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ADHD in the Arab World

A Review of Epidemiologic Studies

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Objective: Epidemiological studies on psychiatric disorders are quite rare in the Arab World. This article reviews epidemiological studies on ADHD in all the Arab countries. **Method:** All epidemiological studies on ADHD conducted from 1966 through the present were reviewed. Samples were drawn from the general community, primary care clinical settings, and populations of traumatized children. Data on prevalence, gender differences, risk factors, comorbidity, and burden of ADHD were reviewed. **Results:** ADHD rates in Arab populations were similar to those in other cultures. Comparisons within Arab studies were difficult given the variability of methodology and instruments used. **Conclusion:** There is an important need for research on ADHD in the Arab World, not only to assess the national prevalence in children and adolescents, but also to look at the differential burden and treatment of this disorder, which has high levels of mental comorbidities and high impact across the life span. (*J. of Att. Dis.* 2009; 13(3) 211-222)

Keywords: ADHD; review; Arab; epidemiological; Institute for Development, Research, Advocacy and Applied Care (IDRAAC)

ADHD has been a topic of intense scientific research in the past two decades. Studies about its prevalence in children and adolescents have been recently conducted in the United States (Barbaresi et al., 2002; Blackwell, Vickerie, & Wondium, 2003; Cuffe, Moore, & McKeown, 2005; Frochlich et al., 2007) and in the United Kingdom (Ford, Goodman, & Meltzer, 2003). A recent review documented the prevalence of ADHD in various countries worldwide (Faraone, Sergeant, Gillberg,

& Biederman, 2003) and a meta-regression analysis of worldwide studies of ADHD among subjects 18 years and younger revealed a pooled prevalence of 5.29%

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(Polanczyk, de Lima, Horta, Biederman, & Rohde, 2007). Prevalence of ADHD is highly heterogeneous with many factors contributing to this heterogeneity, including age (higher in younger children), informants (parents, teachers, subjects, or combinations), diagnostic criteria (higher in the *Diagnostic and Statistical Manual of Mental Disorders*, 4th ed. [DSM-IV; American Psychiatric Association, 1994] versus DSM-III-R [APA, 1987]; higher using DSM classifications vs. International Classification of Diseases [ICD, World Health Organization, 1993]), instruments used, and whether criteria for impairment are applied (Scahill & Schwab-Stone, 2000).

Published studies on ADHD in the Arab World are scarce despite the fact that this disorder commonly affects school children and adolescents, and it is frequently encountered in clinical settings in the Arab World (Fayyad, Jahshan, & Karam, 2001).

This article reviews all epidemiological studies on ADHD in the Arab World as well as associated risk factors, comorbidity, and the burden of ADHD.

Method

The Institute for Development, Research, Advocacy and Applied Care (IDRAAC) has compiled available published mental health research in the Arab World from the year 1966 up through present on its website (<http://www.idraac.org>). This article contains the results of the review on ADHD.

Search Procedure for ADHD

Keywords. The articles included in this review were identified by searching for the following keywords: Attention Deficit Hyperactivity Disorder, ADHD, Attention Deficit Disorder, ADD, and Hyperkinetic Disorder.

Search engines. The search engines used to identify articles containing these keywords were PsycINFO, PubMed, Arabpsynet (<http://www.arabpsynet.com>), IDRAAC's web site (<http://www.idraac.org>) and the IDRAAC database. In addition, child mental health professionals in various Arab countries were personally contacted to get from them any published studies on ADHD in their countries that might have been missed using the search procedures.

Arab countries, regions, and languages. The countries included in the search were Algeria, Bahrain, Egypt, Gaza, Iraq, Jordan, Kuwait, Lebanon, Libya, Morocco,

Oman, Palestine, Qatar, Saudi Arabia, Sudan, Syria, Tunisia, United Arab Emirates (UAE), and Yemen. The regions included were Arab, Gulf, and Middle East. The search was not restricted to any language.

Screening search results and categorization. The search resulted in a large number of abstracts that were screened, and 14 abstracts were marked for being "probably" relevant. The marked abstracts were then categorized according to the following criteria: prevalence, age of onset, comorbidity, age as a risk factor, gender difference, or burden. We retrieved the full text for 12 articles that were found to be relevant for this review. The retrieval was done either online, ordered from local (IDRAAC, Balamand University, American University of Beirut, Saint Joseph University) or international libraries, or hard copies were requested from the authors (by e-mail or regular mail). Some references were not included in this review article because they either turned out to be dissertation abstracts or nonepidemiological studies (e.g., clinical trials) or the samples studied were non-Arab. Based on the populations investigated, the studies were categorized into community samples in which prevalence was examined in either school populations or households, and special populations in which prevalence was examined among traumatized children and adolescents as well as in primary care and child psychiatry clinical settings. Although the latter two settings are not representative of the general population, nor are they epidemiologic samples, they were included in this review because of their relevance to issues of identification, comorbidity, and burden of ADHD.

