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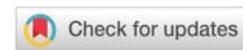
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## Research Article

# Epidemiology and diagnosis of attention deficit hyperactivity disorder in the Arab and Jewish populations in Israel

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## Abstract

**Aims:** The aims of our study were to understand the factors shaping the gap in the literature concerning the Israeli Arab population, and to enhance the knowledge of Attention Deficit Hyperactivity Disorder (ADHD) among this population, and provide information to health professionals.

**Methods:** Retrospective data was collected from medical records in outpatient clinics between the years 2005-2017. Data included 474 Arab and 292 Jewish children aged 5 to 18 years.

**Results:** Main reason for referral was inattention symptoms (44.4%) in Arabs, and academic problems (42.8%) in Jews. Arab preschoolers were mainly hyperactive, whereas adolescents complained about academic difficulties. Arab girls reported inattention symptoms, whereas boys complained of aggressive behavior. ADHD combined subtype (ADHD-C) was the most common subtype in both populations. ADHD-C was more prevalent in preschoolers, and ADHD Inattentive subtype (ADHD-I) was more prevalent between ages 11.1 to 15 years. We found an association between language delay and ADHD in both populations.

**Conclusion:** ADHD characteristics among Israeli Arab and Jewish populations were mainly similar, and analogous with global results.

## Abbreviations

ADHD: Attention Deficit Hyperactivity Disorder; ADHD-C: Combined Subtype; ADHD-H: Hyperactive-Impulsive Subtype; ADHD-I: Inattentive Subtype; DSM: Diagnostic and Statistical Manual of Mental Disorders; SES: Socioeconomic Status

## Current knowledge on the subject

Attention deficit hyperactivity disorder is the most common neurobehavioral disorder in childhood. Researchers have helped characterize biological and genetic components involved in ADHD. Rates of ADHD diagnosis, treatment and access to care often appear to vary according to various factors, such as race/



ethnicity and socioeconomic factors. Epidemiology studies in Arab countries using rating scales in school settings showed rates similar to those in other cultures.

### Contribution of our study to knowledge

In the Arab and Jewish populations parents were the leading informants. There was low agreement between teachers and parents when teachers were the main informants. Significant differences were found between the groups concerning chief complaint which lead to a doctor's appointment in general, and age-related chief complaint. In both populations discrepancies were found in the ADHD types among the different age groups, and an association was identified between language delay and ADHD.

## Introduction

Attention Deficit Hyperactivity Disorder (ADHD) is the most common neurobehavioral disorder of childhood, and among the most prevalent chronic health conditions affecting school-age children [1-3]. The prevalence rates of ADHD seem to have increased during the last decades [4,5]. Scientific research over the past 30 years has helped characterize biological and genetic components involved in ADHD [4]. Due to complexities regarding etiologic factors contributing to ADHD, researchers have studied the relationship of ADHD with various demographic factors, including race/ethnicity and Socioeconomic Status (SES) [6]. Rates of ADHD diagnosis, treatment, and access to care often appear to vary according to these factors. Not all studies have considered whether these factors confound one another [7]. Results have been inconsistent across studies investigating this issue. Basic information regarding how the prevalence of ADHD varies by race/ethnicity, sex, age and SES, remains poorly described [8].

In order to make a diagnosis of ADHD, the primary care clinician as well as other informants (parents, teachers, etc.) should determine (based on subjective judgement) that the Diagnostic and Statistical Manual of Mental Disorders (DSM) criteria have been met [9,10]. Thus, the behavioral characteristics may be interpreted differently by different observers and in diverse cultures [9-11]. Since the nature of this varies according to cultural as well as developmental and individual factors, we assume that diagnosis and treatment decisions will be more effective, and better accepted as researchers improve in identifying and managing ethnic and cultural parameters [12]. The predominance of American research into this disorder over the past 40 years has led to the impression that ADHD is primarily an American disorder and is much less prevalent elsewhere [13]. Similar characteristics and similar prevalence rates of ADHD have been found in different countries and cultures [2,14]. Dissimilarities may result from differential tolerance of *inappropriate behavior* across cultures, e.g. cross-cultural differences in authoritative parenting style could be relevant [15]. There are also significant ethnic differences in knowledge and sources of information concerning ADHD and the use of out-of-school behavioral health services [16].

A review of epidemiology studies in Arab countries, using rating scales in a school setting, showed ADHD rates similar to those in other cultures [17]. Israel is a multiethnic country with a substantial minority of Arab and Druze citizens, and a large diverse immigrant population. One study showed a higher prevalence of ADHD in Jews compared to Arabs and Druze (3.6% vs.1.0%). This discrepancy could be due to genetic, environmental, cultural insensitivity, or under-diagnosis [18-21].

