

# Clinical Profile of Attention Deficit Hyperactivity Disorder: Impact of Ethnic and Social Diversities in Israel

Muhammad Mahajnah MD PhD<sup>1,2</sup>, Rajech Sharkia PhD<sup>3,4</sup>, Nadeem Shorbaji BSc<sup>1,2</sup> and Nathanel Zelnik MD<sup>2,5,6</sup>

<sup>1</sup>Child Neurology and Development Center, Hillel Yaffe Medical Center, Hadera, Israel

<sup>2</sup>Rappaport Faculty of Medicine, Technion-Israel Institute of Technology, Haifa, Israel

<sup>3</sup>Triangle Regional Research and Development Center, Kfar Qari, Israel

<sup>4</sup>Beit Berl Academic College, Beit Berl, Israel

<sup>5</sup>Child Neurology and Development Center, Clalit Health Services - Haifa District, Israel

<sup>6</sup>Department of Pediatrics, Carmel Medical Center, Haifa, Israel

**ABSTRACT:** **Background:** Despite the increased worldwide recognition of attention deficit/hyperactivity disorder (ADHD), there is a variability in the diagnostic rate of both ADHD and its comorbidities. These diversities are probably related to the methodology and instruments used for the diagnosis of ADHD and to awareness and cultural interpretation of its existence.

**Objectives:** To identify consistent differences in the clinical profile of Arab and Jewish children with ADHD in Israel who differ in cultural, ethnic and socioeconomic background.

**Methods:** We analyzed the data of 823 children and adolescents with ADHD (516 Jews and 307 Arabs) and compared the clinical characteristics between these two ethnic groups. All patients were evaluated in two neuropsychiatric and child development centers in northern Israel: one in Haifa and one in Hadera. Children with autism and intellectual disabilities were excluded.

**Results:** The distribution of ADHD subtypes was similar in both populations. However, learning disorders and psychiatric comorbidities (behavioral difficulties and anxiety) were reported more frequently in the Jewish population. The most commonly reported adverse effects to psychostimulants were mood changes, anorexia, headache, insomnia and rebound effect, and were more frequently reported in the Jewish population (42.0% vs.18.0%,  $P < 0.05$ ).

**Conclusions:** We assume that these differences are related to cultural and socioeconomic factors. We suggest that the physician take cultural background into consideration when treating patients with ADHD.

IMAJ 2016; 18: 322–325

**KEY WORDS:** attention deficit/hyperactivity disorder (ADHD), ethnic disparities, psychiatric co-morbidities, methylphenidate formulations, adverse drug effects

ity and/or impulsiveness [1]. The impact of ADHD symptoms in the daily life of school-age children often results in poor school performance, while in adulthood it leads to occupational and social difficulties. One of the major characteristics of ADHD is its tendency to coexist with a wide range of additional mental and neurodevelopmental co-morbidities such as anxiety, behavioral difficulties, learning disabilities, tics and other psychiatric disorders [2].

The management of ADHD is a challenging task and involves a multi-disciplinary approach which usually consists of a combination of educational support, behavioral therapy, lifestyle adaptation and pharmacotherapy. Medications are usually recommended for children with severe symptoms and may be considered for children with moderate severity if they refuse or fail to comply with non-medical modalities.

The prevalence of ADHD is related not only to cultural and social features but also to the clinical instruments used during the diagnostic process. The diagnosis relies mostly on clinical observation and use of standard questionnaires and checklist batteries, which are highly susceptible to human factors. For example, the prevalence of ADHD when using DSM-IV or DSM V criteria is 6%–7% [3], as compared to only 1–2% with the ICD-10 criteria [4]. It appears that in Western societies ADHD is somewhat more frequently diagnosed than in other cultural and ethnic communities. Accordingly, in the United States, racial/ethnic minorities are diagnosed with ADHD at lower rates than in white children [5] and, therefore, may have unmet treatment needs [6]. African-American Children are diagnosed with ADHD at only two-thirds the rate of white children despite displaying greater ADHD symptomatology [7]. Hispanic children have also been reported to be under-diagnosed [8]. There is probably more than one reason for these disparities. Lower accessibility to health professionals and service utilization, lower awareness and likelihood of referral by school professionals, limited ability to pay for health care, and negative attitudes toward disability stigmatization probably play a major role [9–13]. Even when diagnosis of ADHD has been established, patients of these ethnic minorities were found less likely to comply with prescription medication [14,15].

