

ATTENTION DEFICIT HYPERACTIVITY SYNDROME: An update on assessment and management

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SUMMARY

Attention Deficit Hyperactivity Disorder (ADHD) is the most common neurodevelopmental disorder of childhood and makes up 30-40% of referrals to child mental health practitioners. It is associated with significant impairments and frequently persists in adulthood. Because of limited numbers of trained child Psychiatrists in Pakistan, most of these children present to paediatricians and Adult Psychiatrists. Competency in diagnosis and treatment of ADHD requires in depth understanding of its presentation, comorbidities and various management options.

An attempt has been made in this write up to review ADHD along with update on Assessment and Management issues in accordance with International Guidelines. This manuscript was prepared following detailed search on various databases including Pubmed, Psychinfo as well as information on websites of American Association of Child and Adolescent Psychiatry (AACAP) and National Institute of Clinical Excellence, (NICE) UK.

KEY WORDS: Attention Deficit Hyperactivity Disorder, Hyperkinetic disorder, Child Psychiatry, Psychostimulants.

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INTRODUCTION

Attention Deficit Hyperactivity Disorder is the most common neurodevelopmental disorder of childhood.¹ and puts sufferers at risk for a wide range of abnormalities in personality development. By definition, Attention Deficit Hyperactivity Disorder (ADHD) consists of a persistent pattern of inattention and/or hyperactive and impulsive behaviour that is more severe than expected of children at similar age and level of development. In addition, children with ADHD have a host of impairments in multiple domains of functioning, including adult relationships (e.g. noncompliance with

adult requests), school functioning (e.g. classroom disruption, poor achievement), and peer and sibling relationships (e.g. annoying, intrusive, overbearing and aggressive behaviors). These difficulties continue into adolescence and adulthood even though core symptoms may improve with age.² Competency in diagnosis and treatment of patients with ADHD requires an understanding of the spectrum of this condition, its comorbidities, and various treatment approaches.

THE PREVALENCE AND COURSE OF ADHD

The prevalence is conservatively estimated as being from 3% to 7% of the school age children in the United States.³ The prevalence of ADHD in Pakistan has been found to be around 2.49%.⁴ Boys with ADHD outnumber girls, but ratio varies significantly from 2:1 to 9:1. Gender differences are less obvious for inattentive type of ADHD. Boys are more likely to be aggressive and to have other behavioral problems.⁵ ADHD children make up 30-40% of referrals to child mental health Practitioners.⁶

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Historically, it was believed that ADHD was outgrown in mid to late Adolescence. It is now clear that two thirds of children with ADHD will continue to have problems attributable to ADHD as adults and because ADHD is a chronic disorder, will require treatment throughout their lives.⁷

THE ETIOLOGY OF ADHD

The exact etiological pathways of ADHD are unknown. Some of the current hypotheses regarding aetiology of ADHD are as follows:

Genetic Factors: One fourth to one third of biological parents of children with ADHD are affected by ADHD themselves, suggesting a significant genetic component.⁸ The chance of Parents with a child who has ADHD, having another child with ADHD is about 1 in 3.⁹

Brain Damage: It has been speculated that some children affected by ADHD suffered subtle damage to the central nervous system and brain development during their fetal and perinatal periods. It may be associated with circulatory, toxic, metabolic, mechanical or physical insult to the brain during early infancy caused by infection, inflammation, and trauma.^{10,11}

Neurochemical Factors: The most widely studied drugs in the treatment of ADHD, the stimulants, affect both dopamine and norepinephrine, leading to neurotransmitter hypothesis that include possible dysfunction in both dopaminergic and noradrenergic systems.

Neurophysiological Factors: EEG event related potentials suggest an arousal dysfunction related to hypo reactivity to salient informative stimuli. Thus the individual with ADHD is relatively unaware of his or her sensations of salient informative stimuli. This results in the paradoxical reaction to stimulant medication, where individuals with ADHD become less instead of more active after taking stimulant medication, as they become more attentive to salient informative stimuli.¹²

Psychosocial Factors: Beiderman¹³ indicated that family-environment variables such as severe marital discord, large family size, paternal

criminality, maternal mental disorder, and foster care placement are significant risk factors in the development of ADHD.