Socioeconomic factors interact with culturally based attitudes, and factors shape the pediatrician's willingness to issue prescriptions in response to both demands and public expectations [19]. Research suggests that culturally relevant factors, such as beliefs and values regarding child behavior, impact the way members of various ethnic and cultural groups view and respond to problematic behavior in children [22,23].

As all cultures tend to play a significant role in shaping the individual's attitudes and behavior, particularly with regard to children's mental health, mental health professionals in general need to be knowledgeable about their patients by understanding their heterogeneous cultural values, beliefs, and practices [24]. The aim of the current study was to understand the factors shaping the gap in the literature concerning the Israeli Arab population, as well as the paucity of information available regarding the risk and cultural factors, comorbidity, and the association with SES within the Arab community.

## Materials and methods

### Summary

This is a descriptive observational study. As most published data are based on parent-teacher reports, our study used broader ADHD diagnostic determinations including clinicians' definitions to examine these relationships in a multisite sample. To enhance our understanding of ADHD in the Israeli Arab population, we identified and retrospectively collected data on Arab and Jewish children aged 5 to 18 years, diagnosed with ADHD. These children had been referred to the ADHD Clalit Health Services Clinic between the years 2005-2017, and to the Hadassah-Hebrew University Medical Center between the years 2014 and 2016. Our aim was to identify the epidemiology, etiology and families' perceptions of their children's behavior.

### Design

A two-stage study design was applied. In the first phase, data was collected from the medical records of Arab patients. The diagnostic procedure relied on an interview with the patient and parents, a medical/neurological examination as described by the American Academy of Pediatrics clinical practice guidelines [25] and completion of ADHD symptom scales based on DSM-5 criteria [26]. The diagnostic process was performed by an indigenous Arabic speaking specialist in pediatric neurology in an outpatient clinic from January 2005 till December 2017. Data was collected from the Clalit Health Services which is the largest HMO in Israel.

In the second phase, data was collected from the medical records of Jewish children who were diagnosed in the same



precise procedure by a native Hebrew speaking specialist in pediatric neurology in an outpatient clinic at a tertiary care university hospital.

The present study comprised 766 (474 Arabs, and 292 Jewish) children with ADHD, aged 5 to 18 years. The Arab population clinics are based in the central part of Israel in cities (Taibe, Umm el-Fahem, Kafr Qasim, Lod, Ramalleh, and Jaffa), one suburban town (Tira), and rural communities (Kafr Qara, Kafr Bara, and Jaljulia). The Jewish population data was collected from clinics based in Jerusalem, the suburban towns of Modi'in and Bet Shemesh, and rural communities. The diagnostic process was completed according to the native language (Arabic or Hebrew) of each child and his informants, to exclude language restriction.

Retrospective data was collected for each individual and included gender, cause of referral, age at referral, DSM-5 symptoms, ADHD subtype: inattentive subtype (ADHD-I), hyperactive-impulsive subtype (ADHD-H) and ADHD combined subtype (ADHD-C), SES, perinatal history, psychomotor development (gross motor, fine motor, and language difficulties), habits history, such as bedwetting, bowel habits, sleep patterns, social issues, traits, family history, relatives, medication, treatment adherence and outcome.

The SES of the population was determined by the local councils and municipalities, and a socio-economic index by ranking and cluster membership. This 10-cluster index is a measure often used to describe the SES of localities in Israel. The percentage of Arab localities in each SES index is different, with lower SES indices including almost all the Arab localities. However, no Arab localities are included in the higher four indices.

### Ethics statement

This study design was reviewed and approved by the Human Subjects Committee of the Hadassah-Hebrew University Medical Center (Mount Scopus Campus), Jerusalem, in accordance with the principles of the Declaration of Helsinki and Good Clinical Practice, and was approved by the Ethics Board of the Human Subjects Protection Program of the Clalit Health Services.

### Statistical evaluation

Analysis of the data was performed using SPSS software to analyze quantitative data.

The analyses were performed on three levels:

1. Descriptive analysis: Descriptive statistics test was performed to describe the frequencies of the dependent and the independent variables;
2. A two variable test was conducted to examine the relationships between the dependent variables, and the dependent and independent variables. This was performed using the Chi square test;
3. Multilinear hierarchical multivariate regression was

performed between independent variables such as age, SES, family history, and dependent variables, such as treatment, medication and symptoms;

## Results

### Participants

Our cohort comprised 60.7% Arabs, and 39.1% Jews. ADHD was more prevalent among boys (Arabs 76.6%; Jews 70.9%) than among girls (Arabs 23.4%; Jews 29.1%). The Chi square test did not show a significant difference in the incidence of ADHD by gender in either population.

### Diagnosis

In both populations concern regarding the need for ADHD diagnosis was initiated more by the parents than the teachers. Other informants in both populations were physicians, nurses, psychologists, speech therapists, and other family members (Table 1).

