD: 9 items and HAI: 9 items), ODD (8 items) and CD (15 items). The T-DSM-IV-S was developed by Turgay[25] in 1994 and translated and adapted for the Turkish population by Ercan et al. in 2001.[26] Symptoms are scored by estimating the severity for each item on a 4-point Likert-type scale, as follows (0 = not at all; 1 = just a little; 2 = severe; 3 = very severe). For diagnosis, ratings of severe and very severe were considered positive for each item. To diagnose for inattention disorder, the severity of at least 6 of 9 items should be rated 2 or 3; and for hyperactivity/impulsivity disorder the severity of at least 6 of 9 items should be rated 2 or 3; and for oppositional defiant disorder, at least 4 of 8 items should be rated 2 or 3; and for conduct disorder, at least 2 of 15 items should be rated 2 or 3. In all these cases, symptoms should be present for 6 months to a year. Subscale scores on the T-DSM-IV are calculated by summing the scores for the items of each subscale.

Ethical statement

This study was approved by the Ministry of National Education Provincial Directorate Review Board of Kayseri.

Statistical analysis

The data were analysed using the IBM SPSS version 21.0 (IBM Corp., Armonk, NY USA) statistical software. Total scores and subscale scores were calculated for the T-*DSM-IV-S*. The quantitative variables were summarized as mean ± standard deviation. Scores obtained from the scale were categorized as having symptoms of ADHD or other DBDs or not having symptoms of these disorders. The chi-square ($\chi 2$) test was used for categorical variables to examine associations between DBD symptoms and sociodemographic characteristics (age, sex, marital status, monthly income, occupation, education level, family type) of the children and their families. Independent groups were compared using the Student's *t*-test and one-way analysis of variance (ANOVA). The results were assessed using a 95% CI and a significance level of $p < 0.05$.

Results

Sociodemographic characteristics

Of the total 2045 respondents, 52.8% were girls and 47.2% were boys, a well-balanced sex distribution of study participants. The average age was 10.56 (±2.20) years for girls and 10.37 (±2.23) years for boys. A total 62.3% of students were in grades 1–5 and 37.7% were in grades 6–8. The average age of participants' mothers and fathers was 35.96 (±5.53) years and 40.49 (±6.00) years, respectively. The age group distribution of participants' mothers was as follows: ages 31–38 years (52.1%), 39–46 years (26.7%), and 23–30 years (17.2%); the lowest rate (4%) was mothers aged 47 years and above. The age group distribution of fathers was as follows: ages 40–47 years (43.3%), 32–39 years (41.3%), and 48–55 years (9.3%); the age group 56 years and above represented only 2.1% of fathers.

The average monthly income of parents was 1480 ± 1131 TRY; 26.2% of parents had monthly incomes less than the minimum wage (740 TRY). A total 66% of monthly incomes varied between 730–3100 TRY. The proportion of parents with an income of 3101 TRY and above was 7.9%. Most of the mothers (84.8%) did not work outside the home, with only 15.1% of them working at a job with a regular income. Among the fathers, 51.1% were manual labourers and 43.9% were self-employed. Among all parents, 96 (4.7%) were illiterate. A total 49.9% of mothers had completed primary school and 37% had graduated from high school or university. For fathers, 50.5% had completed primary school and 48.1% had graduated high school or university. A total 82.1% of participants came from a nuclear family, and the mean number of siblings was 2.3 ± 1.3.

Relationship between sociodemographic characteristics and prevalence of ADHD and other DBD symptoms

Table 1 gives the distribution of T-DSM-IV-S scores and sex ratios, and Table 2 shows the relationship between the prevalence of DBD symptoms and sociodemographic characteristics. According to parents' statements, 6.2% of children had both AD and HAI disorder symptoms; the rates of symptoms of specific disorders were 41 children (2%) with AD and 85 (4.2%) with HAI. The prevalence of ODD was 6.7% (136 participants) and 14.4% (294 participants) for CD; the overall prevalence of DBD symptoms was 27.4%. In our study, adverse family factors were found to be associated with the detected DBD symptoms. The prevalence of AD symptoms was significantly higher in boys (3%, $p = 0.002$), children whose fathers were illiterate (10.3%, $p = 0.001$), those whose mothers were homemakers (2.3%, $p = 0.010$), and children whose family had incomes lower than minimum wage (4.1%, $p < 0.001$). The sex ratio for AD symptoms was found to be 2.4/1. Similarly, mean AD scores were also

Table 1. Distribution of disruptive behaviour disorders scale (T-DSM-IV-S) scores.

