

Attention Deficit Hyperactivity Disorder Research in Saudi Arabia: Current Status, Gaps, and the Future Needs

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Abstract

Attention deficit hyperactivity disorder (ADHD) is a common neurobehavioral disorder in children and adolescents, with estimated prevalence rates varying by the environment, gender, and age of presentation. ADHD research in Saudi Arabia is currently receiving a better research attention. This review aimed to summarize the literature data about ADHD in Saudi Arabia by identifying the prevalence, risk factors, comorbidities, and current guidelines for management. In addition, the author tried to set the gap areas and point out the future needs of ADHD research in Saudi Arabia. About 30 articles were conducted in Saudi Arabia and were reviewed through the PubMed, Google Scholar, and ResearchGate databases. The keywords used were ADHD prevalence, ADHD risk, ADHD comorbidities, ADHD screening, ADHD diagnosis, ADHD management, and ADHD awareness. All the keywords were followed by "Saudi Arabia" to restrict the search to this country. The conclusion of this review is an estimated prevalence rate varying by region, ranging between 2.7% and 16.4% in Saudi Arabia, with a little available data involving the disease outcomes, therapeutic educational intervention, utilization of services, and adherence to the treatment. In addition, the screening and diagnostic instruments used in Saudi Arabia are crucial research areas and must be evaluated and validated. Therefore, further research is required to broaden the horizons of understanding ADHD in the Saudi context.

Keywords: Attention deficit hyperactivity disorder, current status, future needs, gaps, research, Saudi Arabia

INTRODUCTION

Attention deficit hyperactivity disorder (ADHD) is a neurobehavioral disease of children and adolescents currently receiving the most research attention. It is a severe disorder that can have serious consequences for the person and others around him. Poor attention and hyperactivity/impulsivity are the two vital behavioral criteria that characterize ADHD in children. As a result, the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders-5 suggested the following three ADHD subtypes: the inattentive type, requiring at least six inattentive symptoms; the hyperactive/impulsive type, requiring at least six hyperactive or impulsive symptoms; and the combination type, requiring at least six symptoms from each subtype.^[1] Symptoms should be current for at least 6 months, with the disease typically seen in children younger than 7 years, and affect social, academic, and occupational functioning in several contexts. In addition, to diagnose ADHD, the symptoms must not be better described by another disorder, such as an anxiety disorder, mental illness, or autistic spectrum disorder. Although the prevalence might differ

between the different age groups, symptoms and therapeutic response showed no clear distinction between the upper ranges of childhood, adolescence, and adulthood.^[2] Therefore, this review tried to assess the current ADHD research in Saudi Arabia and to assess the gaps and future needs.

THE PREVALENCE OF ATTENTION DEFICIT HYPERACTIVITY DISORDER IN SAUDI ARABIA

The most prevalent neurobehavioral condition impacting children is ADHD, with a prevalence of 3.4%–5% worldwide.^[2] According to one systematic review including the ADHD epidemiology in the Arab region, the prevalence

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of ADHD was found to range between 1.3% and 16%, with the majority of hyperactive type ADHD between 1.4% and 7.8%, while the bulk of inattention type ranged between 2.1% and 2.7%.^[3] The Saudi Ministry of Health launched the National School-Based Screening Program (NSBSP) to screen children's health. Students from particular grades underwent routine health screenings for obesity, hearing and vision impairment, dental decay, scoliosis, and ADHD. A total number of 444,259 students in the first and fourth grades were included in the secondary data from the NSBSP for the academic year 2018–2019 in the Kingdom of Saudi Arabia. ADHD was estimated to constitute the prevalence of 2.81% of the study participants.^[4]

Many studies in Saudi Arabia found that the prevalence ranges between 2.7% and 16.4%, as shown in Table 1.^[5-13] The studies include large number of participants and involve different regions in Saudi Arabia. For example, a large community epidemiological survey in a nationally representative household sample, involving 11 administrative areas of

Saudi Arabia and excluding two areas of conflicts (Jazan and Najran), found that separation anxiety disorder and ADHD were the two most common lifetime disorders with a prevalence of 11.9 and 8.0%, respectively.^[6] As demonstrated in Table 1 and when comparing the studies that were done in Jeddah, there is a discrepancy in the prevalence of ADHD that ranged between 5.3% in girls and 4.7% in boys in Alzaben *et al.*'s study involving 929 primary school students,^[8] and a prevalence of 11.6% in Homidi *et al.*'s study, involving 2770 school students,^[10] compared to Alghamdi *et al.*'s study which done in the college students and involved 2059 participants and concluded high ADHD prevalence reaching 12%.^[5] This disparity may be attributed to the diagnostic criteria used and the population sampled. In Alghamdi *et al.*'s^[5] study, they depended on Adult ADHD Self-Report Scale, while Alzaben *et al.*^[8] used the Vanderbilt ADHD Scale filled by teachers on all students in their classes. The ADHD Scale was used by Homidi *et al.*^[10] for the assessment of ADHD symptoms after being translated into the Arabic language.