Terminology. Given the variety of methods used to measure ADHD (rating scales, structured interviews) the following terms will be used in this article:

ADHD diagnosis implies meeting all DSM-IV criteria for ADHD, and

ADHD symptoms implies the presence of symptoms only without meeting full criteria for DSM-IV ADHD diagnosis.

Results

Community Samples

School samples. In Alexandria (Egypt) a study was conducted among 1,350 primary school children in grades 3 through 5 (Attia, Tayel, Mounier, Ahmed, & Abo-Rass, 2000). Data about age, sex, and socioeconomic status were collected using a self-administered questionnaire. Using the Conners' rating scale completed

by both teachers and parents (cut-off not reported) the results revealed that the prevalence of ADHD symptoms was 7.48% (11.67% for boys and 3.58% for girls). (See Table 1.)

A cross-sectional study was conducted in Qatar among 1,541 primary school children (Bener, Qahtani, & Abdelaal, 2006). The sample was divided into two age groups: 6 to 9 years and 10 to 12 years. A questionnaire was used to collect sociodemographic variables, and a standardized Arabic version of the Conners classroom rating scale for ADHD (cut-off ≥ 10) was filled by teachers. Results revealed that 112 boys (14.1%) and 33 girls (4.4%) scored above the cut-off for ADHD symptoms, giving an overall prevalence of 9.4% for ADHD symptoms in the school setting. In addition, children aged between 6 and 9 years had a higher score for ADHD symptoms than those between 10 and 12 years.

Two cross-sectional studies were conducted in Muscat (Sultanate of Oman), one among elementary school girls aged 6 to 13 years ($n = 708$; Al-Sharbati, Al Adawi, Al Hussaini, Al Lawati, & Martin, 2004a), and another among elementary school boys 6-14 years ($n = 1502$) (Al-Sharbati, Al Lawati, Al Msherfi, & Al Hussaini, 2004). The Conners Teachers' Rating Scale (CTRS, cut-off ≥ 15), as well as the subjective teachers' views regarding aggression, stealing, and lying was used. The children's demographic and school achievement variables provided by school social workers as well as the children's school performance were considered to assess psychosocial and academic correlates. The prevalence of ADHD symptoms among Omani school girls and school boys was 5.1% and 7.8%, respectively.

A study in the United Arab Emirates (UAE) was conducted in Sharjah (Bu-Haroon, Eapen, & Bener, 1999). The sample consisted of 1,110 primary school children aged 5 to 12 years, excluding students with learning disabilities and those suffering from chronic physical illnesses. Using the CTRS (cut-off ≥ 10), the overall prevalence of situational ADHD symptoms in the school setting was 14.9% (18.3% for boys and 11.4% for girls).

In another study from the UAE, Eapen, Al-Ghazali, Bin-Othman, and Abou-Saleh (1998) conducted a two-stage epidemiological study in the Al Ain District to examine all child psychiatric disorders among the Al Ain school children population. In this article, 23.9% of schoolchildren aged 6 to 15 years ($n = 3,278$) were initially reported to have a mental health problem by either parent (using the Reporting Questionnaire for Children, RQC) or school health physician (using the Physician Reporting Questionnaire, PRQ). A subsample of the children's mothers were asked to fill the Rutter A2 scale.

In the second stage, clinical interview was conducted on a stratified random sample of screen-positives and screen-negatives using the Schedule for Affective Disorders and Schizophrenia for School-Age Children-Present Episode version (K-SADS-P) by interviewing the child in his/her mother's presence. The weighted prevalence of all *DSM-IV* disorders was 10.4% with ADHD 0.46%, mood disorders 3.2%, anxiety disorders 1.6%, and conduct disorder 1.5%.