T DSM-IV-S	Prevalence N	Prevalence %	Scale Score (Min-max)	Research Score (Min-max)	Mean ± SD*	Sex Ratio
Attention deficit (AD)	41	2.0	0–27	0–27	4.13 ± 4.21	2.4/1
Hyperactivity/Impulsivity (HAI)	85	4.2	0–27	0–27	5.55 ± 5.57	2.7/1
Oppositional Defiant Disorder (ODD)	136	6.7	0–24	0–24	3.98 ± 4.00	1.2/1
Conduct Disorders (CD)	294	14.4	0–45	0–20	0.66 ± 1.63	2.2/1
Total	556	27.4	0–123	0–83	14.35 ± 12.63	1.9/1

*Mean ± standard deviation

Table 2. Relationship between prevalence of disruptive behaviour disorder symptoms and sociodemographic characteristics.

Sociodemographic Characteristics	AD Yes %	AD No %	HAI Yes %	HAI No %	ODD Yes %	ODD No %	CD Yes %	CD No %
Age group (years)								
7–12	2.1	97.9	4.6	95.4	6.2	93.8	12.7	87.3
13–15	1.8	98.2	2.5	97.5	8.2	91.8	20.4	79.6
P value	0.482		**0.028**		0.093		<**0.001**	
Sex								
Girls	1.1	98.9	2.1	97.9	6.7	94.3	8.6	91.4
Boys	3.0	97.0	6.4	93.6	7.8	92.2	20.8	79.2
P value	**0.002**		<**0.001**		**0.034**		<**0.001**	
Father's Education								
Illiterate	10.3	89.7	10.3	89.7	10.3	89.7	10.3	89.7
Primary school	2.4	97.6	4.5	96.5	7.3	92.7	15.6	84.4
High school/University	1.3	98.7	3.7	96.3	5.9	94.1	13.2	86.8
P value	**0.001**		0.162		0.337		0.256	
Mother's Occupation								
Homemaker	2.3	97.7	4.5	95.5	7.3	92.7	14.6	85.4
Working	0.3	99.7	2.3	97.7	3.2	96.8	12.9	87.1
P value	**0.010**		**0.042**		**0.004**		0.247	
Monthly Income (TRY)								
Low (55–729)	4.1	95.9	6.2	93.8	8.4	91.6	16.1	83.9
Middle (730–3100)	1.4	98.6	3.5	96.5	6.3	93.7	14.4	85.6
High (3101–15000)	0.0	100.0	3.1	96.9	3.7	96.3	8.1	91.9
P value	<**0.001**		**0.024**		0.074		**0.039**	
Family Type								
Nuclear	1.8	98.2	4.0	96.0	6.5	93.5	13.6	86.4
Extended	2.7	97.3	4.0	96.0	6.6	93.4	15.0	85.0
Separated	4.6	95.4	9.2	90.8	10.8	89.2	30.8	69.2
P value	0.191		0.114		0.398		0.001	

Abbreviations. AD: Attention deficit, HAI: Hyperactivity/impulsivity, ODD: Oppositional defiant disorder, CD: Conduct disorder.

significantly higher in these children compared with their peers ($p < 0.0$ 1).

The prevalence of HAI disorder symptoms was significantly higher among children aged 7–12 years (4.6%, $p = 0.028$), boys (6.4%, $p < 0.001$), children whose mothers were homemakers (4.5%, $p = 0.042$), and those from low-income families (6.2%, $p = 0.024$). The sex ratio for HAI symptoms was 2.7/1.