**A**ttention deficit/hyperactivity disorder (ADHD) is the most common developmental neuropsychiatric disorder in children and adolescents. It is characterized by significant difficulties in executive functions, including attention deficits which are commonly (though not necessarily) associated with hyperactiv-

Knowledge regarding the influence of ethnic and social factors on the clinical characteristics of ADHD outside the USA is still inadequate. The impact of cultural heterogeneity on the prevalence of ADHD subtypes, co-morbidities, and preferred treatment modalities, including usage of various stimulants and other drugs as well as their adverse effects, is even less clear. Israel is a multi-ethnic country with a substantial minority of Arab citizens and a large immigrant population, making it an ideal setting for comparative studies of different sub-cultures. Understanding the cultural background of patients and their families can facilitate and improve the medical care for various chronic lifelong conditions, including ADHD. The aim of this study was to illustrate the clinical characteristics of ADHD in children and adolescents from both the Jewish and Arab sectors in northern Israel and to examine whether they are influenced by the ethnic and social background of each group.

### MATERIALS AND METHODS

Data were retrospectively retrieved from two ADHD clinics in northern Israel. These two centers are situated in the Haifa and Hadera districts whose population numbers approximately one million, of whom 70% are Jews and 30% are Arabs. The clinical data were collected from the medical records of children and adolescents aged 7–17 years who were diagnosed with ADHD during the years 2010–2013. The information collected includes: demographic and medical information (ethnic origin, age, gender, birth history), clinical subtype of ADHD (established by a pediatric neurologist based on the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV)* diagnostic criteria [16]), psychiatric co-morbidities (based on parents' reports or assessment by a pediatric psychiatrist or child psychologist), neurologic co-morbidities including learning disabilities (the diagnoses of "learning disabilities" were based on psychological and didactic tests performed by either the school system or private institutions), other chronic medical conditions as well as drug therapy, psycho-behavioral therapy and adverse effects (based on reports by the patients and their families). Children with autism and intellectual disabilities were excluded.

The data were subject to random spot-checking and verification and were imported into SPSS software (SPSS Inc. Chicago, IL, USA) for statistical analysis. Frequency tallies were performed on all categorical variables, prevalence rates determined, and chi-square tests carried out as appropriate. All *P* values were two-sided, and statistical significance was defined as *P* < 0.05.

### RESULTS

The study cohort comprised 823 children and adolescents who fulfilled the clinical criteria for the diagnosis of ADHD. The participants were divided into two ethnic groups: Jewish (n=516, 62.7%) and Arab (n=307, 37.3%). The male to female ratio of

the total sample was 2.6:1, with a slightly higher preponderance of males among the Arab patients; M/F = 2.9:1 vs. 2.4:1 among the Jewish patients (*P* < 0.05). Prematurity (birth < 37 weeks of gestation) was more commonly found in the Jewish than the Arab group (7.56% vs. 2.93%, *P* < 0.05). The distributions of ADHD subtypes were similar in both populations with minor non-significant differences. The combined and hyperactive subtypes were marginally more common in the Jewish population (53.3% vs. 48.9%) while the inattentive subtype was slightly more common in the Arab population (51.1% vs. 46.7%).

The prevalence of neurologic and psychiatric co-morbidities in the study population is shown in Table 1. The most common neurologic co-morbidity was learning disorders (46%), which was slightly more common among the Jewish patients. Other neurologic co-morbidities, such as tic disorder and epilepsy, were much less common. Psychiatric co-morbidities were quite commonly reported among the Jewish patients (60%), while a significantly lower rate was reported among the Arab patients (20%). Among the Jewish patients the most common psychiatric disorders were anxiety and behavioral difficulties. In this respect, while anxiety was the leading psychiatric complaint in the Jewish group, behavioral difficulties were the predominant complaint among the Arab patients (*P* < 0.05). Other medical conditions associated with ADHD were predominantly asthma and obesity which were more common in the Jewish patients, *P* < 0.05 [Table 2].

With regard to pharmacotherapy, most Arab children were treated with short-acting methylphenidate (MPH) formulations (predominantly Ritalin IR<sup>®</sup>, Novartis, Switzerland) and Ritalin SR<sup>®</sup> [Table 3]. In contrast, most of the Jewish children were treated with longer acting MPH formulations, with only 6.8% being treated with short-acting MPH formulations. Additional medications that are not included in the public Israeli health care insurance program, such as amphetamine and dextro-amphetamine mixed salts (Adderall<sup>®</sup>, Shire, USA) and other stimulants, were prescribed for a small number of patients, all of them from the Jewish sector.