Household samples. A community psychiatric survey by Eapen, Essa, and Abou-Saleh (2003), also in the Al Ain District of the UAE, was conducted among 329 children and adolescents aged 6 to 18 years to investigate the prevalence of all childhood psychiatric disorders. In the first stage, the Rutter Parent Questionnaire was used as a screening instrument. In the second stage, the population was selected following a random sampling regardless of screening scores in stage one. The *DSM-IV* diagnoses were validated using the K-SADS administered to both child and mother/ guardian, and the degree of dysfunction was rated using the Children's Global Assessment Scale (CGAS). This study showed a prevalence rate of 22.2% for all *DSM-IV* disorders and 14.3% of these children and adolescents were noted to have moderate-to-severe impairment (CGAS < 60). The prevalence of mood disorders was 3%, anxiety disorders 2.9%, conduct or oppositional defiant disorder 2.4%, and ADHD 0.9%. (See Table 2.)

A cross-national study of the epidemiology of *DSM-IV* adult ADHD was conducted as part of the World Mental Health Surveys in 10 countries in the Americas, Europe, and Middle East among nationally representative respondents aged 18 to 44 years. Lebanon was the only Arab country included in this study (Fayyad et al., 2007). A total of 11,422 respondents were screened across the 10 countries. The WHO Composite International Diagnostic Interview (CIDI) version 3.0 was administered to a nationally representative sample of respondents in each country. A total of 2,857 respondents were interviewed in Lebanon and were administered Part I of the CIDI. All respondents who met criteria for any of the core disorders in Part I, plus a probability subsample of other Part I respondents were administered Part II of the CIDI ($n = 1,031$). Adult ADHD was assessed in Part II, and this assessment was restricted to respondents aged 18 to 44 years ($n = 595$) because of concerns over recall bias among older respondents. When ADHD diagnosis was met by respondents in childhood, a single question was asked about whether respondents continued to have any current problems with inattention, hyperactivity or impulsivity to evaluate the persistence of these symptoms

Table 1
Epidemiological Studies of ADHD in Arab Countries in School Samples (by Country, Alphabetical Order)

| Country/ Area | Author/ Year | Sample Size, Gender, and Age Range | Instruments | Informants | Prevalence |
|--|--|--|--|---|---|
| Egypt, Alexandria | Attia, Tayel, Mounier, Ahmed, & Abo-Rass, 2000 | N = 1,350 8 to 13 years | Conners Rating Scales (cut-off not reported) | Parents Teachers | 7.48%, total 11.67%, males 3.58%, females |
| Palestine, Gaza | Miller, El-Masri, Allodi & Qouta, 1999 | N = 669 (n ₁ = 458) 6 to 11 years (n ₂ = 211) 12 to 16 years | Ontario Child Health Scale (OCHS) Child Post-Traumatic Stress Reaction Index (CPTS-RI) | Parents Teachers Adolescents | 11.9% males 8.5% females 16.7% males 7.3% females |
| State of Qatar | Bener, Qahtani, & Abdelaal, 2006 | N = 1541 6 to 12 years | Conners Teachers' Rating Scale (CTRS ≥ 10) | Teachers | 9.4%, total 14.1%, males 4.4% females |
| Sultanate of Oman, Muscat | Al-Sharbati, Al Adawi, Al Hussaini, Al Lawati, & Martin 2004 | N = 708 Females 6 to 13 years | CTRS (≥ 15) | Teachers | 5.1% females |
| Sultanate of Oman, Muscat | Al-Sharbati, Al Lawati, Al Msherfi, & Al Hussaini, 2004 | N = 1,502 Males 6 to 14 years | CTRS (≥ 15) | Teachers | 7.8%, males |
| United Arab Emirates, Sharjah District | Bu-Haroon, Eapen, & Bener, 1999 | N = 1,110 5 to 12 years | CTRS (≥ 10) | Teachers | 14.85%, total 18.3%, males 11.4%, females |
| United Arab Emirates, Al Ain District | Eapen, Al-Ghazali, Bin-Othman, & Abou Saleh, 1998 | Stage 1: N = 3,278 Stage 2: N = 199 6 to 15 years | Stage 1: Reporting Questionnaire for Children (RQC; cut-off ≥ 1) Rutter Children's Behavior Questionnaire A2 Scale for Parents (cut-off ≥ 13) 2 Physician Reporting Questionnaire (PRQ) Stage 2: Schedule for Affective Disorders and Schizophrenia for School-Age chil- dren-Present Episode version (K-SDAS-P) | Parents Physicians Teachers School nurses Child | Stage 1 23.9% Mental health problem (by either par- ents or physicians) 16.5% behavioural disor- ders (Rutter-A2 Scale) Stage 2 10.4% Diagnostic and Statistical Manual of Mental Disorders (4th ed., DSM-IV) diagno- sis (Weighted preva- lence): 0.46% ADD/ ADHD |

into adulthood. In addition, the World Health Organization-Disability Assessment Schedule (WHO-DAS) assessed the frequency and intensity of impairment or the lack of ability to perform activities in a number of domains over the past 30 days resulting from ADHD. The cross-national prevalence of adult ADHD was 3.4% with a prevalence of 1.8% in the Lebanese sample.