**Table 1:** Informants in the Israeli Arab and Jewish populations.

Informants	Self-parents %	Teachers %	Others %
Arabs	58.5	31.1	10.4
Jewish	43.2	28.1	28.7

Chi square analysis showed that in both populations the parents tended to refer their children for diagnosis more frequently than other groups. There was a significantly higher than expected equal distribution ( $\chi^2(3)=112.58$  and  $\chi^2(3)=359.92$  for the Jewish and Arab populations, respectively, both with a  $p$  value  $< 0.001$ ).

In the Arab population inattention symptoms were the chief complaint for boys and girls in all age groups (44.4%), compared to the Jewish population wherein academic difficulties were the chief complaint (42.8%). To test whether there is a difference in prevalence of chief complaints between the four age groups, we conducted a Chi square test which revealed a significant difference among the groups (Table 2).

In preschoolers (5 to 7 years) hyperactivity was the major complaint and in the adolescent group (11.1 to 15 years) the major complaint was academic difficulties ( $\chi^2 = 45.87$ ,  $df$  30,  $sig$  0.032). Significant differences were found between genders regarding chief complaints. Arab girls complained more about inattention whereas boys complained about aggression ( $\chi^2=19.66$ ,  $df$  10,  $sig$  0.033). In the Jewish population there was no significant relation between gender and chief complaint. Moreover, the Jews started to report academic problems at an earlier age (7.1 to 11 years) than the Arabs (15.1 to 18 years) ( $\chi^2=53.56$ ,  $df$  27,  $sig$  0.002).

When subtypes were defined based on DSM-5 criteria, the ADHD combined subtype (ADHD-C) was the most common subtype in the Arab population (50.1%) (Table 3). The same subtype was most prevalent in preschoolers than in any other group. The mainly inattentive subtype (ADHD-I) was most



**Table 2:** Chief complaints in the Israeli Arab population I.

Chief complaints	Impulsiveness	Inattention	Hyperactivity	Academic problems	Anxiety	Aggression	Self esteem	Procrastination	Disorganization	Other	χ <sup>2</sup> (p)
Boys	1	142*	72	58	12	15	5	5	8	28	19.7 (0.033) df=10
Girls	0	59*	10	17	2	0	1	0	3	14	
Age groups (years)											45.9 (0.031) df=30
I (5 to 7)	1	45	37*	15	3	3	0	0	4	11	
II (7.1 to11)	0	104	33*	37	9	9	5	2	6	20	
III (11.1 to15)	0	35	8	19*	2	2	0	2	1	9	
IV (15.1 to18)	0	14*	3	4	0	0	0	1	0	1	

prevalent between 11.1 to 15 years of age than other subtypes ( $\chi^2=28.3$ ,  $df =6$ ,  $sig=0.00$ ) (Table 3). These findings were similar in both populations.

A 2 x 3 ANOVA for differences in DSM-5 scores (nationality x informant) was conducted after combining the physicians and all other groups into one group. This analysis revealed significant main effects for nationality ( $F(1,623) = 6.39$ ,  $sig = 0.012$ ,  $\eta^2=0.01$ ) and informant ( $F(2,623) = 9.87$ ,  $sig < 0.001$ ,  $\eta^2=0.03$ ), but no interaction effect ( $F(2,623) = 0.46$ ,  $sig > 0.05$ ). These results, presented in Table 4, suggested that when teachers were the original alerting source of information, they reported higher levels of ADHD symptoms in children. Specialists also tended to report high levels of ADHD symptoms. However, when parents were the original informants, they reported the lowest DSM-5 scores.

Furthermore, post-hoc comparisons confirmed that the ratings of parents were significantly lower than the ratings obtained from teachers.

For additional comprehension of the role played by the person who initiated the diagnosis, we performed an additional 2 x 3 (nationality x informant) ANOVA to test the differences in age of the child at first referral for diagnosis. The results indicated a similar pattern for both nationalities. Interaction and main effect of nationality were not significant, both with p values > 0.05. However, the main effect of informant was significant ( $F(2,724) = 18.95$ ,  $sig < 0.001$ ,  $\eta^2=0.05$ ). The average age, combined for both nationalities, for first referral for diagnosis was 8.61 (2.43) for cases initiated by teachers, 9.46 (3.30) for cases initiated by others groups, and highest 10.20 (3.24) for cases initiated by parents (Table 5).

In both populations there was a significant relation between age groups and delay in developmental milestones. In the Arab preschool population (5 to 7 years) a Chi square test showed that this group was more prone to language delay ( $\chi^2=9.35$ ,  $df =3$ ,  $sig 0.025$ ) (Table 6).

In our cohort most of the ADHD-diagnosed children exhibited difficulties in combined learning objectives (reading, writing and calculating).