Table 1: The prevalence of attention deficit hyperactivity disorder articles in Saudi Arabia

Authors	Type of study	Year of publication	Number of patients	Area of study	Conclusion
Alghamdi <i>et al.</i> ^[5]	cross-sectional study	2022	2059	Jeddah	Almost one-tenth (11.9%) of the sample met the criteria for adult ADHD; only 6.5% had been diagnosed with ADHD in childhood, and <1% (0.8%) had taken medication for the same
Altwaijri <i>et al.</i> ^[6]	Community epidemiological survey in a nationally representative household sample	2020	4302	11 administrative areas of Saudi Arabia	The disorders with the highest 12-month prevalence are also the most common lifetime disorders, but the rank ordering is different, with separation anxiety disorder and ADHD, the two most common lifetime disorders (11.9 and 8.0%, respectively)
Al-Haidar <i>et al.</i> ^[7]	Cross-sectional study	2019	309	Riyadh	The prevalence of ADHD in the study sample was 14.9% (46 cases out of 309 children). 67.39% of these cases were male (31 male cases out of 309 children)
AlZaben <i>et al.</i> ^[8]	Cross-sectional study	2018	929	Jeddah	The overall prevalence of ADHD was 5% (5.3% in girls and 4.7% in boys). The most prevalent subtype of ADHD was the combined type (2.7%), followed by the hyperactive type (1.2%) and inattentive type (1.1%)
Albatti <i>et al.</i> ^[9]	Cross-sectional study	2017	1000	Riyadh	The estimated prevalence of ADHD was 3.4%
Homidi <i>et al.</i> ^[10]	Cross-sectional study	2013	2770	Jeddah	The prevalence of ADHD was estimated to be 11.6%. The subtype's results indicate a prevalence of 6.3% for attention deficit and 2.2% for the hyperactive type. The third type, that is the combined hyperactive/impulsive and inattentive type of ADHD, has a prevalence of 3.1%
Jenahi <i>et al.</i> ^[11]	Cross-sectional study	2012	1009	Al-khobar	The overall prevalence of ADHD was 3.5%. The prevalence of children with ADHD/inattentive type was 2.1%, and the prevalence of children with ADHD/hyperactive-impulsive type was 5.6%. This rate decreased significantly with an increase in age
Alqahtani ^[12]	Cross-sectional study	2010	708	Aseer region	The result showed that the overall rate of ADHD was 2.7%, and in particular, the rate of attention types was 2.0%; the hyperactive/impulsivity type was 1.4%, and the combined type was 0.7%
Al Hamed <i>et al.</i> ^[13]	Cross-sectional study	2008	1287	Dammam	The overall prevalence of combined ADHD was 16.4%, with a prevalence of 12.4% for hyperactivity-impulsivity and 16.3% for inattention disorders, respectively

ADHD: Attention deficit hyperactivity disorder

THE RISK FACTORS AND COMORBIDITIES OF ATTENTION DEFICIT HYPERACTIVITY DISORDER RESEARCH IN SAUDI ARABIA

The genetic and environmental factors contribute to the genesis of ADHD, as shown by numerous kinds of research; hence, first-degree relatives of ADHD patients have a greater chance of having the disease. Moreover, complications during pregnancy or throughout delivery and many diseases that directly affect the brain, such as meningitis, encephalitis, brain injuries, epilepsy, poisons, and medications, are strongly related to ADHD development. Mineral shortages and diet-related sensitivities have traditionally been contentious issues.^[3,14]