The prevalence of comorbid ODD symptoms was higher in boys (7.8%, $p = 0.034$) and children whose mothers were homemakers (7.3%, $p = 0.004$); the sex ratio was 1.2/1. The prevalence of CD symptoms was significantly higher in children aged 13–15 years (20.4%, $p < 0.001$), boys (20.8%, $p < 0.001$), and children from low-income families (16.1%, $p = 0.039$); the sex ratio was 2.2/1. Significant differences were found with respect to CD symptoms between children whose parents were separated and those from a nuclear family ($p = 0.001$).

Relationship between T-DSM-IV-S scores and sociodemographic characteristics

Mean AD scores were significantly higher in boys (4.87 ± 4.65, $p < 0.001$), children from low-income families (5.14 ± 5.12, $p < 0.001$), and children whose mothers (6.93 ± 7.32, $p = 0.001$) and fathers (6.93 ± 7.32, $p < 0.001$) were illiterate, and were homemakers (4.27 ± 4.33, $p = 0.001$) and manual labourers (4.44 ± 4.49, $p < 0.001$), respectively.

Mean HAI scores were significantly higher among boys (6.65 ± 6.05, $p < 0.001$), children with illiterate fathers (8.86 ± 7.76, $p = 0.002$), those whose mothers were homemakers (5.64 ± 5.74, $p = 0.001$), and children from low-income families (6.22 ± 6.35, $p < 0.001$).

Similarly, mean ODD scores were significantly higher in boys (4.38 ± 4.14, $p < 0.001$), children whose fathers were illiterate (5.17 ± 5.23, $p = 0.032$), those whose mothers were homemakers (4.08 ± 4.13, $p = 0.004$), and children from low-income families (4.25 ± 4.47, $p = 0.002$).

Mean CD scores were significantly higher in boys (0.94 ± 1.91, $p < 0.001$), children whose mothers were homemakers (0.69 ± 1.70, $p = 0.001$), and children from low-income families (0.80 ± 1.87, $p = 0.005$).

Based on these results, scores of subscales and overall mean scores were significantly higher among boys (16.86 ± 13.62, $p < 0.001$), children whose mothers (16.67 ± 13.64, $p = 0.001$) and fathers were illiterate (21.34 ± 19.49, $p < 0.001$), those whose mothers were homemakers (14.93 ± 13.59, $p = 0.001$), children whose fathers were manual labourers (14.93 ± 13.59, $p = 0.004$), and those from low-income families (16.4 ± 14.7, $p < 0.001$) (Table 3).

Discussion

As noted in the literature, for planning health services and implementing strategies of detection and early intervention, it is necessary to obtain accurate and reliable epidemiologic data through population-based research with large study samples in developing countries, as is the case in Turkey. Thus, this study is important owing to its use of parent-based estimates to determine the prevalence of commonly observed ADHD and other DBD symptoms among Turkish primary school children.

The prevalence of ADHD was 6.2% in our study. The most common comorbid disorders were CD (14.4%) followed by ODD (6.7%). The rate of detected DBD symptoms in this study (27.4%) was lower than those reported in Chile (38.3%), Hong Kong (38.4%), and the city of İzmir in Turkey (36.7%).[27] Unlike these studies, the prevalence found in this work was higher than that reported by Canino et al.[28] from Puerto Rico (19.8%). Differences in the reported prevalence of DBD symptoms in epidemiological studies may be the result of different information sources (e.g., parent or

Table 3. Relationship between mean disruptive behaviour disorders scale (T-DSM-IV-S) scores and demographic characteristics.