Special Populations

Primary care. Eapen, Al-Sabosy, Saeed, and Sabri (2004) undertook a study in a primary care center in the Al Ain District (UAE). The sample comprised 278 children consulting their family physicians. The latter interviewed the child and his/her parents using the K-SADS/Epidemiological version and made a summary rating of

Table 2
Studies of ADHD in Arab Countries: Community, Clinical, and Primary
Care Samples (by Country, Alphabetical Order)

| Country/Area (Type of Sample) | Author/ Year | Sample Size, Age Range | Instruments | Informants | Prevalence |
|--|---------------------------------|---|--|-------------------|--|
| Kingdom of Saudi Arabia, psychiatric clinic | Al-Haidar, 2002 | N = 416 2 to 18 years | Instrument not specified | Medical records | Normally intelligent: 11.5% ADHD Borderline-mild mental retardation (MR): 16.8% ADHD 11.7% ADHD + learning disability Moderate-severe MR: 10.5% ADHD |
| Ten countries in the Americas, Europe, and Middle East (including Lebanon) | Fayyad et al., 2007 | N = 11,422; 18 to 44 years Lebanon: N = 2,857 Part II: N = 595 | Composite International Diagnostic Interview (CIDI), version 3.0 | Adults themselves | 1.8% in Lebanon |
| Lebanon (community) | Cordahi et al., 2002 | N = 81 6 to 21 years | Diagnostic Interview for Children and Adolescent-Revised (DICA-R) | Parent Child | ADHD Phase I = 1.7% Phase II = 1.6% Phase III = 15.9% Phase IV = 10.1% |
| United Arab Emirates, Al Ain District (primary care center) | Eapen et al., 2004 | N = 278 6 to 18 years | Schedule for Affective Disorders and Schizophrenia for School-Age Children-Epidemiology version (K-SADS-E) | Child Parent | 43% DSM-IV diagnoses 1.4% ADHD |
| United Arab Emirates, Al Ain District (community) | Eapen, Essa, & Abou-Saleh, 2003 | N = 329 6 to 18 years | Stage 1: Rutter Parent Questionnaire Stage 2: Kiddie Schedule for Affective Disorders and Schizophrenia for School Age Children (K-SADS) Children Global Assessment Scale (CGAS) | Child Parent | 22.2% DSM-IV diagnoses 14% with dysfunction criteria applied 0.9% ADHD |

each item based on both informants. The diagnosis was made based on the *DSM-IV* classification. A prevalence rate of 43% for *DSM-IV* disorders was obtained. The most prevalent disorders were depressive disorders (8.6%), anxiety disorders (18.6%), and obsessive compulsive disorder (5%). Conduct disorder was present in 2.9% and ADHD diagnosis in 1.4%. (See Table 2.)

Clinical psychiatric populations. A retrospective study by Al Haidar (2002) investigated sociodemographic data, degree of mental retardation and associated psychiatric disorders in the records of a population of children and adolescents attending an outpatient clinic at King Khaled University Hospital (Kingdom of Saudi Arabia). The

sample consisted of 416 patients younger than 18 years seen at that clinic over a 10-year period. Half of the patients did not have any form of mental retardation. The lifetime prevalence of ADHD diagnosis, based on *DSM-IV* criteria (instruments not specified) in the normally intelligent group was 11.5%. Its prevalence in the borderline-mildly and moderate-severely mentally retarded groups was 16.8% and 10.5%, respectively. (See Table 2.)

Traumatized children. An epidemiological study was conducted by Miller, El-Masri, Allodi, and Qouta (1999) among school-aged Palestinian children in Gaza to measure mental health outcomes. A sample of 669 children from public and private schools was randomly selected.

Parents, teachers, and youth completed the Ontario Child Health Scale (OCHS) for all students and the Child Post-Traumatic Stress Reaction Index (CPTS-RI) only for those above 12 years of age. ADHD symptoms were counted if endorsed at least by one informant. Based on the OCHS, the prevalence rate of ADHD symptoms was 10% among children (6 to 11 years, 11.9% boys and 8.5% girls), and 11.8% among adolescents (12 to 16 years, 16.7% boys and 7.3% girls). (See Table 1.)

