Adult ADHD in the Arab World: A review

Ghinwa El Hayek¹, Dahlia Saab¹, Claudia Farhat¹, Zaher Krayem¹,²,³, Elie Karam¹,²,³*

Authors’ affiliations:
¹ Institute for Development, Research, Advocacy and Applied Care (IDRAAC), Beirut, Lebanon.
² Department of Psychiatry and Clinical Psychology, University of Balamand, Faculty of Medicine, Beirut, Lebanon.
³ Department of Psychiatry and Clinical Psychology, St George Hospital University Medical Center, Beirut, Lebanon.

*Corresponding author: Elie G. Karam, M.D.
Department of Psychiatry and Clinical Psychology,
University of Balamand Faculty of Medicine, St George University Medical Center,
Institute for Development, Research, Advocacy and Applied Care (IDRAAC)
Email: egkaram@idraac.org
Tel: +961 1 583583
Beirut, Lebanon

ABSTRACT

Introduction: Attention Deficit Hyperactivity Disorder (ADHD) has been mainly studied in children, even though it persists into adulthood; only recently has adult ADHD received the required attention. ADHD research in Arab speaking countries is relatively scarce.

Objectives: This scoping review has as objectives to provide a comprehensive overview of adult ADHD research in the 22 Arab countries, to identify gaps in the literature and inform future research.

Methods: The scoping review is underpinned by the five-stage framework of Arksey and O’Malley. Eight electronics databases were searched for published and unpublished literature as well as conference proceedings from conception date of databases until February 2018.

Results: The literature search yielded 2,792 citations after removal of duplicates, out of which 11 articles and conference proceedings were included. Publications were concentrated in the 21st century. ADHD diagnosis and sample differed between each study, where a variety of screening and diagnostic tools were used among clinical and community samples. National prevalence of adult ADHD only exists for Lebanon and Iraq as they are part of the World Mental Health (WMH) Surveys initiative. Also, adult ADHD is highly comorbid with bipolar and...
substance use disorder and related entities.

**Conclusions:** This is the first methodologically rigorous scoping review focusing solely on adult ADHD in the Arab region. We found that adult ADHD is quite prevalent in the Arab World where studied, linked to serious impairment, and is highly comorbid, yet it is under-researched and undertreated across the Middle East and North Africa.

**Keywords:** Attention, hyperactivity, Comorbidities, mental health, Middle East

1. **Introduction:**

1.1 **Overview of Adult ADHD:** Attention Deficit Hyperactivity Disorder (ADHD) is a disorder of inattention, hyperactivity, and impulsivity, affecting 5.3% of children (Polanczyk, Willcutt, Salum, Kieling, & Rohde, 2014). ADHD has been extensively studied over the past four decades, especially in the United States (US), Canada, Europe, and Australia and more recently Eastern Asia (Hodgkins et al., 2012; Polanczyk et al., 2014; Thomas, Sanders, Doust, Beller, & Glasziou, 2015). Scientific research on ADHD in the Middle East, and particularly Arab countries is relatively limited (Alhraiwil, Ali, Househ, Al-Shehri, & El-Metwally, 2015; Alkhateeb & Alhadidi, 2016; Farah et al., 2009).

While it is known that ADHD often persists into adulthood (Goodman, 2007; Mannuzza, Klein, Bessler, Malloy, & LaPadula, 1993; Weiss & Hechtman, 1993; Wilens, Faraone, & Biederman, 2004) only recently has it been considered seriously in adults, becoming the focus of clinical and epidemiological studies (Pary et al., 2002; Wilens, Biederman, & Spencer, 2002; Wilens & Dodson, 2004). In fact, the National Comorbidity Survey Replication (NCSR) reported that 36.3% of adults (aged 18–44 years) with a retrospective diagnosis of childhood ADHD met DSM-IV criteria for adult ADHD in the US (Kessler, Adler, Barkley, et al., 2005). Recently, the World Mental Health (WMH) Surveys concluded that 2.8% of adults across 20 countries (including Lebanon and Iraq from the Middle East) suffered from ADHD (Fayyad et al., 2017).

ADHD in adults often goes unnoticed and untreated, as the majority of adults are not aware of it, leading to poor social, emotional, behavioral and functional outcomes (Ginsberg, Quintero, Anand, Casillas, & Upadhyaya, 2014). Indeed, clinical research suggests that adult ADHD patients are more prone to unemployment (Kessler, Adler, Ames, Barkley, et al., 2005; Mannuzza, Klein, Bessler, Malloy, & Hynes, 1997; K. Murphy & Barkley, 1996).

Moreover, distinguishing ADHD from other comorbid psychiatric conditions that are more common in the clinical adult population is a challenge. As a matter of fact, as many as 80% of adult ADHD patients are estimated to meet criteria for at least one other mental health disorder (anxiety disorder, substance use disorder (SUD),...
Bipolar Disorder (BD), major depressive disorder...etc) (Barkley, Murphy, & Fischer, 2008; Newcorn, Weiss, & Stein, 2007).

Consequently, patients are most likely treated for the comorbid disorder (Fayyad et al., 2007). The reported rates of ADHD comorbidities vary in the literature, further complicating matters. The discrepancy in the rates varies according to the type of population studied (community or clinical, etc.), and type of diagnostic measures (Composite International Diagnostic Interview (CIDI), Structured Clinical Interview for DSM (SCID), the Mini International Neuropsychiatric Interview (MINI), clinical diagnosis, etc....) (Kessler et al., 2006; Park et al., 2011). For instance, when looking at rates of anxiety disorders, some studies found a higher prevalence of panic disorder, posttraumatic stress disorder, social phobia, and other anxiety disorders in individuals with ADHD (Biederman, Faraone, Monuteaux, Bober, & Cadogen, 2004; Gorlin, Dalrymple, Chelminski, & Zimmerman, 2016; Kessler et al., 2006; Miller, Nigg, & Faraone, 2007) and other studies observed no such differences (Murphy & Barkley, 1996; Murphy, Barkley, & Bush, 2002; Schubiner et al., 2000). Nevertheless, findings related to elevated rates of SUD and antisocial personality disorders among adult ADHD groups (versus adults without ADHD) were more consistent (Biederman et al., 1993; Gorlin et al., 2016; Miller et al., 2007; K. Murphy & Barkley, 1996; Park et al., 2011; Schubiner et al., 2000). In addition, adult ADHD is reported to co-occur with BD (Kessler et al., 2006). Meta-analysis examining comorbidity of ADHD and BD in adults identified rates ranging from 5% to 47%, regardless of whether comorbidity is assessed in ADHD or BD populations (Wingo & Ghaemi, 2007).