Sociodemographic Characteristics	AD Mean ± SD	HAI Mean ± SD	ODD Mean ± SD	CD Mean ± SD	Total Mean ± SD
Sex					
Girls	3.46 ± 3.64	4.58 ± 4.96	3.62 ± 3.83	0.42 ± 1.28	12.09 ± 11.21
Boys	4.87 ± 4.65	6.65 ± 6.05	4.38 ± 4.14	0.94 ± 1.91	16.86 ± 13.62
P value	<**0.001**	<**0.001**	<**0.001**	<**0.001**	<**0.001**
Mother's Education					
Illiterate	5.32 ± 5.15	5.92 ± 5.52	4.58 ± 4.18	0.83 ± 1.58	16.67 ± 13.64
Primary school	4.30 ± 4.30	5.64 ± 5.80	4.02 ± 4.16	0.71 ± 1.72	14.70 ± 13.18
High school/University	3.74 ± 3.91	5.39 ± 5.26	3.87 ± 3.69	0.57 ± 1.47	13.58 ± 11.56
P value	**0.001**	0.534	0.121	0.329	0.050
Father's Education					
Illiterate	6.93 ± 7.32	8.86 ± 7.76	5.17 ± 5.23	0.37 ± 0.77	21.34 ± 19.49
Primary school	4.50 ± 4.35	5.67 ± 5.75	4.05 ± 4.09	0.76 ± 1.84	15.00 ± 13.01
High school/University	3.65 ± 3.84	5.34 ± 5.32	3.87 ± 3.85	0.58 ± 1.40	13.45 ± 11.86
P value	<**0.001**	**0.002**	**0.032**	0.163	<**0.001**
Mother's Occupation					
Homemaker	4.27 ± 4.33	5.64 ± 5.74	4.08 ± 4.13	0.69 ± 1.70	14.69 ± 13.07
Working	3.33 ± 3.30	5.11 ± 4.73	3.45 ± 3.13	0.52 ± 1.16	12.43 ± 9.59
P value	**0.001**	**0.001**	**0.004**	**0.001**	**0.001**
Father's Occupation					
Manual labourer	4.44 ± 4.49	5.67 ± 5.92	4.09 ± 4.21	0.71 ± 1.82	14.93 ± 13.59
Government employee	3.40 ± 3.59	5.16 ± 5.15	3.74 ± 3.74	0.54 ± 1.45	12.86 ± 11.27
Tradesman	4.38 ± 4.32	5.73 ± 5.64	4.06 ± 4.01	0.71 ± 1.60	14.90 ± 12.73
P value	<**0.001**	0.138	0.237	0.119	**0.004**
Monthly Income (TRY)					
Low (55–729)	5.14 ± 5.12	6.22 ± 6.35	4.25 ± 4.47	0.80 ± 1.87	16.4 ± 14.7
Middle (730–3100)	3.87 ± 3.82	5.43 ± 5.30	4.00 ± 3.87	0.65 ± 1.59	13.9 ± 11.8
High (3101–15000)	2.95 ± 3.16	4.39 ± 5.05	2.98 ± 3.16	0.32 ± 0.93	10.6 ± 9.7
P value	<**0.001**	<**0.001**	**0.002**	**0.005**	<**0.001**

Abbreviations. AD: Attention deficit, HAI: Hyperactivity/impulsivity, ODD: Oppositional defiant disorder, CD: Conduct disorder.

teacher-based, strict criteria), differences in sampling methods (stratified cluster sampling, school sampling, clinical evaluation) and different scales applied (e.g., ICD-10, DSM-IV)[3]

In our study, the ADHD prevalence rate (6.2%) was similar to the pooled worldwide prevalence (5.29–5.79%) for children and adolescents.[9,4] At the same time, our findings are consistent with previous studies[24,29] conducted among elementary school children using parent based-estimates, which have reported ADHD prevalence between 2.7% and 9.6%. In another study performed in Malatya, Turkey among 3002 primary school children, the prevalence of ADHD was found to be 9.5%.[30] The abovementioned study in İzmir used strict criteria and a school sampling method, as in our study; a prevalence of ADHD of 21.8% was found in that city.[27]

In our study, the prevalence of ODD was found to be 6.7%, which was higher than the worldwide pooled prevalence.[28] Various studies in Turkey have reported ODD prevalence of between 2.4 and 25.9%.

In a study conducted by Bilgic et al.[31] with 266 children aged 4–18 years who were diagnosed with ADHD, 36.1% of the children had CD and 25.9% had ODD. A recent study by Ercan et al.[11,12] found an ODD prevalence of 2.4%.