Among the ADHD-diagnosed children, the rate of co-occurrence with other psychopathological symptoms was higher in the Arab population despite no significant relation according to Chi square in both populations. The most prevalent symptoms in the Arab population were: Conduct disorder (13%),

**Table 3:** Prevalence of attention deficit hyperactivity disorder (ADHD) subtypes within the Israeli Arab sample.

ADHD Arabs	ADHD (%)	ADHD-I (%)	ADHD-H (%)	ADHD-C (%)	χ <sup>2</sup> (p)
All	453	156 (34.4)	1 (0.2)	227 (50.1)	
Boys	347 (76.6)	113 (37.8)	1 (0.3)	185 (61.9)	
Girls	106 (23.4)	43 (50.6)	0	42 (49.4)	
<b>Age groups (years)</b>					
I (5 to 7)	92 (20.3)	27 (17.3)	0	65* (28.6)	28.31(0.00)
II (7.1 to 11)	195 (43.0)	79 (50.6)	0	116 (51.1)	
III (11.1 to 15)	65 (14.3)	35* (22.4)	0	30 (13.2)	
IV (15.1 to 18)	20 (4.4)	10 (6.4)	1 (100)	9 (4.0)	

ADHD-I = Inattentive Subtype; ADHD-H: Hyperactive-impulsive subtype; ADHD-C: Combined Subtypes

\*A significant relation between age groups and ADHD types according to Chi-square test.

**Table 4:** Diagnostic and Statistical Manual of Mental Disorders (DSM-5) scores according to nationality and informant.

	Arab M (SD) [N]	Jewish M (SD) [N]
Teachers	11.94 (4.84) [120]	11.13 (4.65) [69]
Parents	9.86 (5.21) [226]	9.08 (4.29) [103]
Others	11.51 (4.43) [41]	9.70 (5.26) [70]

**Table 5:** Descriptive statistics.

Nationality	Informants	mean	SD deviation	N
Jews	Others	9.375	3.22716	80
	Teachers	8.4634	2.47554	82
	Parents	10.32	3.35194	125
	Total	9.5261	3.17637	287
Arabs	Others	9.6136	3.4521	44
	Teachers	8.7	2.40483	139
	Parents	10.1385	3.19297	260
	Total	9.635	3.05991	443
Total	Others	9.4597	3.29671	124
	Teachers	8.6122	2.42839	221
	Parents	10.1974	3.24218	385
	Total	9.5922	3.10451	730

oppositional defiant disorder (ODD) (9%), seizures (2.6%), tics (1.3%), hearing difficulties (2.6%). and enuresis (2%). In this same population there was a greater tendency for boys than girls with ADHD to suffer from sleep disorders ( $\chi^2=3.37$ ,  $df=1$ ,  $sig=0.06$ ).

## Discussion

This study that compared parameters of pediatric ADHD in Israeli Arab and Jewish populations revealed that the



**Table 6:** Developmental delay in the Israeli Arab and Jewish populations.

Developmental Delay Age groups (years)		Motor	Fine	Language
I (5 to 7)	Arabs	6	30	45
	Jewish	9	14	17*
II (7.1 to 11)	Arabs	13	50	75
	Jewish	15	16	31
III (11.1 to 15)	Arabs	3	9	15
	Jewish	6	3	4
IV (15.1 to 18)	Arabs	0	3	2
	Jewish	0	2	1

results of both populations were similar, and analogous with global results in most aspects. This study revealed that in the Arab sector the parents were the main informants, but low agreement was found between teachers and parents when teachers were the main informants. Such a divergence was not found in the Jewish population. Significant differences were found between the two populations concerning chief complaint leading to a doctor's appointment in general, and age-related chief complaint. We found a relation between language delay and ADHD in both populations.

The differences in symptoms in relation to age and gender in this study are similar to other studies. As was concluded previously, the first steps towards seeking help for a child with ADHD lies in identifying core symptoms and assessing impairment level (1). In our study, in the Arab and Jewish populations, parents and not teachers reported a higher prevalence of ADHD symptoms. This finding is appropriate for the Arab culture, where parents (especially the mother) are the primary caretakers [27].

We also found that when teachers were the original alerting source of information, they reported higher levels of ADHD symptoms in children than did the parents. This implies that parent-teacher agreement on ADHD rates was low when the parents were not the informants. Low parent-teacher agreement on ADHD rates was also shown in other cultures [28,29]. Sollie, et al. [28] found that according to the hyperactivity-impulsivity subscale on the ADHD rating scale-IV, teachers rated the child's problems to be less serious than did both parents, which contradicts the results of the study conducted in an Arab population [30-32]. Our findings indicated that more Arab children may suffer from unrecognized behavioral problems, and moreover, could explain the higher prevalence of Jewish ethnicity reported by Farbstain, et al. [18].

