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

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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.

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

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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. 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.

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. Population-based surveys have reported that the prevalence ADHD is about 5% among children and 2.5% among adults in most cultures. For this reason, it is considered to be a major health problem owing to the considerable lifelong effects of ADHD and related disorders.

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.

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. Similarly, meta-analyses have documented a pooled worldwide prevalence of ADHD at 5.29% and 5.71%. 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. The increase in the prevalence of ADHD among school-aged children in Turkey is similar to the global trend, with current studies reporting an ADHD prevalence of about 13% in that population. However, some studies have observed oppositional defiant disorder (ODD), which often accompanies ADHD, in 46% of adolescents and 33% of children. 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.\textsuperscript{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, PICA-GAS, or CBLC), and cultural differences.\textsuperscript{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\%.\textsuperscript{17} Ercan et al.\textsuperscript{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 \textit{DRD4} gene. Although some studies\textsuperscript{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.\textsuperscript{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\textsuperscript{18} and may potentially be more present among populations with lower socioeconomic status.\textsuperscript{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\textsuperscript{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 Haci 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...
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)\textsuperscript{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\textsuperscript{25} in 1994 and translated and adapted for the Turkish population by Ercan et al. in 2001.\textsuperscript{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.

\begin{figure}[ht]
\centering
\includegraphics[width=\textwidth]{figure1.png}
\caption{Distribution of the sample group according to grade level.}
\end{figure}
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 | Scale Score (Min-max) | Research Score (Min-max) | Mean ± SD* | Sex Ratio |
|-----------------------------|------------|-----------------------|---------------------------|------------|-----------|
|                             | N          | %                     | (Min-max)                 | (Min-max)  |           |
| 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  | HAI | ODD | CD  |
|----------------------------------|-----|-----|-----|-----|
|                                  | Yes % | No % | Yes % | No % | Yes % | No % | Yes % | 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 |      |      |      |      |      |
| 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 |      |      |      |      |      |
| 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 |      |      |      |      |      |      |      |
| 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 |      |      |      |      |      |
| 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 |      |      |      |      |      |
| 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 |      |      |      |      |      |

Abbreviations. AD: Attention deficit, HAI: Hyperactivity/impulsivity, ODD: Oppositional defiant disorder, CD: Conduct disorder.
significantly higher in these children compared with their peers \((p < 0.01)\).

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 \((p = 0.001)\).

**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 Izmir in Turkey \((36.7\%)\). 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
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 studies24,29 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%.

### 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.
In a study conducted by Bilgic et al. 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. 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. 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 and the predominantly inattentive subtype of ADHD has been shown to be significantly more common in girls than in boys. 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. In a study by Toros and Tataroglu 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. In a retrospective study by Aktepe et al. 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, 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.

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.

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 previously43,44, 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.

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Declaration of conflicting interests

The authors declare that there is no conflict of interest.

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