Cordahi et al. (2002) conducted a long-term naturalistic follow-up of 81 children and youth aged between 6 and 21 years who were orphaned following the "Grapes of Wrath" military operation in South and West Bekaa of Lebanon in 1996. This study was conducted in four yearly phases; the first phase began one year after trauma. The Diagnostic Interview for Children and Adolescent-Revised (DICA-R) was administered to both surviving parent/guardian and subject. Various psychiatric disorders were assessed including ADHD. The 1-year *DSM-IV* prevalence of ADHD at Phase I and II were 1.7% and 1.6%, respectively. The assessment procedures of Phases III and IV differed from those of Phases I and II in which all subjects were evaluated through a clinical diagnostic interview with the social worker who visited these children and youth in their schools regularly. Only those who were reported to have impairing psychiatric symptoms were then clinically assessed with more in-depth interviewing of both children or youth and their surviving parent or guardian. Using the Conners parent questionnaire, the prevalence of ADHD symptoms was 15.9% at Phase III and 10.1% at Phase IV. These high rates of ADHD coincided with lower rates of anxiety and mood disorders (Posttraumatic Stress Disorder [PTSD], Major Depressive Disorder, and Separation Anxiety Disorder), which decreased over the follow-up period.

In the aftermath of the summer 2006 war on Lebanon, Karam et al. (in press) conducted an assessment of psychosocial and mental health needs of a representative sample of 970 children and adolescents residing in war-exposed regions in South Lebanon and the Beirut South Suburbs. The self-rated version of the Strengths and Difficulties Questionnaire (SDQ) along with the Child-Revised Impact of Events Scale (CRIES) were used with adolescents and focus group discussions with students and teachers were used to collect information from younger children. The prevalence of childhood adolescents at risk for ADHD using the Hyperactivity subscale of SDQ was 7.4%. In addition, the symptoms of hyperactivity and inattention were reported by teachers to be among the major causes of concern in this population because of academic and behavioral difficulties associated with these symptoms.

Risk Factors, Comorbidity, and Burden of ADHD

Risk factors. Very few risk factors were investigated in the epidemiological community studies in the Arab region. Bu-Haroon et al. (1999) in the Sharjah district, UAE, found that, among sociodemographic and family factors, being raised by a single parent was the only factor that had a significant correlation with a higher score of ADHD symptoms ($p < .01$). However, Bener et al. (2006) in Qatar showed that there was a statistically significant difference between children scoring above and below the cut-offs in relation to multiple marriages where children with polygamous parents were more likely to have ADHD symptoms than those with parents with single marriages.

The results in Attia et al. study (2000) in Egypt revealed a significant correlation between low socioeconomic class and ADHD ($p < .05$) in which 18.9% of children with ADHD belonged to families of low and very low socioeconomic classes compared with 5.7% in high socioeconomic classes.

A study of ADHD in a Lebanese clinical sample of 270 subjects with ADHD between 2 and 24 years conducted by one of the coauthors of this article showed that 42.1% of the subjects had at least one biological parent with symptoms of inattention and/or hyperactivity/impulsivity during the parent's early school years, and 40.2% of the subjects had at least one perinatal factor that was associated with ADHD, such as prematurity, hypoxia at birth, poor maternal health during pregnancy, smoking or alcohol intake during pregnancy (Fayyad, Sadek, & Cordahi, 2001).

Results in all Arab studies reporting on gender differences showed that the prevalence rate of ADHD was higher in males than in females, with ratios varying from 2:1 to 3:1.

Comorbidity with ADHD. Two studies in the Arab World examined comorbidity with ADHD. Fayyad et al. (2001a) in Lebanon showed that ADHD in a clinical sample of children and adolescents was often comorbid with one other psychiatric disorder. The most common comorbid conditions were mood disorders (Major Depression, Dysthymia, Bipolar Disorder, Cyclothymia); 19.1%), Learning/Language or Communication Disorder (18.8%), anxiety disorders (Separation Anxiety Disorder, Generalized Anxiety Disorder, Obsessive Compulsive Disorder, Social Phobia, Panic Disorder; 15.6%), enuresis (14.8%), and encopresis (3.0%). In addition, this study showed that 11.8% of ADHD subjects in this clinical sample had borderline intellectual function, and 11.1% had mental retardation.

In the World Mental Health Surveys study on adult ADHD conducted in 10 countries (Lebanon among them), subjects with adult ADHD had an odds ratio of 11.1% for a comorbid mood disorder, 9.9% for an anxiety disorder and 12.5% for substance use disorder (Fayyad et al., 2007).