Differences were found both on DSM-5 scores and age between cases in which parents vs teachers initiated the quest for ADHD diagnosis. Teachers referred younger children and reported higher scores than parents. It may be asserted that the more severe cases were identified at an earlier stage. Teachers recognized ADHD symptoms in those children and requested referral for treatment even before parents became aware of any warning signs. On the other end of the spectrum were the children with less severe ADHD who remained undiagnosed till a later stage when the parents, for any reason, were ready to seek help.

Regarding the persistence of ADHD symptoms throughout development, there is a continuance of inattention symptoms, whereas levels of hyperactivity decrease with age [33-35]. Poor concentration and high levels of activity are frequent characteristics of normal preschool children. At school age the child starts developing maturity that facilitates learning and concentration. According to Larsson, et al. [33], variations in symptoms between childhood and early adolescence are not only due to new genetic effects but also due to new non-shared environmental effects that gain importance during adolescence. Our study replicated these findings in Arab preschoolers. Hyperactivity symptoms were more consistently reported by different informants at school age (11.1 to 15 years), and academic problems constituted the main complaint. In the Jewish population the onset of complaints regarding academic problems began at an earlier age (7.1 to 11 years) as demonstrated in the literature regarding the relation of academic problems to ADHD symptoms, and especially inattention. A review by Loe & Feldman [27] found that ADHD was associated with low grades, reading problems, and poor performance in mathematics standardized test scores, and with an increased likelihood of repeating a school year. Thorell [36], reported that only symptoms of inattention were correlated with academic skills. We speculated that the reasons for the emergence of academic problems at an earlier age in the Jewish population were connected to differences in the awareness of ADHD, a point which is beyond the scope of this paper.

As was previously published ADHD symptoms in our study were gender related. Arab girls complained more about inattention whereas boys reported aggression. This finding is consistent with other studies which showed that, according to parents and teachers, boys were more likely to be hyperactive, whereas girls tended to be inattentive [32]. Similarly, other researchers confirmed that the inattentive subtype is more prevalent in girls [37-39].

Concerning subtypes, we found that the rates of the inattentive, hyperactive-impulsive, and the combined subtypes were 34.4%, 0.2% and 50.0%, respectively, in both populations, with the combined subtype being the most prevalent. Surprisingly, different findings were reported internationally, with the predominance of the inattentive subtype [40,41].

Regarding subtypes and age groups, in preschoolers, as found in other studies, the hyperactive-impulsive subtype is the most prevalent [29,43]. In the school age group, the inattentive subtype outweighed the other subtypes, which correlates with other studies conducted in Israel and worldwide [44].

However some results are different to those previously published, probably reflecting specific Israeli cultural characteristics. The differences in the Israeli and international results regarding subtypes could be explained by population idiosyncrasies, cultural differences, and the stress levels in life-style. The socio-political and ethno-cultural composition of Israel (Arab and other minorities vs. a Jewish majority) together with the long-lasting Palestinian-Israeli conflict make this country unique in comparison with other cultures [42]. Therefore, further studies might be needed in order to



investigate the reason for these differences in both Israeli and global populations.

We found that delayed language development was an early sign of ADHD among the Jewish population. Whereas this result correlates with that of another study conducted in Israel [45], in our Arab population sample, as well as in other studies, there was no significant relation between delayed language development and ADHD [29]. More studies are warranted in examining the long-term outcome of language delay and ADHD symptoms, especially attention deficit and its effect on language, short term memory and processing speed.

**Our study has several limitations:** This study was based on data from a single institution for each ethnicity. The majority of cases were boys, which could cause a bias, as there is under diagnosis amongst girls who tend to be less disruptive. Despite the existence of differences in the prevalence of ADHD among socioeconomic levels internationally, these differences did not reach a significant level due to the lack of heterogeneity in the SES index of the Arab localities, which were found to be in the lower SES indices.

## Conclusion

Our study revealed that in most aspects, the results of the Israeli Arab and Jewish populations were similar, and analogous with global results. However, there are some differences between our study and international studies, which warrants further investigation. Ethnic and cultural differences may explain some of the increase in ADHD prevalence worldwide. In Israel, as in other countries, efforts are being made to enhance physicians' sensitivity to the diagnosis of ADHD and ethnic/cultural differences. Increased public awareness, improved access to health services, and improved referral from primary care and communities to specialty health services may increase the likelihood of ADHD being identified on screening and diagnosis [19,46]. The contributions of these parameters and the understanding of the complex relationships between ethnic/cultural variables and ADHD identification and treatment warrant further investigation and may aid clinicians in providing more specific and appropriate care [7,46].

## Author contributions

LJ and NH contributed equally to this work as the principal investigators. LJ, NH and IB conceptualized, designed the study and drafted the initial manuscript. NH and EG completed the statistical analyses. NH and LJ collected the data. EG assisted with the statistical analyses. LJ, NH, and IB critically reviewed and revised the manuscript. All authors were involved in writing the paper and had final approval of the submitted and published versions.