1.2 ADHD research in the Arab World:

Literature on ADHD in Arab countries is relatively sparse, with the latest review of literature conducted by Alkhateeb and Alhaidi (2016) finding 58 articles conducted in fourteen out of twenty-two Arab countries. Most of the studies included were done in the last decade and did not use specific DSM criteria, only 9 (15%) reported doing so while the others reported relying on screening tests, and rating scales. The prevalence of ADHD in children and youth ranged from 1.3% (Alyahri & Goodman, 2008) to 34.5% (Khamis, 2006). Another review conducted by Alhraiwil and colleagues (2015) included 22 articles, reporting a prevalence range between 0.5% and 19.6%. The first review about ADHD in Arab countries by Farah and colleagues (2009), reported the ADHD prevalence among children and adolescents to be 0.9% in the community and 0.5% in school. Only one article in the three reviews addressed adult ADHD, noting that this article was not the same in the three reviews (Abdelkarim, Salama, Ibrahim, & El Magd, 2015; Alhraiwil et al., 2015; Alkhateeb & Alhadidi, 2016; Ashor, 2012; Farah et al., 2009; Fayyad et al., 2007).

The scarcity of adult ADHD research in the Arab region, and the fact that none of the previous reviews followed a systematic approach, prompts for mapping the literature to disseminate any findings regarding adult ADHD, identifying the gaps, and making recommendations for future research. Subsequently, a scoping review is a suitable
methodology, as according to Arksey and O’Malley’s (2005) it will examine the extent and nature of research activity, identify if a further systematic review is necessary, summarize research findings and report potential research gaps. The aim of this paper is to draw conclusions on any relevant literature related to adult ADHD in the Arab region. The five specific objectives of this scoping review are: 1) conduct a systematic search of the published and gray literature for adult ADHD in the Arab world 2) Map out the different methodologies used to assess adult ADHD in the different papers 3) Extrapolate findings related to prevalence of ADHD and its comorbidities, as well as any additional information 4) examine any challenges and limitations 5) propose recommendations for advancing adult ADHD research in the Arab region.

2. Methods

2.1 Protocol: The protocol of this scoping review was developed following the methodological framework of Arksey and O’Malley and more recently the Joanna Briggs Institute (Arksey & O’Malley, 2005; Peters et al., 2015). The research question was: “What is the research available on adult ADHD in the Arab Region?”

2.2 Study Selection: The following search engines: Medline, PubMed, Embase, Scopus, CINAHL, in addition to IDRAAC’s search engine (http://www.idraac.org/home/research-and-publications/mental-health-research-in-the-arab-world), Google scholar and Google were used to look for articles, conference abstracts, presentations and reports in English, French and Arabic pertaining to the objective of this review. Furthermore, the authors contacted key ADHD stakeholders in the region for unpublished and un-indexed reports and research papers. The timing of the search spread from the conception date of databases until February 2018. The search strategy was developed by the authors and a medical librarian. The key words used for ADHD were “attention deficit disorder”, “ADD”, “ADHD”, “ADDH”, “Hyperactivity”, and “Hyperkinetic Syndrome”. The context of the study was limited to the Arab Region. Accordingly, the Arab Countries chosen were: Algeria, Bahrain, Comoros, Djibouti, Egypt, Gaza, Iraq, Jordan, Kuwait, Libya, Lebanon, Mauritania, Morocco, Oman, Qatar, Saudi Arabia, South Sudan, Sudan, Syria, Tunisia, United Arab Emirates, West Bank, and Yemen.

Studies were screened by one of the authors, at first by title and abstract following the inclusion criteria (Table 1). Once selected the articles were agreed on by all authors of the manuscripts. Additionally, the reference list of the included articles and their citations were screened for additional manuscripts.

<table>
<thead>
<tr>
<th>Term</th>
<th>Include</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Population</td>
<td>Men and women above 18 years old with ADHD</td>
</tr>
<tr>
<td>Study Type</td>
<td>Original research articles</td>
</tr>
<tr>
<td>Geography</td>
<td>Middle East and North Africa (Arab Speaking countries)</td>
</tr>
<tr>
<td>Language of articles</td>
<td>English, French, Arabic</td>
</tr>
</tbody>
</table>
3. Results

3.1 Literature Search: The literature search yielded 2,792 citations after removal of duplicates (Figure 1). The records screened for their abstract were only 244, as the others were removed for either not fitting under the research question and for being conference abstracts or posters. Subsequently, 57 full text articles were reviewed, including a conference presentation of a yet to be published study by two of the authors of this manuscript from the IDRAAC search engine. Only 11 articles were selected to be discussed in details in this scoping review as per the inclusion criteria in Table 1.

Figure 1: Flow Diagram of the different phases of the study, mapping the numbers of records identified, reviewed, included, and excluded with reasons

3.2 Study Characteristics: The first was published in 1997 and the last one in 2017. Egypt and Lebanon had the highest number of original research on adult ADHD with 4 articles each, Saudi Arabia followed with two, and Iraq with one. Of the four articles that included data from, Lebanon, three were part of the WMH Surveys, as well as one article that includes Iraq (Table 2). The fourth source of data from Lebanon, is a
presentation conducted by two of the authors of this manuscript during the “ADHD across the Lifespan” Conference in April 2017 in Beirut, Lebanon, and currently under final preparation for publication. The samples of participants recruited in all these 11 articles were equally diverse, as 54.54% (n=6) were clinical samples from either mental health inpatients or outpatient facilities and the remaining were epidemiological samples from household surveys, or university students. All studies defined used the terminology ADHD, except one study that used the term “Behavioral Disorder-Hyperactive”.