Burden and impairment. Based on teacher reports on children's scholastic performance in Sharjah (UAE), Bu-Haroon et al. (1999) observed that children with ADHD symptoms did not achieve as well as other children academically. This association of poor school performance and ADHD is similar to what Al-Sharbati et al. found in Muscat among Omani school children (Al-Sharbati, Al Adawi, Al Hussaini, Al Lawati, & Martin, 2004; Al-Sharbati, Al Lawati, et al., 2004). In the Bener et al. study (2006) conducted in Qatar, children who had a higher score for ADHD symptoms were judged by teachers as having poorer academic performance than those with lower scores.

Furthermore, females with high scores of ADHD symptoms exhibited significantly more aggressive behaviors than the normal group in Muscat, Oman (Al-Sharbati, Al Adawi, et al., 2004). In addition to aggression, engaging in stealing and lying behaviors was found to be significantly correlated with high ADHD symptoms score among Omani males (Al-Sharbati, Al Lawati, et al., 2004).

In the World Mental Health Surveys study (Lebanon included), adult ADHD was also associated with significant disability in one of the three WHO-DAS dimensions of basic functioning, namely cognition. In addition, adult ADHD was found to be associated with elevated risk of high number of days "out of role" as well as with disability in the domain of social interactions.

Discussion

Given the limited number of studies undertaken in the Arab countries and the use of different methodologies, the results are difficult to compare. However, it is interesting to note that the rate of ADHD symptoms using rating scales in the school setting among Arab students ranges from 5.1% to 14.9%, whereas the rate of ADHD diagnosis using structured interviews in children and adolescents ranges from 0.5% in the school setting to 0.9% in the community. As discussed later in this section, the low rates stemming from structured interviews (both from studies in Al Ain district, UAE) may well be underestimates. Nevertheless, it is important to note that although the prevalence of ADHD

symptoms and diagnosis vary considerably in range across countries and settings, this prevalence is comparable in range to what has been reported in other international studies.

Instruments Used

Very low rates of ADHD were found in Arab studies when structured interviews were used, and moderately high ones were found when using rating scales: This is consistent with other epidemiologic studies on ADHD (Scahill & Schwab-Stone, 2000). In the Al Ain (UAE) schools study, another main reason for the low prevalence of ADHD was the use of the RQC by mothers, as this instrument does not tap into ADHD symptoms at all. In addition, teachers' questionnaires were not used. An important explanation of the low prevalence in both the above studies according to Eapen et al. (1998, 2003) is that only one diagnosis per child was reported on the K-SADS; some of the children with ADHD, who may have received an additional comorbid diagnosis of conduct disorder or oppositional defiant disorder, were therefore included under the latter two categories and not under ADHD. Furthermore, the authors (Eapen et al., personal communication) believe that the low rates of ADHD in both studies (the school and community samples in Al Ain study, UAE) are due to a culturally shared higher threshold for behavioral problems.

The Conners Rating Scales used in the Sharjah (UAE), Qatar, and Muscat (Oman) studies were filled by teachers only without obtaining parent data. This approach provides useful, but only preliminary, screening information pertaining to situational ADHD and does not generate the full ADHD diagnosis. As indicated by Barkley (1990), when the CTRS is used alone it may lead to overestimation of prevalence rates.

Population Characteristics

In populations of traumatized children and adolescents (Gaza and Lebanon), comorbidity between PTSD and ADHD (as well as other externalizing disorders) was reported. This has also been documented in maltreated children (Famularo, Fenton, Kinscherff, & Augustyn, 1996) as well as following natural disasters (Shaw, Applegate, & Schorr, 1996), and wars (Shaw, 2003; Allwood, Bell-Dolan, & Husain, 2002). In one of the Lebanon studies (Cordahi et al., 2002), it was noted that the prevalence of ADHD symptoms increased over a 4-year period of follow-up, whereas that of internalizing disorders decreased in a sample of children orphaned by war. The authors proposed two hypotheses to explain the

apparent rise of ADHD. First, internalizing disorders could have been masking or suppressing hyperactivity/impulsivity symptoms, and once the former remitted, externalizing symptoms became more prominent. Second, ADHD-like symptoms and disruptive behaviors could be long-term consequences of war trauma and co-occurring parental loss; this kind of twofold trauma may have rendered the surviving parent less consistent and less emotionally available to be able to set limits and discipline efficiently.