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## Conflict of interest

The authors declare that the research was conducted in the

absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

## Ethics

This study was approved by the Human Subjects Protection Program of the Clalit Health Services Ethics Board.

## References

1. American Academy of Pediatrics (2011) Subcommittee on attention deficit hyperactivity disorder (oversight by the steering committee on quality improvement and management. Clinical practice guideline: diagnosis and evaluation of the child with attention-deficit/hyperactivity disorder. *Pediatrics* 105: 1158-1170.
2. Faraone SV, Sergeant J, Gillberg C, Biederman J (2003) The worldwide prevalence of ADHD: is it an American condition? *World Psychiatry* 2: 104-113. [Link: https://bit.ly/3hKbsw4](https://bit.ly/3hKbsw4)
3. Faraone SV, Biederman J, Mick E (2006) The age-dependent decline of attention deficit hyperactivity disorder: a meta-analysis of follow-up studies. *Psychol Med* 36: 159-165. [Link: https://bit.ly/30R03nq](https://bit.ly/30R03nq)
4. Castellanos FX, Tannock R (2002) Neuroscience of attention-deficit/hyperactivity disorder: the search for endophenotypes. *Nat Rev Neurosci* 3: 617-628. [Link: https://bit.ly/2DhFrFf](https://bit.ly/2DhFrFf)
5. Visser SN, Danielson ML, Bitsko RH, Holbrook JR, Kogan MD, Ghandour RM, et al. (2014) Trends in the parent-report of health care provider-diagnosed and medicated attention-deficit/hyperactivity disorder: United States, 2003-2011. *J Am Acad Child Adolesc Psychiatry* 53: 34-46.e2. [Link: https://bit.ly/20YQxca](https://bit.ly/20YQxca)
6. Danielson ML, Bitsko RH, Ghandour RM, Holbrook JR, Kogan MD, et al. (2018) Prevalence of parent-reported ADHD diagnosis and associated treatment among U.S. children and adolescents, 2016. *J Clin Child Adolesc Psychol* 47:199-212. [Link: https://bit.ly/306GfNr](https://bit.ly/306GfNr)
7. Bax AC, Bard DE, Cuffe SP, McKeown RE, Wolraich ML (2019) The association between race/ethnicity and socioeconomic factors and the diagnosis and treatment of children with attention-deficit hyperactivity disorder. *J Dev Behav Pediatr* 40: 81-91. [Link: https://bit.ly/2CNV5jk](https://bit.ly/2CNV5jk)
8. Rowland AS, Lesesne CA, Abramowitz AJ (2002) The epidemiology of attention-deficit/hyperactivity disorder (ADHD): a public health view. *Ment Retard Dev Disabil Res Rev* 8: 162-170. [Link: https://bit.ly/333imse](https://bit.ly/333imse)
9. Berger I (2011) Diagnosis of attention deficit hyperactivity disorder: much ado about something. *IMAJ* 13: 571-574. [Link: https://bit.ly/307Bxz7](https://bit.ly/307Bxz7)
10. Rader RL, McCauley L, Callen EC (2009) Current strategies in the diagnosis and treatment of childhood attention-deficit/hyperactivity disorder. *Am Fam Physician* 79: 657-665. [Link: https://bit.ly/30MTAJS](https://bit.ly/30MTAJS)
11. Rousseau C, Measham T, Bathiche-Suidan M (2008) DSM IV, culture and child psychiatry. *J Can Acad Child Adolesc Psychiatry* 17: 69-75. [Link: https://bit.ly/3jG7Mx0](https://bit.ly/3jG7Mx0)
12. Livingston R (1999) Cultural issues in diagnosis and treatment of ADHD. *J Am Acad Child Adolesc Psychiatry* 38: 1591-1594. [Link: https://bit.ly/3jPtTKA](https://bit.ly/3jPtTKA)
13. Polanczyk G, Jensen P (2008) Epidemiologic considerations in attention deficit hyperactivity disorder: a review and update. *Child Adolesc Psychiatr Clin N Am* 17: 245-260. [Link: https://bit.ly/3f4p4Aj](https://bit.ly/3f4p4Aj)
14. Fayyad J, De Graaf R, Kessler R, Alonso J, Angermeyer M, et al. (2007) Cross-national prevalence and correlates of adult attention-deficit hyperactivity disorder. *Brit J Psychiatry* 190: 402-409. [Link: https://bit.ly/30Tqed1](https://bit.ly/30Tqed1)
15. Gomez-Benito J, Van de Vijver FJR, Balluerka N, Caterino L (2015) Cross-cultural and gender differences in ADHD among young adults. *J Atten Disord* 23: 22-31. [Link: https://bit.ly/3hJ9H2e](https://bit.ly/3hJ9H2e)