There are conflicting findings in the literature linking ADHD with socioeconomic status. Consistent with some previous works, adverse family factors were found to be associated with detected DBD symptoms in our study.[32,33] We found that compared with their counterparts, ADHD and other DBDs were more prevalent in boys and children whose parents had lower monthly incomes and whose mothers were homemakers. In recent studies, ADHD symptoms have been suggested to be 2–5 times more prevalent in boys than in girls[34] and the predominantly inattentive subtype of ADHD has been shown to be significantly more common in girls than in boys.[27,35–38] Likewise, our study found that some subscale scores and overall mean scores were significantly higher in boys, children whose parents were illiterate, those whose mothers were homemakers, children whose fathers were manual labourers, and those whose family had lower monthly incomes.

In our study, the sex ratio for ADHD and other disorders (ODD and CD) ranged from 1.2:1 to 2.7:1. Whereas the reported sex ratio is 9:1 in clinical sampling, it increases to 4:1 in population screenings. For the predominantly hyperactive/impulsive subtype, the sex ratio is 4:1; however, in the predominantly inattentive subtype, this ratio decreases to 2:1. In other words, girls are more vulnerable to the predominantly inattentive subtype of ADHD.[39] In a study by Toros and Tataroglu[38] in Turkey, the female/male ratio was 1:3.65 whereas in another study among 219 primary school children diagnosed with AD, this ratio was reported to be 1:3.5.[40] In a retrospective study by Aktepe et al.[8] of 763 children aged 7–12 years who were admitted to the Psychiatry Clinic of Suleyman Demirel University Faculty of Medicine, the most frequently diagnosed disorder in boys was ADHD (15.8%) whereas females were diagnosed with ADHD at a rate of 5.2%. In contrast to previous works[8,39,40], the difference between male and female ratios of ADHD decreased significantly in our study. Unlike those reports, in another study of 401 children diagnosed with ADHD, whereas there was no significant difference by sex in the combined type (coexisting AD and HAI), the predominantly hyperactive subtype was more prevalent among boys and the predominantly inattentive subtype was more prevalent among girls.[18]

Consequently, it is clear that DBD symptoms are more prevalent in boys than in girls when the symptom distributions and subtypes are taken into consideration. However, this prevalence rate must be further investigated to prove it is in fact more dominant in one sex. The tendency of these disorders to manifest in the form of attention deficit and cognitive difficulties in females owing to biological characteristics may lead to DBDs being less diagnosed in females. For instance, simple signs like having less motivation or spending less time studying may be considered the reason for poor academic performance; thus, it may be possible to miss the more serious underlying reasons behind such changes; because the problem is attributed to other causes, no treatment-seeking behaviour takes place. Male children are reported to have a greater tendency for extrinsic problems owing to their biological and genetic characteristics. They are also shown greater tolerance by those around them for these problems, which in turn results in such behavioural problems becoming more permanent.[41,42]

The presence of AD and poor cognitive abilities in boys owing to problems such as CD, impulsivity, hyperactivity, and intra- and extra-familial social problems related to these (e.g., quarrels, arguments, and causing

accidents) means that boys get more attention and more effort is made to seek a solution. This in turn decreases the likelihood of overlooking the disorder in boys. It is obvious that ADHD is more prevalent in boys than in girls. Nevertheless, it should be borne in mind that the sex ratio difference, as stated in our study and in other studies, may be lower in reality. The fact that many studies base their assessments on diagnostic criteria decreases the significance of these stated justifications; however, our approach may still be significant. This is owing to certain symptoms being given more consideration than others because the assessment of individuals is based on assessment by their families.

In our study, the prevalence and severity of HAI was found to be significantly higher among boys, children aged 7–12 years, those whose parents were illiterate, children whose mothers were homemakers, and those from low-income families, consistent with previous studies.[3,4] As reported previously[43,44], the degree of communication between children and mothers with higher education levels is usually such that mothers can spot any unfavourable changes in their children earlier, and they will ask for professional help when necessary. Because mothers with higher education levels can more easily recognise behavioural changes in their children and will seek treatment at an early stage, and because they are more deeply involved in their children's education, they can more easily discourage any unfavourable attitudes and behaviours observed in their children.

Similarly, we found the prevalence and severity of ODD to be significantly higher in boys and in children whose mothers were homemakers, from low-income families, and whose fathers were illiterate. Because homemakers have a more intense and prolonged relationship with their children than mothers who work outside the home, there may be more opportunities for mothers and their children to disagree; thus, ODD may be observed more intensely in children, as a reaction to such conflict.