**Table 1.** Prevalence of neurologic and psychiatric co-morbidities among the study patients

Concurrent disorder	Jews No. (%)	Arabs No. (%)	Total No. (%)	<i>P</i> values
Without co-morbid neurologic disorders	218 (42.2)	155 (50.5)	373 (45.3)	< 0.05
Learning disability	251 (48.6)	128 (41.7)	379 (46.0)	< 0.05
Epilepsy	3 (0.6)	2 (0.6)	5 (0.6)	0.10
Tics	27 (5.2)	0 (0)	27 (3.3)	NA
Without co-morbid psychiatric disorders	205 (39.7)	247 (80.5)	452 (54.9)	< 0.01
Behavioral difficulties	119 (23.1)	39 (12.7)	158 (19.2)	< 0.01
Anxiety	138 (26.7)	3 (1)	141 (17.1)	< 0.01
Depression	4 (0.8)	0 (0)	4 (0.5)	< 0.01

**Table 2.** Other common diseases associated with ADHD among the study patients

	Jews No. (%)	Arabs No. (%)	Total No. (%)	P values
No associated disease	364 (70.5)	198 (64.5)	562 (68.3)	0.44
Asthma and respiratory diseases	20 (3.9)	2 (0.7)	22 (2.7)	< 0.01
Obesity or endocrine disease	34 (6.6)	5 (1.6)	39 (4.7)	< 0.01
None	364 (70.5)	198 (64.5)	562 (68.3)	0.44

**Table 3.** Preferred medications prescribed for ADHD among the study patients

Medications	Jews No. (%)	Arabs No. (%)	Total No. (%)	P values
MPH (IR)	24 (4.7)	100 (32.6)	124 (15)	< 0.05
MPH (SR)	11 (2.1)	118 (38.4)	129 (15.7)	< 0.05
MPH (LA)	240 (46.5)	53 (17.3)	293 (35.6)	< 0.05
OROS-MPH (Concerta®)	181 (35)	36 (11.7)	217 (26.4)	< 0.01
Mixed amphetamine salts (Adderall®)	51 (9.9)	0 (0)	51 (6.2)	NA
Others	9 (1.7)	0 (0)	9 (1.1)	NA
Total	516	307	823	

MPH = methylphenidate, IR = immediate release, SR = slow release, LA = long-acting, OROS = osmotic-controlled release oral delivery system, NA = not applicable

**Table 4.** Psychostimulant adverse effects reported by the patients

Adverse effect	Jews No. (%)	Arabs No. (%)	Total (%) No. (%)	P values
Mood changes*	81 (15.7)	2 (0.7)	83 (10.3)	< 0.05
Anorexia	48 (9.3)	1 (0.3)	49 (6.0)	< 0.05
Headache	31 (6.0)	3 (1.0)	34 (4.1)	< 0.05
Insomnia	24 (4.7)	0	24 (2.9)	NA
Rebound effect	22 (4.3)	0	22 (2.7)	NA
Others	10 (1.9)	1 (0.3)	11 (1.8)	< 0.05
All adverse effects	216 (41.9)	7 (2.3)	223 (28.6)	< 0.05
No adverse effects	291 (56.4)	297 (96.7)	588 (71.4)	< 0.05
Missing data	9 (1.7)	3 (1.0)	12	NA
Total	516	307	823	

\*Including increased anxiety or depression with or without somatic complaints  
NA = not applicable

Most of the patients did not report any adverse effects of the medications (588, 71.4%). The vast majority of the patients and families reporting adverse effects were from the Jewish sector [Table 4].

## DISCUSSION

The present study shows that while the core symptoms and subtypes of ADHD are evenly distributed in both Jewish and Arab communities, its psychiatric and neurologic co-morbidities are