16. Locke J, Kang-Yi CD, Pellicchia M, Marcus S, Hadley T, et al. (2017) Ethnic Disparities in school-based behavioral health service use for children with psychiatric disorders. *J Sch Health* 87: 47-54. [Link: https://bit.ly/3hLJhwS](https://bit.ly/3hLJhwS)
17. Farah LG, Fayyad JA, Eapen V, Cassir Y, Salamoun MM, et al. (2009) ADHD in the Arab world: a review of epidemiologic studies. *J Atten Disord* 13: 211-222. [Link: https://bit.ly/3g7Dzox](https://bit.ly/3g7Dzox)
18. Farbstein I, Mansbach-Kleinfeld I, Auerbach JG, Ponizovsky AM, Apter A (2014) The Israel Survey of Mental Health among Adolescents: Prevalence of attention-deficit/hyperactivity disorder, comorbidity, methylphenidate use, and help-seeking patterns. *IMAJ* 16: 568-573. [Link: https://bit.ly/333sPE6](https://bit.ly/333sPE6)
19. Jaber L, Rigler S, Shuper A, Diamond G (2017) Changing epidemiology of Methylphenidate prescriptions in the community: A multifactorial model. *J Atten Disord* 21: 1143-1150. [Link: https://bit.ly/2X35zSR](https://bit.ly/2X35zSR)
20. Habel LA, Schaefer CA, Levine P, Bhat AK, Elliott G (2005) Treatment with stimulants among youths in a large California health plan. *J Child Adolesc Psychopharmacol* 15: 62-67.
21. Zuvekas SH, Vitiello B, Norquist GS (2006) Recent trends in stimulant medication use among U.S. children. *Am Journal Psychiatry* 163: 579-585. [Link: https://bit.ly/3hMkHMj](https://bit.ly/3hMkHMj)
22. Barkley RAE (2006) Attention Deficit Hyperactivity Disorder: A Handbook for Diagnosis and Treatment. Third edition. New York: The Guildford Press.
23. Eiraldi RB, Mccurdy B, Khanna M, Mautone J, Jawad AF, et al. (2006) Service utilization among ethnic minority children with ADHD: a model of help-seeking behavior. *Adm Policy Ment Health* 33: 607-622. [Link: https://bit.ly/2D8Rw70](https://bit.ly/2D8Rw70)
24. Tirosh E, Cohen A (1998) Language deficit with attention-deficit disorder: a prevalent comorbidity. *J Child Neurol* 13: 493-497. [Link: https://bit.ly/3hAR3tg](https://bit.ly/3hAR3tg)
25. Wolraich M, Brown L, Brown RT, DuPaul G, Earls M, et al. (2011) Subcommittee on Attention-Deficit/Hyperactivity Disorder; Steering Committee on Quality Improvement and Management. ADHD: Clinical practice guideline for the diagnosis, evaluation, and treatment of attention-deficit/hyperactivity disorder in children and adolescents. *Pediatrics* 128: 1007-1022. [Link: https://bit.ly/39x1u4](https://bit.ly/39x1u4)
26. Dalsgaard S (2013) Attention-deficit/hyperactivity disorder (ADHD). *Eur Child Adolesc Psychiatry* 22: S43-S48.
27. Loe IM, Feldman HM (2007) Academic and educational outcomes of children with ADHD. *J Pediatr Psychol* 32: 643-654. [Link: https://bit.ly/3g90lfx](https://bit.ly/3g90lfx)
28. Sollie H, Larsson B, Mørch WT (2012) Comparison of mother, father, and teacher reports of ADHD core symptoms in a sample of child psychiatric outpatients. *J Atten Disord* 17: 699-710. [Link: https://bit.ly/3jWVv71](https://bit.ly/3jWVv71)
29. Canals J, Morales-Hidalgo P, Jané MC, Domènech E (2018) ADHD prevalence in Spanish preschoolers: Comorbidity, socio-demographic factors, and functional consequences. *J Atten Disord* 22: 143-153. [Link: https://bit.ly/2X2rKbH](https://bit.ly/2X2rKbH)
30. Antrop I, Roeyers H, Oosterlaan J (2002) Agreement between parent and teacher ratings of disruptive behavior disorders in children with clinically diagnosed ADHD. *J Psychopathol Behav Assess* 24: 67-73. [Link: https://bit.ly/39yfGE4](https://bit.ly/39yfGE4)
31. Murray DW, Kollins S, Hardy KK, Abikoff HB, Swanson JM, et al. (2007) Parent versus teacher ratings of attention-deficit/hyperactivity disorder symptoms in the preschoolers with Attention-Deficit/Hyperactivity Disorder Treatment Study (PATS). *J Child Adolesc Psychopharmacol*. 17: 605-620. [Link: https://bit.ly/30708UU](https://bit.ly/30708UU)