A few studies looked at a wide range of risk factors and concluded that the most constant risk factors were male gender and younger age.^[15,16] In addition, only one study looked into behavioral issues in the classroom, psychiatric comorbidity, and poor academic performance.^[15] Another Saudi study used various diagnostic procedures to check for genetic variations to look for the coexistence of autism and ADHD. It found that 75% of the individuals with ADHD and autism had six genes discovered, suggesting that these genes may have a possible role in generating autism, whereas five gene variants may make ADHD more severe.^[17] One study tried to link the involvement of neurotransmitter systems in the pathogenesis of ADHD. Therefore, monoamine oxidase A (MAOA), which is involved in the degradation of these neurotransmitters, and dopamine transporter 1 (DAT1), which plays a vital role in controlling blood levels of dopamine, were studied. The results were consistent with the theory that some MAOA and DAT1 polymorphisms contribute to the emergence of ADHD in the Saudi population.^[18] In a study that tried to assess the Saudi maternal risk factors for autism and ADHD during pregnancy and delivery, there was no apparent correlation between the risk factors during pregnancy, delivery, or the postnatal period and the autism spectrum disorders symptoms of ADHD in children. In the study, individuals with the least parity history had a considerably higher chance of having babies with low birth weights, preterm deliveries, and a diagnosis of ADHD.^[19] On the other study involving 163 diagnosed ADHD children in the Asser region to assess comorbidities associated with ADHD found that broken or missing teeth were the most often reported traumas, followed by burns, fractures, and deep injuries. Only 52% of ADHD children attended their scheduled clinician visits and medication appointments, and this nonadherence was attributed to less parental care and the COVID-19 epidemic.^[20]

SCREENING AND DIAGNOSIS OF ATTENTION DEFICIT HYPERACTIVITY DISORDER IN SAUDI ARABIA

The diagnosis of ADHD is based on a clinical evaluation of the kind of behavioral disorder and functional impairment of cognitive functions; there is no objective test to confirm the diagnosis. Therefore, accurate diagnosis and effective

treatment of ADHD in children begin using a valid and trustworthy behavioral rating scale for screening. However, rating scales for ADHD have some limitations because they are susceptible to biases in opinion. For example, the ratings may be influenced by the informants' backgrounds, levels of education, and emotional states at the assessment time. In addition, rating systems may need to assess the factors impacting a child's behavior accurately. Furthermore, the design of rating scales, particularly the depth of response scale and language specificity, increases the chance of bias. Furthermore, the demographic factors may cause situational variations in a child's conduct or how, for instance, a child's parents may interpret and grade their child's behavior.^[21] The limited rating scales for ADHD available in Saudi Arabia are just translations of other rating scales. Their validity and reliability metrics have yet to be thoroughly investigated. No local rating scale, for instance, is valid based on comparison to a gold standard, such as a legitimate clinical diagnosis or another rating scale with empirically demonstrated validity. Many tools are used to screen ADHD, including the Vanderbilt ADHD Diagnostic Rating Scale. It is a psychological evaluation instrument for parents of children aged 6–12 years that assesses the severity of ADHD symptoms. This rating scale was created by Mark Wolraich at the Oklahoma Health Sciences Center and included additional conditions that frequently co-occur with ADHD.^[22] One study included 119 children and assessed the validity of an Arabic version of the ADHD Rating Scale and found that the Arabic version of the scale was an effective tool to differentiate between children with a clinically valid ADHD diagnosis and both typical children and children with non-ADHD psychiatric illnesses like mental retardation.^[21] Some studies used two kinds of questionnaire: the modified Arabic version of the Attention Deficit Disorders Evaluation Scale school version and the parents' questionnaire to diagnose the three main subtypes of ADHD, namely: inattention, hyperactivity-impulsivity, and combined ADHD.^[13]

THE CLINICAL MANAGEMENT RESEARCH OF ATTENTION DEFICIT HYPERACTIVITY DISORDER IN SAUDI ARABIA

ADHD is managed globally using various shared-care models between primary and secondary care that are best suited to each nation's resources, cultures, and modes of practice. In Saudi Arabia, there were no uniform clinical recommendations for treating ADHD. A few attempts have been made to manage ADHD in primary care; however, ADHD is typically diagnosed and treated in tertiary care and the private sector and is managed in a variety of settings, perhaps ineffectively or inappropriately; due to this, clinical practice is somewhat variable, and the level of treatment is suboptimal.^[23,24] Accordingly, the Saudi ADHD Society organized a multidisciplinary team to address this issue to increase access to care for Saudi Arabians with ADHD. In order to improve the identification, diagnosis, and standard of care for patients with ADHD, the clinical practice guideline was modified from the National Institute for Health and Care Excellence guideline entitled, ADHD:

Diagnosis and management.^[24,25] As shown in Table 2, the recommendation of the clinical practice guideline for ADHD management in Saudi Arabia gives more informative points that include: (i) training, (ii) identification and referral, (iii) diagnosis, (iv) support, (v) management, (vi) dietary advice, (vii) medication, (viii) maintenance and

monitoring, (ix) adherence to treatment, and (x) review of medication and discontinuation.^[26]

A few Saudi studies were investigating the management modalities of ADHD in Saudi Arabia. In one study, a sample of 29 Saudi children with ADHD was examined to determine whether Cogmed Working Memory Training could successfully improve cognitive functioning, as it showed a significant improvement in working memory training in ADHD patients. Most parents thought the Cogmed training was practical for their kids, were happy with it, and eager to keep going with it, and thought it helped them deal with their issues.^[27] Another study assessed the side effects of ADHD medications; one of which evaluated bruxism, involuntary habitual grinding of the teeth that occur during sleep, with increased prevalence in children affected by ADHD children taking medications.^[28] In a study involving 1,177 medical students in Riyadh, Saudi Arabia, 2.46% were found to be using stimulants illicitly, while 3.31% were using the stimulants medically due to ADHD.^[29]

Table 2: Summary of the recommendations in the adapted clinical practice guideline for the attention deficit hyperactivity disorder management

Item	Recommendation
Recognition of risk factors of ADHD	Preterm babies Oppositional, conduct disorders, or mood disorders Neurodevelopmental disorders A family member diagnosed with ADHD Epilepsy A history of substance misuse Acquired brain injury
Diagnosis	Based on DSM-5 or the International Statistical Classification of Diseases and Related Health Problems, 10 th Revision (ICD-10) (hyperkinetic disorder). It should be made by a qualified health-care professional with training and expertise in the diagnosis of ADHD after a complete clinical, psychosocial, developmental, and psychiatric assessment and the use of standard rating scales like Conners rating and Vanderbilt scales
Management	Early recognition and referral to specialized service (multidisciplinary approach) ADHD-focused group parent-training program is the first-line treatment for children under five Group-based education for parents and carers of all children aged five years and over Cognitive behavioral therapy Medications for patients with a persistent, significant impairment Methylphenidate is the first-line treatment for children aged five years and over Lisdexamfetamine is the 2 nd line for children who have had a 6-week trial of methylphenidate Atomoxetine or guanfacine is the 3 rd line for children aged five years and more if not tolerated the 1 st and 2 nd
Maintenance and monitoring	Monitor the effectiveness of medication and adverse effects Regular measurement of weight, height, and BMI Monitor heart rate and blood pressure Number routine blood tests or ECGs without clinical indication For new seizures or worsening of existing seizures, review ADHD medication and stop any medication contributing to the seizures Monitor the behavioral response to medication
Dietary advice	A balanced diet, good nutrition, and regular exercise for patients with ADHD are advised Elimination of artificial coloring and additives from the diet should not be advised A referral to a dietitian should be offered if a relationship is found between behaviors and specific food or drinks

BMI: Body mass index, ADHD: Attention deficit hyperactivity disorder, DSM: Diagnostic and statistical manual of mental disorders, ICD: International classification of disease, ECGs: Electrocardiograms

AWARENESS RESEARCH OF ATTENTION DEFICIT HYPERACTIVITY DISORDER IN SAUDI ARABIA

Since they are the first to notice the symptoms in children, health-care and nonhealth-care workers' collaborations are necessary for diagnosing and treating ADHD. In order to have a good perception and a reasonable attitude toward children with ADHD, health-care professionals, guardians, and teachers need to have sufficient knowledge and comprehension about it. However, most previous research in Saudi Arabia [Table 3] has shown that there is still insufficient understanding, perceptions, and attitudes surrounding ADHD.^[30-35] Parents of children with ADHD report having several challenges taking care of their children and less understanding of their children's lives and behaviors. Low parental knowledge can negatively affect early ADHD diagnosis, perception of ADHD-related problems, and long-term treatment adherence. On the other hand, teachers play a crucial role in the diagnosis and educational interventions used to manage ADHD children as they usually spend significant time with children and can promptly observe behavioral changes in ADHD children. However, a few studies specifically address how parents and teachers can handle children with ADHD in Saudi Arabia; therefore, more research is needed to raise their knowledge and change their negative attitude.^[32,33]