In our study, the prevalence and severity of CD was found to be significantly higher in boys, in children aged 13–15 years, and in those whose mothers are homemakers and from low-income families ($p < 0.01$). Çak et al.[45] stated in their study that there is a relationship between being from a family with high socioeconomic status and fewer diagnoses of AD and HAI disorders. Based on the traditional knowledge that unfavourable family and environmental factors have a significant role in causing, triggering, and the prognosis of mental problems, the prognosis in children with ADHD is expected to be adversely affected by conditions such as severe marital problems, lower social class, extended family structure, fathers with a greater inclination toward criminality, maternal history of a mental disorder, and being in foster care, all of which are considered family and environmental factors.[46]

Despite some limitations in this research, ours is one of the few studies evaluating ADHD, ODD, and CD together in school-age children. In addition, this population-based study also examined the association between sociodemographic factors and DBD symptoms.

Conclusion

The prevalence of ADHD and other DBD symptoms was 27.4% in our study. The most prevalent disorder was CD. The detected DBD symptoms were closely associated with children's age and sex, as well as parental education level, occupation, monthly income, and family structure. ADHD and other DBDs were more prevalent among boys and children from less educated, low-income families compared with their peers. In terms of exposure, boys were found to be more vulnerable to DBDs. The awareness of parents and treatment-seeking behaviour are highly valuable for

early diagnosis and appropriate treatment of these disorders.

Limitations of the study

The main limitation of our study is that the children were not actually examined diagnosed with ADHD by a physician. Therefore, because the research data were based on reports of family members and sociocultural differences exist between families, the collected data are likely to be subjective, even if only to a small degree. In other words, there may be differences between educated and illiterate parents in perceiving and interpreting the same symptoms. In this context, not having matched parents is a subjectivity factor.

Another limitation was that because of our data were obtained based only on parental reporting, the prevalence of ADHD and other DBDs may have been over- or underreported, compared with information gathered from combined sources such as parents plus teachers or clinicians plus parents.

Informed Consent

An invitation letter explaining the purpose of the study and a voluntary consent form were sent, along with data collection tools, in a sealed envelope to parents of the selected students. Written informed consent was obtained from the parents of children who participated in this study.

Acknowledgements

The authors thank the students at Develi Hüseyin Sahin Vocational School for their important contributions to the data collection process.

Declaration of conflicting interests

The authors declare that there is no conflict of interest.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

References

1. American Psychiatric Association. Diagnostic and statistical manual of mental disorders *(5th ed.), Changes from DSM-IV to DSM -5*. Washington, DC: Author, 2013.
2. Hales RE and Yudofsky SC. *American psychiatric publishing text book of clinical psychiatry*, 4th ed. Washington DC, London, England: American Psychiatric Association Publishing, 2003, p.838.
3. Dang MT, Warrington D, Tung T, et al. A school-based approach to early identification and management of students with ADHD. *J Sch Nurs* 2007; 23: 2–12.
4. Polanczyk G and Jensen P. Epidemiologic considerations in attention deficit hyperactivity disorder: a review and update. *Child Adolesc Psychiatr Clin N Am* 2008; 17: 245–260. doi:10.1016/j. chc.2007.11.006
5. Barkley R. Edwards G. Diagnostic interview, behaviour rating scales and the medical examination. Attention-deficit Hyperactivity Disorder: A Clinical Workbook, 2, 2006.
6. Diagnostic and statistical manual of mental disorders source information. (1994). (4th ed.), Washington, DC. *http://www.psych.org/MainMenu/Research/DSMIV.aspx),* 1995.
7. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (4th ed., rev.), Washington, DC, 2000.
8. Aktepe E, Demirci K, Calışkan AM, et al. Çocuk ve ergen psikiyatrisi polikliniğine başvuran hastalarda belirti ve tanı dağılımları. *Düşünen Adam: Psikiyatri ve Nörolojik Bilimler Dergisi* 2010; 23: 100–108.
9. Willcutt EG. The prevalence of DSM-IV attention-deficit/hyperactivity disorder: a meta-analytic review. *Neurotherapeutics* 2012; 9: 490–499. doi:10.1007/s13311-012-0135-8
10. Faraone SV, Sergeant J, Gillberg C, et al. The worldwide prevalence of ADHD: is it an American condition? *World Psychiatry* 2003; 2: 104–113.
11. Ercan ES, Kandulu R, Uslu E, et al. Prevalence and diagnostic stability of ADHD and ODD in Turkish children: a 4-year longitudinal study. *Child Adolesc Psychiatry Ment Health* 2013; 7: 30. doi:10.1186/17532000-7-30