32. Papageorgiou V, Kalyva E, Dafoulis V, Vostanis P (2008) Differences in parents' and teachers' ratings of ADHD symptoms and other mental health problems. *Eur J Psychiat* 22: 200-210. [Link: https://bit.ly/331N4Sw](https://bit.ly/331N4Sw)
33. Larsson JO, Larsson H, Lichtenstein P (2004) Genetic and environmental contributions to stability and change of ADHD symptoms between 8 and 13 years of age: a longitudinal twin study. *J Am Acad Child Adolesc Psychiatry* 43: 1267-1275. [Link: https://bit.ly/306E3pq](https://bit.ly/306E3pq)
34. Harpin VA (2005) The effect of ADHD on the life of an individual, their family, and community from preschool to adult life. *Arch Dis Child* 90: i2-i7. [Link: https://bit.ly/32ZVZng](https://bit.ly/32ZVZng)
35. Sibley MH, Pelham WE, Molina BSG, Gnagy EM, Waschbusch DA, et al. (2012) Diagnosing ADHD in adolescence. *J Consult Clin Psychol* 80: 139-150. [Link: https://bit.ly/2BzwZle](https://bit.ly/2BzwZle)
36. Thorell LB (2007) Do delay aversion and executive function deficits make distinct contributions to the functional impact of ADHD symptoms? A study of early academic skill deficits. *J Child Psychol Psychiatry* 48: 1061-1070. [Link: https://bit.ly/3g7YaZU](https://bit.ly/3g7YaZU)
37. Weiss M, Worling D, Wasdell M (2003) Chart review study of the inattentive and combined types of ADHD. *J Atten Disord* 7: 1-9. [Link: https://bit.ly/3hN0upl](https://bit.ly/3hN0upl)
38. Biederman J, Kwon A, Aleardi M, Chouinard VA, Marino T, et al. (2005) Absence of gender effects on attention deficit hyperactivity disorder: findings in nonreferred subjects. *Am J Psychiatry* 162: 1083-1089. [Link: https://bit.ly/2X2qHZj](https://bit.ly/2X2qHZj)
39. Aboul-Ata MA, Amin FA (2018) The prevalence of ADHD in Fayoum City (Egypt) among school-age children: Depending on a DSM-5-Based Rating Scale. *J Atten Disord* 22: 127-133. [Link: https://bit.ly/2X5q80G](https://bit.ly/2X5q80G)
40. Graetz BW, Sawyer MG, Baghurst P, Ettridge K (2006) Are ADHD gender patterns moderated by sample source? *J Atten Disord* 10: 36-43. [Link: https://bit.ly/3g8oblz](https://bit.ly/3g8oblz)
41. Froehlich TE, Lanphear B, Epstein JN, Barbaresi WJ, Katusic SK, et al. (2007) Prevalence, recognition, and treatment of attention-deficit/hyperactivity disorder in a national sample of US children. *Arch Pediatr Adolesc Med* 161: 857-864. [Link: https://bit.ly/3g6KbdJ](https://bit.ly/3g6KbdJ)
42. Daoud N, Soskolne V, Mindel IJS, Roth MA, Manor O (2018) Ethnic inequalities in health between Arabs and Jews in Israel: the relative contribution of individual-level factors and the living environment. *Int J Public Health* 63: 313-323. [Link: https://bit.ly/2P1yamZ](https://bit.ly/2P1yamZ)
43. Amador-Campos JA, Forns-Santacana M, Guàrdia-Olmos J, Peró-Cebollero M (2006) DSM-IV Attention Deficit Hyperactivity Disorder Symptoms: Agreement between informants in prevalence and factor structure at different ages. *J Psychopathol Behav Assess* 28: 23-32. [Link: https://bit.ly/2CSMxYc](https://bit.ly/2CSMxYc)
44. Brook U, Boaz M (2005) Attention deficit and learning disabilities (ADHD/LD) among high school pupils in Holon (Israel). *Patient Educ Couns* 58: 164-167. [Link: https://bit.ly/2X3Pxb5](https://bit.ly/2X3Pxb5)
45. Ornoy A, Uriel L, Tennenbaum A (1993) Inattention, hyperactivity and speech delay at 2-4 years of age as a predictor for ADD-ADHD syndrome. *Isr J Psychiatry Relat Sci* 30: 155-163. [Link: https://bit.ly/3jLH6ed](https://bit.ly/3jLH6ed)
46. Xu G, Strathearn L, Liu B, Yang B, Bao W (2018) Twenty year trends in diagnosed attention deficit/hyperactivity disorder among US children and adolescents 1997-2016. *JAMA Netw Open* 1: e181471. [Link: https://bit.ly/2X3iNPw](https://bit.ly/2X3iNPw)

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