The finding of ADHD in clinical populations with mental retardation reported by Al Haidar (2002) at rates comparable to those without retardation is in line with what Gillberg, Persson, Grufman, and Themner (1986) had reported in a Swedish sample of children and adolescents.

Risk Factors, Comorbidity, and Burden

As reported in the results, investigation of risk factors revealed a significant correlation between low socioeconomic class and ADHD. Bener et al. (2006) in Qatar hypothesized that this significance could be due to the fact that children from low socioeconomic classes whose parents are polygamous or divorced do not receive proper attention and care from their parents, and this may have contributed to a greater incidence of ADHD symptoms. Similar findings on single parenthood and low social class were reported by Scahill et al. (1999) in a sample of U.S. children. In the Sharjah (UAE) and Muscat (Oman) studies, data were collected from children in public, governmental schools. Monthly family income was in the low and medium range in both studies. Students attending private schools were excluded. This may have led to an overrepresentation of ADHD because of the lower social classes investigated. Furthermore, children in the community who do not attend school at all need to be included in prevalence studies given that psychiatric disorders may be overrepresented among school dropouts (Eapen, Essa, & Abou-Saleh, 2003). It is of interest to note that in the World Mental Health Surveys of community adults (Lebanon included), there was no relation between ADHD and social class as measured by income (Fayyad et al., 2007).

The significant correlation between perinatal factors and ADHD, such as smoking during pregnancy, hypoxia, and prematurity found by Fayyad, Sadek, and Cordahi (2001) in Lebanon were all found to be significant in other studies (Button, Thapar, & Mc Guffin, 2005; Lou, 1996; Milberger, Biederman, Faraone, Chen, & Janice, 1996).

In all schools and community samples in Arab countries included in this review, there was a preponderance of

males with ADHD. Only in the primary care setting (Eapen et al., 2004) was there a higher rate of girls with *DSM-IV* disorders, which may have been due to the overrepresentation of girls with somatic symptoms presenting to the primary care clinic, but the numbers of subjects with ADHD in this study was too low to allow for meaningful examination of gender distribution. Results in all Arab studies reporting on gender differences showed that the prevalence rate of ADHD was higher in males than in females with ratios varying from 2:1 to 3:1, which is compatible with the international literature on ADHD in both epidemiological and clinical samples.

As reviewed in Pliszka (2000) and Gillberg et al. (2004), children and adolescents with ADHD show significant comorbidity with other psychiatric disorders, such as oppositional defiant disorder, conduct disorder, mood and anxiety disorders, tic disorders and obsessive compulsive disorder, substance use disorders, as well as learning and language disorders. The two studies reviewed in this article found a similar pattern both in epidemiological and clinical samples. In addition, findings from this review in Arab countries are compatible with the findings on the relation between ADHD and other externalizing disorders in males (Levy, Bennett, & McStephen, 2005) as well as the impact of ADHD on underachievement in school, school failure, disruptive and aggressive behavior, financial burden, and adverse vocational outcome (Biederman, 2005; Barkley, 1990).

Cultural Factors

With studies documenting comparable prevalence of ADHD from various countries in the world, the notion of a culturally specific construct of ADHD seems less and less relevant as more studies document similar impact of ADHD on subjects and their families across various cultures (Bauermeister et al., 2005; Faraone et al., 2003; Gadow et al., 2000; Polanczyk et al., 2007; Rhode et al., 2005). It remains to be seen whether issues like polygamy and low social class are indeed related to ADHD or are confounded by other genetic and family factors.

Cultural factors may play a significant role in the identification of ADHD. Indeed, there may be a higher threshold in some Arab cultures for what is identified as a behavioral problem. Conversely, given that ADHD impairs academic performance, which is culturally highly valued in the Arab World, it may be specifically the inattention symptoms of ADHD (and not hyperactivity/impulsivity) that draws parents' attention for early identification and treatment (Fayyad, Sadek, & Cordahi, 2001).

Awareness and Parent Support Groups

We believe that the findings of this review have significant implications for health care planning as well as for service delivery and awareness campaigns in the Arab region.

It is interesting to note that in the study of subjects attending a child psychiatry clinic in the Kingdom of Saudi Arabia (Al Haidar, 2002) as well as that in primary care in the UAE (Eapen, Al-Sabosy, et al., 2004), the rates of ADHD encountered are far below expected ranges, whereas in a child psychiatric clinic in Lebanon, ADHD is the most frequently encountered disorder among outpatients, accounting for more than half of outpatient presentations. This indicates the need to increase awareness about ADHD among all primary care physicians and even among mental health professionals themselves.