more frequently reported among Jewish patients. Although not entirely clear, this discrepancy could be attributed to under-diagnosis and hesitation to report additional co-morbidities in the Arab community due to concern of stigmatization and prejudice towards psychiatric disorders, learning disabilities and epilepsy. Scarcity of skilled personnel, including pediatric psychiatrists and psychologists, in the Arab community as well as the scanty network of medical services in these fields may lead to a lower rate of diagnosis and awareness of these co-morbidities. Our assumption is supported in part by a recent study from Israel [17] which demonstrated a lower prevalence of ADHD and inadequate usage of MPH and other psychostimulants in the Arab and Druze minorities. This previous study showed that the rate of ADHD in the Arab and Druze communities was only 1.0% compared to 3.6% in the Jewish community. Although this was not a population-based epidemiologic survey, our data suggest that the relative occurrence of the primary features of ADHD in both communities is proportional to their portions in the general population. Hence, the distributions of ADHD (62.7% and 37.3% in the Jewish and Arab sectors respectively) were more proportional to the demographic distribution of these communities in the referral area of our clinics. We consider that the increasing awareness of the diagnosis and subsequent treatment of ADHD in recent years were the main contributory factors in the increasing prevalence of ADHD in the Arab sector. The previously reported lower rate of ADHD was probably related to cultural insensitivity of the instrument used by inexperienced medical personnel as well as to patients' lack of awareness and the inaccessibility of medical services. Nevertheless, in the present study there is still a significant discrepancy in the prevalence of tics and psychiatric co-morbidities (behavioral difficulties, anxiety, depression) between Jewish and Arab ADHD patients. The reason for the much lower rate of these disorders in the Arab community is not entirely clear, though it seems that Arab families were more reluctant to disclose the presence of emotional and behavioral difficulties or regard them as afflicted conditions. It seems that in cases where families from the Arab sector were reluctant to disclose emotional and psychiatric problems, the medical and educational personnel did not thoroughly investigate the family to uncover such sensitive information. There is also a solid difference in the preferred medical treatment. Arab patients tend to consume cheaper immediate-release MPH and slow-release MPH, while Jewish patients were more likely to use the more expensive long-acting MPH and OROS-MPH (osmotic-controlled release oral delivery system methylphenidate, Concerta®, Janssen-Cilag, Belgium). Our findings are compatible with those of some previous American studies showing that African-American children with ADHD had a narrower pattern of psychiatric co-morbidity and dysfunction than was observed in Caucasians and consumed fewer ADHD medications [5,7,18].

Surprisingly, the few studies that were conducted in the Arab world showed a much higher prevalence of ADHD, its subtype distribution and its psychiatric co-morbidities as compared to our findings, or to those in the Israeli population. An Egyptian study exploring the clinical characteristics of ADHD in a cohort of 925 high-school students showed that 9.4% fulfilled the ADHD diagnostic criteria with an evident preponderance in boys (13.8%, n = 58) compared to girls (5.8%, n = 29), and a ratio of 2:1 [19]. Among the students diagnosed with ADHD, psychiatric co-morbidities were invariably common (85.1%) and nearly half the students had poor academic achievements (43.7%). The higher than expected rate of psychiatric co-morbidities, which was higher than the reported prevalence in most countries, might be related to selection bias, since the study was conducted in a secondary psychiatric institution rather than in community clinics.

Most other studies that surveyed the prevalence and co-morbidities of ADHD in Arab Middle Eastern countries demonstrated a similar prevalence to that of many other communities and cultures (7.48–14.8%) [20–22]. In contrast to our findings, Fayyad et al. [23] showed that Lebanese children with ADHD often had psychiatric co-morbid disorders, such as mood disorders (19.1%), learning and language or communication disorder (18.8%), anxiety disorders (15.6%), enuresis (14.8%), and encopresis (3.0%). In the World Mental Health Surveys study on adult ADHD conducted in 10 countries (including Lebanon), subjects with adult ADHD had an odds ratio of 11.1% for a co-morbid mood disorder, 9.9% for anxiety disorder and 12.5% for substance abuse [24].

With regard to limitations, the present study employed a retrospective design. It is assumed that a prospective approach would have resulted in a more comprehensive data retrieval. Although the proportional distribution of ADHD among Jews and Arabs referred to our centers is similar to the proportional presentation of these populations in our centers, it is not yet an epidemiologic population-based study. Nevertheless, it should be noted that the medical centers in this study represent a typical sample of patients in the two regions studied, Haifa and Hadera, and reflect the clinical profile of ADHD in children and adolescents in those regions.

In conclusion, this study demonstrates that while the biological nature of ADHD and its subtypes are similar in these two populations, learning disorders, psychiatric co-morbidities, employment of long-acting MPH formulations, and complaints of drug-related adverse effects were more prevalent in patients from the Jewish sectors. We assume that these differences are related to cultural and socioeconomic factors. We suggest that the physician take into consideration cultural background when treating patients with ADHD. In order to determine an accurate prevalence rate of ADHD among Jews and Arabs we suggest that a wide-scale epidemiologic survey based on the national health registry be undertaken.