**Table 2**: Characteristics of included studies

<table>
<thead>
<tr>
<th>Authors (Year), Location</th>
<th>Sample Type/Selection criteria</th>
<th>Sample Size/Age range</th>
<th>Instrument(s) used to diagnose condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Al-Sulaiman (1997), Saudi Arabia</td>
<td>Clinical: patients in rehabilitation centers in the eastern province: The Vocational Rehabilitation Center, the Comprehensive Rehabilitation Center, both in Dammam, the Welfare Society and Rehabilitation Institute in Sehat, and the Rehabilitation center for severely handicapped in Hofuf.</td>
<td>N=608 N= 244: below 13 years old N= 321: 14-65 years old N=43: above 65 years old</td>
<td>No instrument: Screened and examined by a team of either a pediatrician and nurse or neurologist and nurse.</td>
</tr>
<tr>
<td>Fayyad et al. (2007), World Mental Health Survey including Lebanon</td>
<td>Epidemiological: Stratified multistage clustered area probability sample of household residents.</td>
<td>Total N=11,422 with ADHD: 18-44 years old Lebanon N=595 with ADHD</td>
<td>ADHD: Version 3.0 of the WHO Composite International Diagnostic Interview (CIDI 3.0), based on questions originally developed in the Diagnostic Interview Schedule for DSM-IV. Adult ADHD: Respondents classified retrospectively as having met full ADHD criteria in childhood were then asked a single question about whether they continued to have any current problems with attention or hyperactivity–impulsivity.</td>
</tr>
</tbody>
</table>
| De Graaf et al. (2008), World Mental Health Survey including Lebanon | Epidemiological: Stratified multistage clustered area probability sample of household residents. | Total N=11,422 with ADHD: 18-44 years old Lebanon N=595 with ADHD | ADHD: Version 3.0 of the WHO Composite International Diagnostic Interview (CIDI 3.0), based on questions originally developed in the Diagnostic Interview Schedule for DSM-IV. Adult ADHD: Respondents classified retrospectively as having met full ADHD criteria in childhood were
then asked a single question about whether they continued to have any current problems with attention or hyperactivity–impulsivity.

<table>
<thead>
<tr>
<th>Study</th>
<th>Design</th>
<th>Participants</th>
<th>Procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td>El-Hay and El Sawy (2011), Egypt</td>
<td>Epidemiological: College Students in Tanta University attending classes on Saturday, Monday, and Wednesday during the academic year 2009–2010. Then selected a sample with ADHD, was compared with a sample without ADHD</td>
<td>N= 2000: above 18 years old, surveyed with the screener ASRS-V1.1 N=39 with ADHD: 19.2 to 21.9 years old, matched by age and gender to N=39 without ADHD: 19.2 to 21.9 years old</td>
<td>ADHD: Screening using the short version of Adult ADHD Self-Report Scale, Version1.1. (ASRS-V1.1) Diagnosis: Individual assessment using the 18-question form of the ASRS-V1.1e, the Barkley Childhood ADHD Symptom Scale, and the ADHD Current Symptom Scale. Other psychiatric disorders: The Mini International Neuropsychiatric Interview. Functional Impairment: The Global Assessment of Functioning (GAF) Scale.</td>
</tr>
<tr>
<td>Ashor (2012), Iraq</td>
<td>Epidemiological: Medical students in their 1st to 6th years attending the Department of Pharmacology, University of Al-Mustansiriya in Baghdad.</td>
<td>N=361: 18-25 years old</td>
<td>ADHD: ASRS-screener Nicotine Dependence: The Fagerstrom Test for Nicotine Dependence (FTND). An FTND score ≥6 signifies heavy smokers, and an FTND score ≤5 signifies light smokers.</td>
</tr>
<tr>
<td>Abdelkarim (2015), Egypt</td>
<td>Clinical: Substance use inpatients the Addiction Treatment Center at El Maamoura psychiatric Hospital.</td>
<td>N= 102: aged between 18 and 60 years old N=36 with ADHD: 25-53 years old N=66 without ADHD: 19-42 years old</td>
<td>ADHD: Arabic validated version of Adult ADHD Self-Report Scale (ASRS-v1.1) and a Symptom Checklist Childhood ADHD: Arabic validated version of Wender Utah Rating Scale (WURS) Psychiatric Interview with DSM-IV-TR Physical and neurological examinations</td>
</tr>
<tr>
<td>Salama et al. (2015), Egypt</td>
<td>Clinical: Male inpatients from the Addiction Treatment Center at El Maamoura Psychiatric Hospital</td>
<td>N=102: 19-53 years old N=36 with ADHD N=66 without ADHD N=28 with childhood ADHD</td>
<td>ADHD: Arabic validated version of Adult ADHD Self-Report Scale (ASRS-v1.1) and a Symptom Checklist Childhood ADHD: Arabic validated version of Wender Utah Rating Scale (WURS) Psychiatric Interview with DSM-IV-TR Physical and neurological examinations</td>
</tr>
<tr>
<td>Study</td>
<td>Design</td>
<td>Sample</td>
<td>Methods</td>
</tr>
<tr>
<td>------------------------------</td>
<td>--------</td>
<td>--------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Khalil et al. (2016), Egypt</td>
<td>Clinical: inpatients and outpatients screened positive for Alcohol, Opioids, Amphetamine or Cannabis, at the Psychiatric Department of Mansoura University.</td>
<td>N=97: 18-65 years old, mean average=40.9±5.8 years old N=27 with ADHD: mean average=34.2±5.8 years old N=70 without ADHD: mean average=38.1±5.8 years old</td>
<td>ADHD Screening: Arabic validated version of Adult ADHD Self-Report Scale (ASRS-v1.1) and a Symptom Checklist. ADHD Diagnosis: Patients who answered positive for four or more questions were further interviewed using Diagnostic Interview of Adult ADHD (DIVA) Substance use: Alcohol: Enzymatic method by oxidation to acetaldehyde with NADH+. Opiates, amphetamines and cocaine: Immunoassay screening for urine and gas chromatography-mass spectroscopy.</td>
</tr>
<tr>
<td>Alosaimi et al. (2017), Saudi Arabia</td>
<td>Clinical: Patients seeking psychiatric help at six major Hospitals in Saudi Arabia: King Khalid University Hospital in Riyadh and Zulfi General Hospital (central region), Jeddah Mental Health Hospital (western region), Al Amal Complex for Mental Health in Dammam (eastern region), Aljouf Mental Health Hospital (northern region), and Abha Mental Health Hospital (southern region). King Khalid University Hospital is a university-affiliated governmental hospital whereas the other hospitals are government-funded service hospitals under the authority of the Ministry of Health.</td>
<td>N=1,205 patients: above 18 years old, total mean average=38.1±13.0 years old N=443 inpatients: mean average=8.4±1.3 years old N=762 outpatients: mean average=37.4±12.0 years old</td>
<td>ADHD: Routine clinical interviews using DSMIV-TR criteria</td>
</tr>
<tr>
<td>Fayyad et al. (2017), World Mental Health Survey including Iraq and Lebanon</td>
<td>Epidemiological: Stratified multistage clustered area probability sample of household residents.</td>
<td>Total N=26,744 with ADHD: 18-44 years old Lebanon N=595 with ADHD Iraq N=3227</td>
<td>ADHD: Version 3.0 of the WHO Composite International Diagnostic Interview (CIDI 3.0), based on questions originally developed in the Diagnostic Interview Schedule for DSM-IV. Adult ADHD: Respondents classified retrospectively as having met full ADHD criteria in childhood were then asked a single question about whether they continued to have any current problems with attention or hyperactivity–impulsivity.</td>
</tr>
</tbody>
</table>
Karam et al. (2017), Lebanon  
Clinical: first time patients presenting for a consultation at MIND Clinics in Saint Georges Hospital University Medical Center in Beirut, Lebanon, between January 2014 and December 2016.  
Total N= 1,305  
N= 236 with ADHD  
N=136 with ADHD and Bipolar Disorder  
N=100 with ADHD and non-Bipolar Disorder  
Adult ADHD: Physician assistant and Psychiatrist diagnosed patients rigorously based on the DSM-IV criteria, but not following the checklist systematically. Patients classified as ADHD are patients with either past or present ADHD or ADD diagnosis and classified according to levels: Definite, Probable and Possible