12. Ercan ES, Bilaç Ö, Uysal Özaslan T, et al. Is the prevalence of ADHD in Turkish elementary school children really high? *Soc Psychiatry Psychiatr Epidemiol* 2015; 50: 1145–1154. doi: 10.1007/s00127-015-1071-9.
13. Biederman J, Faraone SV and Taylor A. Diagnostic continuity between child and adolescent ADHD: findings from a longitudinal clinical sample. *J Am Acad Child Adolesc Psychiatry* 1998; 37: 305–313.
14. Kilic BG and Sener S. Dikkat eksikliği ve hiperaktivite bozukluğu olan çocuklarda karşıt olma-karşı gelme bozukluğu/davranış bozukluğu eş hastalanımında aile işlevleri ve psikososyal değişkenlerin karşılaştırılması. *Türk Psikiyatri Derg* 2005; 16: 21–28.
15. Loeber R, Burke JD, Lahey BB, et al. Oppositional defiant and conduct disorder: a review of the past 10 years, part I. *J Am Acad Child Adolesc Psychiatry* 2000; 39: 1468–1484.
16. Polanczyk G, de Lima MS, Horta BL, et al. The worldwide prevalence of ADHD: a systematic review and metaregression analysis. *Am J Psychiatry* 2007; 164: 942–948.
17. Cantwell DP. Attention deficit disorder: A rewiew of past 10 years. *J Am Acad Child Adolesc Psychiatry* 1996; 35: 978–987.
18. Hill JC and Schoener EP. Age-dependent decline of attention deficit hyperactivity disorder. *Am J Psychiatry* 1996; 153: 1143–1146.
19. Larsson H, Sariaslan A, Langstrom N, et al. Family income in early childhood and subsequent attention deficit/hyperactivity disorder: a quasi-experimental study. *J Child Psychol Psychiatry* 2014; 55: 428–435. doi: 10.1111/jcpp.12140 [Epub 2013 Sep 23]
20. Froehlich TE, Lanphear BP, Epstein JN, et al. Prevalence, recognition, and treatment of attention-deficit/hyperactivity disorder in a national sample of US children. *Arch Pediatr Adolesc Med* 2007; 161: 857–864. doi:10.1001/archpedi.161.9.857
21. Gershon J. Meta-analytic review of gender differences in ADHD. *J Attent Disord* 2002; 5: 143–154.
22. Aslan F and Kubilay G. Determining the awareness level of parents from different socioeconomic levels regarding the Attention Deficit and Hyperactivity Disorder (ADHD) bearing children. Unpublished Master of Science Thesis, Hacettepe University, Graduate School of Health Sciences, Public Health Nursing Program, Ankara, 2013. http://hdl.handle.net/11655/1489
23. Motavalli MN. Investigation of prevalence of attention deficit and hyperactivity disorder in neurological context in Turkish primary school children in urban sector. Unpublished Master of Science Thesis, Istanbul University, Istanbul, 1994.
24. Uyan Z, Ceyhun Peker AG, Tekiner AS, et al. Investigation of prevalence of attention deficit hyperactivity disorder among adolescents. *Konuralp Tıp Dergisi* 2014; 6: 21–26.
25. Turgay A. *Disruptive behavior disorders: child and adolescent screening and rating scales for children, adolescents, parents and teachers*. West Bloomfield, MI: Michigan Integrative Therapy Institute Publication, 1994.
26. Ercan ES, Amado S, Somer O, et al. Development of a test battery for the assessment of attention deficit hyperactivity disorder. *Çocuk ve Gençlik Ruh Sağlığı Dergisi* 2001; 8: 132–144. [in Turkish].
27. Ercan ES, Bilac O, Ozaslan UT, et al. Prevalence of psychiatric disorders among Turkish children: the effects of impairment and sociodemographic correlates. *Child Psychiatry Hum Dev* 2016; 47: 35–42.
28. Canino G, Polanczyk G, Bauermeister JJ, et al. Does the prevalence of CD and ODD vary across cultures? *Soc Psychiatry Psychiatr Epidemiol* 2010; 45: 695–704.
29. Guler AS, Scahill L, Jeon S, et al. Use of multiple informants to identify children at high risk for ADHD in Turkish school-aged-children *J Atten Disord* 2014 May 5. doi: https://doi.org/10.1177/1087054714530556 [Epub ahead of print].
30. Özcan E, Egri M, Kutlu NO, et al. ADHD prevalence among school-age children: a preliminary study. *Turgut Özal Tıp Dergisi* 1998; 5: 2–3.
31. Bilgic A, Kılıc BG, Gürkan K, et al. Disruptive behavioral disorders and specific learning disorders in a clinical sample with attention deficit hyperactivity. *Çocuk ve Gençlik Ruh Sağlığı Dergisi* 2006; 13: 54–59.