**Correspondence**

**Dr. M. Mahajnah**

Child Neurology and Development Center, Hillel Yaffe Medical Center, Hadera 38100, Israel

**email:** MohamedM@hy.health.gov.il

**References**

1. Feldman HM, Reiff MI. Attention deficit-hyperactivity disorder in children and adolescents [Review]. *N Engl J Med* 2014; 370: 838-46.
2. Reiersen AM, Todorov AA. Exploration of ADHD subtype definitions and co-occurring psychopathology in a Missouri population-based large sibship sample. *Scand J Child Adolesc Psychiatr Psychol* 2013; 1: 3-13.
3. Willcutt EG. The prevalence of DSM-IV attention-deficit/hyperactivity disorder: a meta-analytic review. *Neurotherapeutics* 2012; 9: 490-9.
4. Cowen P, Harrison P, Burns T. *Shorter Oxford Textbook of Psychiatry*. 6th edn. Oxford University Press, 2012: 546.
5. Schneider H, Eisenberg D. Who receives a diagnosis of attention-deficit/hyperactivity disorder in the United States elementary school population? *Pediatrics* 2006; 117: 601-9.
6. Mehta S, Nagar S, Aparasu R. Unmet prescription medication need in U.S. children. *J Am Pharm Assoc* 2009; 49: 769-76.
7. Miller TW, Nigg JT, Miller RL. Attention deficit hyperactivity disorder in African American children: what can be concluded from the past ten years? *Clin Psychol Rev* 2009; 29: 77-86.
8. Froehlich TE, Lanphear BP, Epstein JN, Barbaresi WJ, Katusic SK, Kahn RS. Prevalence, recognition, and treatment of attention-deficit/hyperactivity disorder in a national sample of US children. *Arch Pediatr Adolesc Med* 2007; 161: 857-64.
9. Coker TR, Elliott MN, Kataoka S, et al. Racial/ethnic disparities in the mental health care utilization of fifth grade children. *Acad Pediatr* 2009; 9: 89-96.
10. Flores G, Tomany-Korman SC. Racial and ethnic disparities in medical and dental health, access to care, and use of services in US children. *Pediatrics* 2008; 121: 286-98.
11. Flores G, Olson L, Tomany-Korman SC. Racial and ethnic disparities in early childhood health and health care. *Pediatrics* 2005; 115: 183-93.
12. Guerrero AD, Rodriguez MA, Flores G. Disparities in provider elicitation of parents' developmental concerns for US children. *Pediatrics* 2011; 128: 901-9.
13. Hervey-Jumper H, Douyon K, Falcone T, Franco KN. Identifying, evaluating, diagnosing, and treating ADHD in minority youth. *J Atten Disord* 2008; 11: 522-8.
14. Pastor PN, Reuben CA. Racial and ethnic differences in ADHD and LD in young school-age children: parental reports in the National Health Interview Survey. *Public Health Rep* 2005; 120: 383-92.
15. Zuvekas SH, Vitiello B. Stimulant medication use in children: a 12-year perspective. *Am J Psychiatry* 2012; 169: 160-6.
16. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders*, 4th edn. Text Revision. Washington DC: American Psychiatric Publishing, 2000.
17. Farbstein I, Mansbach-Kleinfeld I, Auerbach J, Ponizovsky AM, Apter A. The Israel Survey of Mental Health among Adolescents: prevalence of attention deficit/hyperactivity disorder, comorbidity methylphenidate, use, and help-seeking patterns. *IMAJ* 2014; 16: 568-73.
18. Morgan PL, Staff J, Hillemeier MM, Farkas G, Maczuga S. Racial and ethnic disparities in ADHD diagnosis from kindergarten to eighth grade. *Pediatrics* 2013; 132: 85-93.
19. Bishry Z, Ramy HA, El-Shahawi HH, El-Sheikh MM, El-Missiry AA, El-Missiry MA. Screening for ADHD in a sample of Egyptian adolescent school students. *J Atten Disord* 2014 Jun 2. pii: 1087054714533190
20. Bener A, Razna Al, Qahtani RA, Abdelal I. The prevalence of ADHD among primary school children in an Arabian Society. *J Atten Disord* 2006; 10: 77-82.
21. Farah LG, Fayyad JA, Eapen V, et al. ADHD in the Arab world: a review of epidemiologic studies. *J Atten Disord* 2009; 13: 211-22.
22. Salem HA, Fahmy MT, Youssef IM, et al. Attention deficit hyperactivity disorder in a referred sample of school-aged children in Kuwait: sociodemographics, frequency, clinical presentations and impairments. *Egypt J Psychiatry* 2014; 35: 115-26.
23. Fayyad JA, Jahshan CS, Karam EG. Systems development of child mental health services in developing countries [Review]. *Child Adolesc Psychiatr Clin North Am* 2001; 10: 745-62.
24. Fayyad J, De Graaf R, Kessler R, et al. Cross-national prevalence and correlates of adult attention-deficit hyperactivity disorder. *Br J Psychiatry* 2007; 190: 402-9.