THE FUTURE NEEDED RESEARCH IN ATTENTION DEFICIT HYPERACTIVITY DISORDER IN SAUDI ARABIA

The current research on ADHD in Saudi Arabia provides a trustworthy evidence for its prevalence and the general parents' knowledge of this neurobehavioral disorder. However, there is limited research on ADHD comorbidities, educational interventions, medication side effects, and ADHD outcomes in Saudi Arabia. Consequently, there are areas suggested by the author for future research on ADHD in Saudi Arabia which are:

Table 3: Some studies on the knowledge, attitude, and practice of attention deficit hyperactivity disorder in Saudi Arabia

Authors	Type of study	Year of publication	Number of patients	Participants	Conclusion
Qashqari <i>et al.</i> ^[30]	cross-sectional study	2017	111	Medical students at King Abdul-Aziz University	Most students (67%) recognized ADHD. Only 24% correctly recognized ADHD subtypes, and 58% did not know what the initial required management step is
Al-Ahmari <i>et al.</i> ^[31]	cross-sectional study	2018	340	Health-care physician	PHC physicians' knowledge about ADHD was suboptimal, but they had a positive attitude toward their role in ADHD
Al-Mohsin <i>et al.</i> ^[32]	Cross-sectional study	2020	132	Mothers of ADHD children in Al-Khobar, Dammam, and Al-Qatif cities	About 47% of mothers of children with ADHD had a poor knowledge of ADHD, 74.2% had a positive attitude toward the condition, and 51.5% had a neutral perception of their children
Alanazi and Al Turkī ^[33]	Cross-sectional study	2021	400	Male teachers of primary schools	The knowledge regarding ADHD among elementary school teachers is suboptimal. Some teachers had a misunderstanding about ADHD symptoms and general information
Alsuhaiibani <i>et al.</i> ^[34]	Cross-sectional study	2020	224	Medical students at Qassim University	Medical students had a good awareness of ADHD; however, they had insufficient knowledge
Aljabri <i>et al.</i> ^[35]	Cross-sectional study	2022	603	The general population of Makkah	94.2% had heard about ADHD, and 39.9% of responders knew about it from social media

ADHD: Attention deficit hyperactivity disorder, PHC: Primary health care

1. Systematic data collection, participant retention, and selecting appropriate comparison levels are essential components of practical studies that need to be accomplished
2. There is insufficient research available about the outcomes for those with co-occurring learning disabilities, language disorders, or other ADHD comorbidities
3. Some research adapted specialized screening and diagnostic instruments to identify ADHD, yet every tool was translated into Arabic. Evaluation and psychomotor assessment are necessary for diagnosing children with ADHD in the Arab context
4. An essential objective that will advance the research methodologies in this field is developing a system for assessing and comparing the internal validity of studies utilizing data collected
5. It would be helpful to utilize standardized outcome measures, such as global impairment scores or quality of life scales, to compare the study outcomes of ADHD in Saudi Arabia
6. The role of diet and its impact on ADHD are important areas to be searched. Eliminating diets, adding supplements, and awareness of micronutrients for neurobehavioral health in children are important areas of possible research
7. With a focus on long-term academic outcomes, it is crucial to comprehend the function of academic interventions combined with ADHD therapy. In addition, it is crucial to examine how educational interventions simulate specific subgroups of ADHD children diagnosed with learning difficulties
8. More research is required to specify the function of psychoeducational interventions in the continuity of ADHD management for parents and educators. In addition, studies into parent preferences for behavior training are required to determine if parent training completion rates may be increased
9. There is a necessity for more research on the effects and efficacy of the medicine in children and adolescents who are currently receiving therapy for ADHD
10. More studies on the utilization of the available services are required to understand better how the health-care system, learning environment, and insurance coverage impact the treatment for ADHD.

CONCLUSION

ADHD is a common neurobehavioral disorder in children and adolescents, with estimated prevalence rates varying by region, ranging between 2.7% and 16.4% in Saudi Arabia. There are generally well-known risk factors and comorbidities associated with ADHD; however, there are a little available data in the current research in Saudi Arabia. In addition, the country has clear clinical guidelines for diagnosing and managing this condition. Nevertheless, adherence to these, the guidelines and the utilization of the services provided are still uncharted and need more investigations. Therefore, further research is needed to widen the horizons of understanding ADHD in the Saudi context involving the regions where the problem is not yet addressed.

Ethical approval

The Ethics Board Approval was not required in the review article.

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Conflicts of interest

There are no conflicts of interest.

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