3.3 Methods of assessing adults ADHD:  
Different methods were used to assess ADHD in the selected studies. Three studies used medical diagnosis (a medical and clinical team diagnosed them based on medical definitions rather than using self-administered questionnaires, or structured interviews such as the CIDI) in order to classify patients as ADHD: one failed to mention the exact method used, yet patients were already in a rehabilitation center (Al-Sulaiman, 1997), while in another study psychiatric residents and staff were responsible for the chart review that had psychiatric diagnosis based on DSMIV-TR criteria (Alosaimi et al., 2017). The study done by the authors of this paper, diagnosed patients rigorously based on the DSM system of diagnosis, but not following the checklist systematically. The patients were diagnosed by both the physician’s assistant and the psychiatrist. Patients with past or present ADHD or ADD diagnosis were classified according to levels: Definite, Probable and Possible (Karam, El Hayek, & Farhat, 2017). Five papers used a self-rated screening test such as the short screening version of the adult ADHD Self-Report Scale (ASRS). The Arabic version of the ASRS V1.1 Screener (WHO, 2014) was used in three studies in Egypt (Abdelkarim et al., 2015; Khalil et al., 2016; Salama, Ibrahim, El Magd, & Kerim, 2015), the other two studies (El Hay and Sawy (2011), and Ashor (2012)) failed to mention if they used the Arabic or English version. The ASRS was developed in conjunction with the revision of the CIDI, its 18 items are based on the 18 DSM-IV criteria and symptoms of ADHD. They are measured on a 5-point scale (0=never to 4=very often), yielding a possible score of 0 to 72. Items 1-9 cover the symptoms of inattention; and items 10-18 covers the symptoms of hyperactivity and impulsivity (Adler, Kessler, & Spencer, 2003; Kessler et al., 2005). The ASRS is standardized and validated in individuals above 18 years old (Kessler, Adler, Ames, Demler, et al., 2005; Kessler, Adler, Barkley, et al., 2005; Kessler et al., 2007), in different languages (Evren et al., 2016; Kim, Lee, & Joung, 2013; Morin, Tran, & Caci, 2016; Ramos-Quiroga et al., 2009) and among patients with other comorbid disorders (Carlucci, Ivanova, Bissada, & Tasca, 2017; Chiasson et al., 2012; C. Daigre et al., 2009; Constanza Daigre et al., 2015; Reyes et al., 2016; Van de Glind et al., 2013). The ASRS V1.1 Screener used in the three Egyptian studies is a subset of the
WHO’s 18 question ASRS, which measures the presence and frequency of current ADHD symptoms (WHO, 2003, 2014). It has 6 items rated on a 5-item Likert scale (scale 0-4), asking about the frequency of the symptoms of ADHD during adulthood. There are four questions pertaining to the theme of inattention and two questions related to hyperactivity, when four or more marks appear in darkly shaded boxes, then there is suspicion of adult ADHD, prompting for further tests, and diagnosis (WHO, 2003). Abdelkarim et al., (2015) and Salama et al., (2015) used in addition to the ASRS V1.1, the Arabic version, the Wender Utah Rating Scale for the retrospective assessment of childhood ADHD with a cut off of 46 (Wender, 1998). To verify the results of the ASRS V1.1 and make a final diagnosis, patients in one study were subjected to the Diagnostic Interview for ADHD in Adults (DIVA 2.0) (Khalil et al., 2016). This structured interview is divided into three parts that are each applied to both childhood and adulthood, the criteria for attention deficit, the criteria for hyperactivity-impulsivity, the age of onset and impairment accounted for by ADHD symptoms. The patients are diagnosed as having adult ADHD if they scored six or more for each of the symptom domains of attention deficit and hyperactivity-impulsivity in childhood and during adult life with evidence of life-long persistent course with impairment in at least two situations and these symptoms not explained by another psychiatric disorder (Kooij et al., 2005; Sandra Kooij et al., 2008). In another study in Egypt as well, students above the age of 18 years with positive screening of ADHD were assessed individually by both investigators of the study at the same time, for the core symptoms of ADHD (El-Hay & El Sawy, 2011). This time the complete version of the ASRS V1.1 was used, along with Barkley childhood ADHD symptom scale, and the ADHD current Symptom Scale (Barkley & Murphy, 1998; WHO, 2003). While the Barkley childhood ADHD symptom scale focuses on the retrospective assessment of the 18 DSM-IV criteria, the adult scale looks at the patients’ behavior during the past 6 months only. It is composed of questions corresponding to the nine symptoms of inattention and the nine symptoms of hyperactivity/impulsivity according to the DSM-IV, using a scale from 0-3 (with 0=never/rarely, 1= sometimes, 2=often and 3=very often) (Barkley & Murphy, 1998). The WMH surveys evaluated retrospectively childhood ADHD with Version 3.0 of the WHO CIDI as a part of the assessment of different mental health disorders (de Graaf et al., 2008; Fayyad et al., 2007; Fayyad et al., 2017; Kessler & Üstün, 2004). The module that assessed ADHD was originally developed from the Diagnostic Interview Schedule for DSM-IV (DIS) (Robins, Cottler, Bucholz, & Compton, 1995). When respondents meet the full childhood ADHD criteria, they are asked a single question whether they continued to have any current problems with attention or hyperactivity-impulsivity. Based on a pilot clinical reappraisal interview done in the US, a transformation rule was developed to convert responses to the CIDI ADHD symptom-recency questions into a predicted probability of adult ADHD for each respondent in the larger samples (Fayyad et al., 2007; Kessler et al., 2006).
3.4 Prevalence of adult ADHD:

3.4.1 The World Mental Health Cross-National Studies: In 2007, the first cross national prevalence of ADHD was published as part of WMH surveys, and among the different countries taken into consideration Lebanon was then the only Arab country. The estimated prevalence of DSM-IV and CIDI adult ADHD in Lebanon was 1.8% (n=595), based on nationally representative data collected in 2002-2003 through multistage clustered households stratified by area probability (Fayyad et al., 2007). In the updated publication of WMH about DSM-IV adult ADHD, Iraq completed its survey in 2006-2007 and as such the prevalence in Iraq was 0.6% in its nationally representative sample. Results showed that the percentage of adult ADHD cases who were childhood ADHD cases was 52.4% for the Lebanese and 77.0% for the Iraqis. Additionally, 29.9% of adult Lebanese with ADHD and 47.9% of adult Iraqis with ADHD reported sub-threshold childhood ADHD. Sub-threshold childhood ADHD was defined by having 4 to 5 symptoms of inattention, hyperactivity and impulsivity. One notable result this analysis was that the estimated prevalence of adult ADHD was higher than that of childhood ADHD. This was deemed true because a substantial proportion of adult threshold cases were sub-threshold childhood cases according to retrospective reports. The presence of so many sub-threshold childhood cases that converted into full adult cases, explained their findings (Fayyad et al., 2017). The WMH surveys series, went on and estimated the prevalence of ADHD among workers (employed/self-employed). In Lebanon 0.9% (n=305) of workers were diagnosed as ADHD, compared to 2.8% (n=290) among other respondents (de Graaf et al., 2008).

3.4.2 University Studies: Two studies focused on university students. The first, conducted in Egypt on students with a mean age of 20.5 years, found a total prevalence of ADHD of 2.7% (N=39); whereby 69.2% (n=27) had a predominantly inattentive type and 30.8% (n=12) had a predominantly combined type. The ratio of men to women with ADHD was 1.4:1 (El-Hay & El Sawy, 2011). The second was a cross sectional study involving 361 medical students in Iraq. The prevalence of ADHD was 16.6%, with male medical students having borderline significant higher ADHD symptoms relative to their female counterparts with 19.8% and 12.1% respectively (Ashor, 2012).

3.4.3 Clinical Population Studies: The oldest study selected in this review is from 1997. It reported signs of hyperactivity rather than ADHD and found a prevalence of 24% among 608 residents of rehabilitation centers aged from ≥13 years old to ≤ 65 years old (Al-Sulaiman, 1997). One study reported on prevalence of ADHD among 1,205 inpatients (n=443) and outpatients (n=762) attending 6 hospitals in Saudi Arabia. The total prevalence of ADHD was 0.3% (n=4), representing 0.2% (n=1) for inpatients and 0.4% (n=3) for outpatients (Alosaimi et al., 2017). In the conference presentation, two of the authors of this present publication, studied various psychiatric disorders among 1,305 adults visiting for the first time an outpatient clinic (MIND) in Lebanon, between January 2014 and December 2016. This study looked at ADHD diagnosis in the total clinical sample,
whereby 18.1% (n=236) had ADHD. A closer analysis, which will be developed further in a future publication, found that adult Bipolar patients were more likely to receive also the diagnosis of ADHD: 27.5% (n=136) out of the Bipolar (N=495) patients, versus 12.4% (n=100) out of the non-bipolar patients (n=810) (Karam et al., 2017).