32. Gureje O and Omigbodun OO. Children with mental disorders in primary care: functional status and risk factors. *Acta Psychiatr Scand* 1995; 92: 310–314.
33. Eapen V, al-Gazali L, Bin-Othman S, et al. Mental health problems among schoolchildren in United Arab Emirates: prevalence and risk factors. *J Am Acad Child Adolesc Psychiatry* 1998; 37: 880–886.
34. Faraone SV, Biederman J and Friedman D. Validity of DSM-IV subtypes of attention-deficit/hyperactivity disorder: a family study perspective. *J Am Acad Child Adolesc Psychiatry* 2000; 39: 300–307.
35. Biederman J. Attention-deficit/hyperactivity disorder: a selective overview. *Biol Psychiatry* 2005; 57: 1215–1220.
36. Baumgaertal A, Wolraich ML and Dietrich M. Comparison of diagnostic criteria for ADHD in a German elementary school sample. *J Am Acad Child Adolesc Psychiatry* 1995; 34: 629–638.
37. Wolraich ML, Hannah JN, Pinnock YT, et al. Comparison of diagnostic criteria for attention-deficit hyperactivity disorder in a country-wide sample. *J Am Acad Child Adolesc Psychiatry* 1996; 35: 319–324.
38. Toros F and Tataroglu C. Attention deficit and hyperactivity disorder: socio-demographic characteristics, anxiety and depression levels. *Çocuk ve Gençlik Ruh Sağlığı Dergisi* 2002; 9: 23–31.
39. Oner P, Oner O and Aysev A. Attention Deficit and Hyperactivity Disorder, Sted 2003; 12: 97–98.
40. Öktem F and Sonuvar B. Characteristics of children receiving attention deficit. *Turk Psikiyatri Derg* 1993; 4: 267–272.
41. Lauth GW, Schlottke PF and Naumann K. *Restless children, helpless parents. Help with ADHD*. Munich: German Pocketbook, 2007.
42. Lauth GW and Naumann K. *ADHD at school*. Wine: Beltz, 2009.
43. Johnston C and Mash EJ. Families of children with attention-deficit/hyperactivity disorder: Review and recommendations for future research. *Clin Child Fam Psychol Rev* 2001; 4: 183–207.
44. Strauss CC, Lease CA, Last CG, et al. Overanxious disorder. *J Abnorm Child Psychol* 1988; 16: 433–443.
45. Çak HT and Gokler B. Attention deficit hyperactivity disorder and associated perinatal risk factors in preterm children. *Turk Pediatri Arsivi* 2013; 48: 315–322.
46. Biderman J, Milberger S, Faraone SV, et al. Family-environment risk factors of attention-deficit hyperactivity disorders. A test of Rutter's indicators of adversity. *Arch Gen Psychiatry* 1995; 52: 464–470. doi:10.1001/archpsyc.1995.03950180050007