In many Arab countries, families may not accept their children's mental health problems and their need for treatment for fear of labeling and stigma. It is important to fight stigma and increase awareness about child mental health and ADHD in particular. In Lebanon, workshops about ADHD were set up at schools for administrators, teachers, and parents in ways similar to those for specialists working with children (Fayyad, Jahshan, & Karam, 2001). These public awareness activities have similarly occurred in many other Arab countries. In the UAE, a national school mental health screening program has been initiated. Under this program, all children attending 1st, 4th, 7th, and 10th grade in all the government schools are screened for mental health problems including ADHD. Those children who receive a *yes* response on the screening question about ADHD symptoms are then assessed using the Conner's Teacher Rating Scale and Parent Rating Scale. Those who receive a high score on either of the two scales (parent or teacher) are then clinically evaluated to see whether they fulfill criteria for a clinical disorder of ADHD. Workshops have been held for School Health Physicians and other school personnel on the detection and diagnosis of ADHD.

The problems of ADHD children can place a tremendous strain on family functioning (Barkley, 1990). Parents may assume that they are responsible or at fault for their children's problems. It may also be that parental perception of mental illness in children are culturally determined. Similarly, there may be cultural and societal differences in the help-seeking patterns as evidenced in a study carried out in the UAE, which observed that only 38% of parents of children with mental health problems chose to consult a mental health specialist (Eapen & Ghubash, 2004). The main reasons given for nonconsultation were reluctance to acknowledge that a member of

their family has a mental illness, stigma attached to attending mental health services, and the skepticism about the usefulness of such services. For these reasons, and given the potential contributions of family interactions to the child's behavior problems (White, 1999), parent support groups are recommended for ADHD children. The aim of parent support groups is to empower parents and enable them to help themselves and their children. Such support groups are already present in Lebanon, Saudi Arabia, and the UAE.

Limitations

This review has some limitations that need to be addressed. Although we have searched for all published papers on ADHD in the Arab world, we might have missed some local papers that were published in non-peer reviewed journals or in abstracts of local or regional meetings.

Another limitation pertains to the fact that the small size of the populations in most of the studies did not allow the data to be stratified by age, gender, and other sociodemographic characteristics that may have influence on the prevalence rates. The comparison between results is further restricted by differences in sociodemographic conditions and health care systems across the Arab region, which makes interpretation of findings more difficult. Moreover, the variability in awareness about mental health conditions and acceptance of mental health treatment in the different Arab regions should be taken into consideration while interpreting the findings.

Proposal for Future Studies

In developing countries, there is a great need to improve scientific research and to get more accurate knowledge of the state of mental health in each region, country, and culture.

Given the limited content of some questionnaires and the limited type of informants in some studies, future studies on ADHD in the Arab World should include representative samples using more adequate diagnostic procedures and tools taking into consideration culture-specific risk factors. In addition, given the exposure to war in many countries in the Arab world, more studies are needed to investigate fully the relation between war exposure, ADHD, and externalizing disorders among children and adolescents.

Screening instruments to be utilized should be more comprehensive and administered to a wider range of informants, such as the child, parents, and school teachers to combine divergent answers into a significant whole. Conditions comorbid with ADHD need to be

investigated in community samples and the population studied needs to be representative of the entire community. The burden of ADHD during childhood and adolescence in all its facets needs to be investigated.

Given that children with behavioral or emotional disorders such as ADHD are likely to come to the attention of primary health care workers, such as pediatricians, nurses, school health workers and social workers first, these professionals need to be educated about childhood mental health, the nature of the problems, and their extent. With comorbidity being the rule, rather than the exception in ADHD, educating professionals in contact with children and adolescents about the various other childhood mental health conditions becomes mandatory. It would be an easy trap for health policy planners in developing countries to fall into if awareness and intervention programs are geared towards ADHD only, propagating the false notion that it is an isolated disorder occurring in a void. In this regard, it is to be noted that mental health screening programs can be effectively implemented using the existing manpower resources and facilities in schools with the support of health professionals (Eapen et al., 1999). In the aftermath of war, there is a great need for screening, training of school professionals, and setting up of networks of referral in underserved regions as behavioral problems, including ADHD, are expected to be commonly encountered in the school setting where school professionals are poorly prepared to manage them (Karam et al., in press).

Finally, well-designed epidemiological studies of national samples will help to guide policy makers and health planners in initiating awareness campaigns for early intervention as well as prevention of mental health disorders.

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