Three studies conducted in Egypt by two different research groups checked specifically on prevalence of ADHD among SUD patients. One was at the psychiatric department of Mansoura University, looking at a sample of inpatients and outpatient screening positive for SUD based on DMS-IV-TR. The number of recruited SUD participants was 97 (90 males and 7 females), out of which 27.8% (n=27) had ADHD, divided as follow 24 males and 3 females (Khalil et al., 2016). The other two studies were at the addiction treatment center of El Maamoura psychiatric hospital. The cross sectional studies enrolled 102 male inpatients. These patients were classified as follows: 63.7% (n=64) had a positive history of childhood ADHD according to the WURS, and 43.1% (n=44) were positive for adult ADHD as per the ASRS-v1.1. Following a semi-structured interview only 35.3% (n=36) were diagnosed as having ADHD, out of which 16 met criteria for ADHD inattentive type, 2 met criteria for ADHD hyperactive-impulsive type and 18 met criteria for the combined type (Abdelkarim et al., 2015; Salama et al., 2015). The mean age of ADHD patients was 30.2±4.9, while it was 32.8±7.3 for non-ADHD patients. (Abdelkarim et al., 2015).

### 3.5 ADHD and comorbidities:

#### 3.5.1 The World Mental Health Cross-National Studies: The studies derived from the WMH surveys discussed ADHD comorbidities, as one general sample not by country (Fayyad et al., 2007; Fayyad et al., 2017). Odds Ratios (OR) were in the range between 2.5 (major depressive disorder) and 15.0 (oppositional defiant disorder). Bipolar had a significant OR of 5.4 (95% CI: 4.0, 7.2), Panic disorder had an OR of 4.5 (95% CI: 3.0, 6.6), and Social Phobia an OR of 3.9 (95 CI: 2.9, 5.1) (Fayyad et al., 2017).

#### 3.5.2 University Studies: Among university students in Egypt, El-Hay and El Sawy (2011), diagnosed 39 students with ADHD, and chose 39 students without ADHD as a control group, to compare the psychiatric comorbidities of both groups. Lifetime psychiatric comorbidity in the ADHD group was found to be 66.7% (n=26), compared with 25.6% (n=10) of the control group. Compared to students without ADHD, students with ADHD were more depressed (20.5%, n=8 versus 2.6%, n=1), anxious (20.5%, n=8 versus 2.6%, n=1), smoked more cigarettes (48.7%, n=19 versus 23.1%, n=9), and abused more substances (30.8%, n=12 versus 10.3%, n=4) (El-Hay & El Sawy, 2011). Nevertheless, there was no significant differences reported for BD and Obsessive Compulsive Disorder (OCD) (El-Hay & El Sawy, 2011). In Iraq, Ashor (2012) showed that medical students with ADHD symptoms smoked at higher rate with 45% versus 11.6% for non-ADHD. Additionally about half of them (51.8%) were heavy smokers, and started smoking at a younger with 17.2±2.3 years old versus 18.5±2.1 years old for non-ADHD (Ashor, 2012). In
the second part of this study, there was a comparison among different types of smokers such as non-smokers, light smokers, and heavy smokers assessed using the Fagerström Test for Nicotine Dependence (FTND). Therefore, two third (66.7%) of heavy smokers reported symptoms of ADHD in comparison with 31.7% of light smokers, and 11% of non-smokers. Also, heavy smoking was associated with significant deterioration in the inattentive and total ASRS scores in comparison with none and light smokers. The hyperactivity symptoms scores significantly differed between nonsmokers in comparison with light and heavy smokers. A correlation was established between ASRS and FTND scores, showing that students with a high FTND score tend to start smoking earlier ($r=-0.432$, $p=0.001$), and to have higher inattentive ($r=0.391$, $p=0.001$), and total ASRS scores ($r=0.330$, $p=0.004$) (Ashor, 2012).

3.5.3 Clinical Population Studies: Two studies conducted in the Addiction Center of Al Maamoura psychiatric Hospital, investigated patterns of substance use and ADHD. The first study observed that mean age of substance use was lower in the ADHD group with 13.2±2.6 years compared to 15.6±3.8 years in the non ADHD group. Also, comorbid ADHD and SUD led to double the number of hospital admissions with 6.8±8.1 times compared to 3.4±4.0 times or the non ADHD and SUD group. The latter was able to have a longer period of abstinence with 209.8±282.0 compared to 124.5±171.9 days for SUD patients with ADHD (Abdelkarim et al., 2015). The comorbidity of ADHD and SUD might be a source of legal problems for 38.9% of this sample (Salama et al., 2015). In view of substances consumption, the ADHD group had a higher cocaine use with 11.1% (n=4) compared to 0% among non-ADHD. The multivariate regression pointed out that ADHD and SUD patients prefer 2.6 times to sniff heroin more than only SUD patients. They are also, admitted to the hospital 1.13 times more than their non ADHD counterparts. They start SUD use at earlier with a ratio of 0.9. When comparing SUD patients with a history of childhood ADHD and SUD patients with adult ADHD, the latter consumed substances at an earlier age (13.2±2.6 versus 14.9±2.9), had more exposure to legal problems (38.9%, n=14 versus 14.3%, n=4), and a shorter duration of abstinence (124.5±171.9 versus 271.5±363.9). Nevertheless both groups had a similar mean average for the number of times to be admitted to the hospital (6.8±8.1 and 4.2±4.9) (Salama et al., 2015).

Similarly, a study conducted among inpatients and outpatients at the psychiatric department of Mansoura University explored ADHD among SUD patients. The SUD with ADHD group had an earlier age of onset with 20.2±2.1 years when compared to SUD without ADHD who had a mean age of onset of 32.8±6.2 years. Besides, they had a longer period of substance use (12.4±6.1 years versus 4.3±4.1 years). The study indicated that they relapsed about three times more than SUD patients without ADHD (3.9±1.4 versus 1.1±1.2), yet this finding was borderline significant with a p-value of 0.056 (Khalil et al., 2016). In the study conducted in Lebanon in MIND clinics referred to above, ADHD patients (n=236) had higher rates of Bipolar disorder,
and SUD compared to non-ADHD patients (n=1,069) with 57.6% (n=136) versus 33.6% (n=359) and 28.4% (n=67) versus 13.8% (n=147) respectively (Karam et al., 2017). Adjusting for age and gender bipolar and SUD patients were 2.3 (95% CI= 1.5, 3.6) and 1.8 (95% CI= 1.1, 2.8) times more likely to have ADHD. More analysis is underway at present in a larger sample.

3.6 ADHD and work performance: De Graaf et al. (2008) described the loss of role performance among workers as part of the WMH surveys. On an individual level, compared to subjects without ADHD, adjusting for age, gender, education and occupation, employed/self-employed patients with ADHD, were out of role for 19.4 days, yet this was not statistically significant. On a national level (in millions of days), the overall days out of role was 0.3 (de Graaf et al., 2008). This article also stated that socio-demographics among Lebanese could predict total role performance for ADHD workers (p-value=0.044), yet the effect size was not presented, as the table showed associations for the total sample of 10 countries (de Graaf et al., 2008). In Egypt, university students with ADHD, scored lower on the Global Assessment of Functioning (GAF) a scale that evaluates their overall functioning. The mean average was 56.7 compared to 86.0 for the control group (El-Hay & El Sawy, 2011).

3.7 ADHD treatment: Patterns of treatment for mental health disorders were computed in the WMH surveys: as such 1.1% and 0.7% of ADHD patients received any professional help during the last 12–months in Lebanon and Iraq respectively (Fayyad et al., 2007; Fayyad et al., 2017). However, none of the adults with ADHD received any treatment specifically for ADHD, but 0.8% in Lebanon (and none in Iraq) received mental health treatment for other mental disorders (Fayyad et al., 2007; Fayyad et al., 2017).

3.8 ADHD and family history of Psychiatric disorders: Only one article examined the consequences of the presence of a family history of psychiatric disorders and ADHD among the offspring (El-Hay & El Sawy, 2011). As it turns out, family history of psychiatric disorders was more common among students with ADHD (59.0%) compared to students without ADHD (28.2%). In particular, a family history of ADHD, and Major Depression Disorder were more prevalent among students with ADHD with 28.2% and 23.1% respectively, compared to 5.1% for both disorders in the control group (El-Hay & El Sawy, 2011).

4. Discussion: To the extent of our knowledge this is the first scoping review that specifically discusses adult ADHD in the Arab region. In this review we managed to map out the different methodologies used to assess adult ADHD in the different papers and extrapolate findings related to the prevalence of ADHD and its comorbidities. This review have several strengths: its protocol was developed following the methodological framework of Arksey and O’Malley and more recently the Joanna Briggs Institute (Arksey & O’Malley, 2005; Peters et al., 2015). Various search engines: Medline, PubMed, Embase, Scopus, CINAHL, in addition to IDRAAC’s search engine, Google scholar and Google were used to look for articles, conference abstracts, presentations and reports in
English, French and Arabic; pertaining to the objective of this review. In addition, the authors contacted key ADHD stakeholders in the region for unpublished and un-indexed reports and research papers.

This review yielded significant findings. The results of the WMH surveys demonstrated that not only childhood but also adult ADHD is quite prevalent (1.8% in Lebanon and 0.6% in Iraq) (Fayyad et al., 2007; Fayyad et al., 2017), seriously impairing, and highly comorbid but greatly under-recognized and undertreated across countries and cultures. Most importantly, it proved that adult ADHD is possibly more prevalent than childhood ADHD probably due to conversion of sub-threshold cases of childhood ADHD, as the data from WMH surveys across 20 countries showed (in addition to non-childhood onset of ADHD) (Fayyad et al., 2017). De Graaf et al. (2008), showed higher rates of absenteeism and lower productivity amongst ADHD workers pointing to the importance of providing assistance and accommodations to workers struggling with ADHD. Further WMH surveys are on the way in the Arab region, rendering nationally representative data on mental health disorders available soon. Indeed, the survey in Saudi Arabia has just been completed (Hyder et al., 2017; Shahab et al., 2017), yet the results are not out at the time of writing of this manuscript. Furthermore, Qatar will be implementing its own survey soon.

Various studies pointed to the co-occurrence of ADHD with other mental disorders. Although the WMH surveys did not discuss comorbidities by country but rather as one general sample, it is important to note their significant findings. Twelve-month adult ADHD was significantly and positively comorbid with 12-month prevalence of other DSM-IV/CIDI disorders considered in the WMH surveys (Fayyad et al., 2017). University students with ADHD were found to have more lifetime psychiatric comorbidities, notably depression and anxiety (El-Hay & El Sawy, 2011), whereas outpatients showed a higher rate of BD (Karam et al., 2017).

Quite significantly, adult ADHD seems to be highly comorbid with SUDs in the Arab region. In Lebanon, ADHD patients had higher rates of SUD (Karam et al., 2017). In the other clinical studies an earlier age of onset of substance used was noticed (Abdelkarim et al., 2015; Khalil et al., 2016; Salama et al., 2015), as well as higher rates of cocaine use and preference for heroin (Salama et al., 2015). Additionally, more than one study (Ashor, 2012; El-Hay & El Sawy, 2011), found that university students who had ADHD consumed more cigarettes and abused more substances. Furthermore, comorbid adult ADHD in SUD patients prolonged the course of SUD and contributed to higher relapse rates in these groups of patients (Ashor, 2012; Khalil et al., 2016).

These findings point to the need for providing clinical scrutiny in adults who suffer from ADHD in general but also those suffering from other mental disorders (including substance use disorders) who might as well have comorbid ADHD. In addition, adult ADHD may be frequently not diagnosed by clinicians because of the false impression that ADHD occurs only in childhood and adolescence.
4.1 Limitations: Limitations of this review were due to those of the existing literature and included lack of standardization of assessment tools and difficulties with random sampling. This limited our ability to compare cross-national results.

4.1.1 Limitations of the World Mental Health Cross-National Studies: In the well-known international WMH surveys which has comprised so far 31 countries used DSM-IV criteria for ADHD that were developed for children, and offered limited guidance regarding adult diagnosis, childhood ADHD was assessed retrospectively, leaving room for recall bias as per the authors of those studies (de Graaf et al., 2008; Fayyad et al., 2007; Fayyad et al., 2017). Furthermore, adult ADHD was diagnosed based entirely on adult respondent self-report which typically leads to inaccuracies. In addition, adult ADHD was estimated from an imputation model carried in the US only, rather than directly (de Graaf et al., 2008; Fayyad et al., 2007; Fayyad et al., 2017).

4.1.2 Limitations of University Studies: University studies such as El-Hay and El Sawy (2011), noticed that unlike childhood ADHD studies, no gender differences were seen in the adult population, proposing that the standard Hyperactivity/Impulsive diagnostic criteria might not be suitable for the adult population. In addition these findings might not apply to all college students, and the theoretical possibility that the use of screening tools not necessarily standardized for the Egyptian culture (El-Hay & El Sawy, 2011) In addition, Ashor (2012) themselves highlighted that small sample size, students belonging to only one university, and relying on clinical interviews to diagnose ADHD were significant limitations to their study.

4.1.3 Limitations of Clinical Population Studies: In clinical population studies, limitations were small sample size (Ashor, 2012; Khalil et al., 2016), patients belonging to one institution or a clinical facility (Ashor, 2012; Karam et al., 2017), absence of female patients (Abdelkarim et al., 2015; Salama et al., 2015), and the use of different diagnostic tools that are not the Structured Clinical Interview for DSM-IV (SCID) (Alosaimi et al., 2017; Ashor, 2012), or not following strictly the SCID interview format (Karam et al., 2017). The cross-sectional design of the studies selected prevents from making any causal inferences on the association of ADHD with demographics, other psychiatric disorders, family history of psychiatric disorders, work performance, and treatment. Nevertheless, only two studies acknowledged this (Alosaimi et al., 2017; Khalil et al., 2016). Additionally, one clinical study acknowledged not looking at Oppositional Defiance Disorder, and anti-social personality disorder (Karam et al., 2017).

Furthermore, all the clinical and university studies used convenient sampling, when compared to the WMH national surveys, resulting in the non-generalizability of the results.

Despite the limitations of the studies involved, there are various implications for future research and clinical practices. The presence of only one study (El-Hay & El Sawy, 2011), examining family history of psychiatric disorders and ADHD among the
offspring highlights the importance of further research in that realm in the Arab World. Furthermore, due to the lack of awareness around distinguishing ADHD symptoms it is important to provide public and professional trainings on how to diagnose adult ADHD (Fayyad et al., 2017). Distinguishing between symptoms of ADHD and other comorbid disorders can be very complicated. This becomes especially important if ADHD first started in adulthood and was not present in childhood in a sub-threshold form (Sibley et al., 2017); experienced clinicians should look at the first time ever adult onset ADHD to tease apart nuanced differences from, or overlap with other disorders (Sibley, Arnold, Swanson, Kennedy, et al., 2018). For example, differentiating the causal roles of substance use and other mental disorders is very necessary (Sibley, Arnold, Swanson, Hechtman, et al., 2018). This could explain some false positive so-called late onset ADHD. Hence the importance of carefully assessing impairment, psychiatric history, and substance use before diagnosing late onset ADHD. In addition, there are many other sources of cognitive dysfunction that might lead to false positive symptom endorsement on an ADHD checklist. A few examples are, unhealthy lifestyles; (sleep, diet, and physical activity), extremely taxing environmental demands such as working multiple jobs and experiencing high stress (Sibley, Arnold, Swanson, Kennedy, et al., 2018). Also Chamberlain and Muller (2018), argued that some ADHD like symptoms may be caused by non-psychiatric pathologies such as traumatic brain injury, or thyroid disease.

Based on the evidence and research on ADHD in the Arab World, there is a great need for larger scale studies including bigger sample sizes in order to produce more conclusive results. This also requires the use of random sampling and diverse representative samples (female patients as well) to reflect the populations that are being studied, reducing sampling bias, and increasing generalizability. This will be available soon as stated above with the addition of Saudi Arabia and Qatar to the already existing Iraq and Lebanon WMH surveys. Furthermore, longitudinal studies which are more demanding than cross-sectional studies can be helpful in monitoring ADHD symptoms and psychiatric histories across time, and in determining causality (Alosaimi et al., 2017; Khalil et al., 2016). This may improve the understanding of adult ADHD and the impact it has at both personal and societal levels. Greater in depth research may shed the light on how to work with adults with ADHD to better understand the everyday challenges that result from the disorder. It would also be useful to have a practical ADHD screening scale that is validated across many countries rather than relying on imputation in future studies (Fayyad et al., 2017). This standardization of tools across epidemiological studies will lead to an improved ability to compare cross-national results.

Moreover, increasing awareness around ADHD could be beneficial in providing the needed support for adults who struggle with it. This may take the shape of supporting adults with ADHD in the workplace by providing targeted workplace screenings and
treatment programs (De Graaf et al., 2008). Consequently, a better integration of adults with ADHD in society in the Arab world, a reduction in unemployment, and higher rates of treatment seeking could be achieved.

Meanwhile, more clinical studies that look at ADHD might be easier to do than larger epidemiologic and longitudinal studies and those can be relatively easy to integrate in the practice of most mental health professionals in the Arab region and elsewhere. This could answer several important questions; such as how do adult patients differ from others with respect to major mental health disorders such as mood, anxiety disorders, temperament and substance use disorders? How does ADHD influence the treatment of these comorbidities and vice versa? In fact, Ekinci et al. (2013) examined the links between affective disorders, temperament, and ADHD. Their findings showed significant links between affective disorders, temperament and ADHD (Ekinci et al., 2013). These convenient clinical studies, in addition to the larger more expensive epidemiologic and longitudinal studies, could fill in gaps that cannot be grasped easily and may very well be influenced by regional or cultural variables. They could also be a place to start for the remaining Arab countries.

Acknowledgment

Acknowledgements: Ms. Aida Farha for helping in developing the search strategy.

References:


Temperamental characteristics in adults with attention-deficit hyperactivity disorder: a comparison with bipolar disorder and healthy control groups. *Psychiatry investigation, 10*(2), 137-142.


46. Murphy, K., & Barkley, R. A. (1996). Attention deficit hyperactivity disorder
adults: comorbidities and adaptive impairments. *Comprehensive psychiatry, 37*(6), 393-401.