DIAGNOSIS

As per Diagnostic and Statistical Manual of Mental disorders-1V.³

- * Children must have six of nine symptoms to qualify for either the inattentive or hyperactive/impulsive subtypes of ADHD, or six of nine symptoms of both subtypes to qualify for the combined type.
- * These symptoms must have been present before the age of seven.
- * Symptoms must create impairment in two or more settings (e.g. home, school, and neighborhood).
- * Symptoms must cause clinically significant impairment in social, academic or occupational functioning.
- * Symptoms must not be better accounted for by any other disorder.

Symptoms of ADHD fall into two broad categories as shown in Table-I. DSM-1V identifies three subtypes of ADHD as predominantly inattentive type, predominantly hyperactive/impulsive type and combined types.

The ICD 10 (International Classification of Diseases)¹⁴ diagnosis of hyperkinetic disorder is the narrower category. In ICD 10, all three problems of inattention, hyperactivity and impulsivity should be present; more stringent criteria for pervasiveness across situations are met; and the presence of another disorder such as anxiety state is in itself an exclusion criteria-the expectation is that most cases will have a single diagnosis.

COMORBIDITY

About 44% of children with ADHD have a co-morbid disorder, almost a third have two co-morbid disorders, and approximately one tenth have three comorbid disorders.¹⁵

Conduct Disorder: Goldstein and Goldstein¹⁶ reported that conduct disorder and oppositional defiant disorder are the most common co-morbid disorders with ADHD. Barkley indicated that about one quarter of children

diagnosed with ADHD also meet the criteria for conduct disorder and about one third meet the criteria for oppositional defiant disorder. Longitudinal studies indicate that in primary school aged children, hyperactive behaviour is a risk factor for conduct disorder.¹⁷

Emotional Disorders: Anxiety disorders and depression are seen in about one fourth of ADHD children. Some children may develop low self-esteem and insecurity a result of failures at school and interpersonal relationships.

Learning Disabilities: Learning disabilities are also a common co morbid disability for children with ADHD. These children are more likely to show neurodevelopmental delays of various types. Language milestones are achieved later than normal, expressive language is unduly simple, sensory motor coordination is often impaired, handwriting is poor and reading ability is behind that expected for chronological age.¹⁸ Mental Retardation may be a co- morbid disorder.¹⁹

Pervasive Developmental Disorders: Children with autism often show hyperactive behaviour, and autistic symptoms are sometimes seen in the hyperactive children.

TIC Disorder: Number of children with ADHD develops co morbid TIC disorder during their early school years.²⁰

Developmental Coordination Disorder: ADHD is often accompanied by problems in sensory motor coordination, especially seen in poor handwriting, clumsiness, poor performance in sports, and marked delays in achieving motor milestones.²¹

THE ASSESSMENT OF ADHD

Assessment for ADHD should include detail history, interview, physical and psychological evaluation. Information can be gained through interview from at least three sources.

- * Clinical interview with the parents.
- * Interview with the child.
- * Kindergarten, preschool or school information.

These interviews can be structured or unstructured and are the most important part of the evaluation process.²²

Observational Measures: Behavioral observations of the child and of Parent child interactions, informally while in the waiting room and as part of the interview as well as formally thorough assigned task for parent and child to complete together may be helpful. The Individualized Target Behaviour Evaluation (ITBE) is a very simple observational scheme that uses teacher or parent implemented frequency counts as proxies for more extensive observations by independent observers.

Rating Scales: Various rating scales are routinely used in assessment of children for ADHD. For example:

- * Strengths and Difficulties Questionnaires.²³ (Parent and teacher version. It has been validated in Urdu Language.)
- * Conner's Rating Scales.^{24,25}
- * Child Behavior checklist(CBCL)and Teacher Report form.²⁶
- * ADHD Rating scale.²⁷

Psychological Tests: Some of the instruments that have been used in assessing ADHD are:

- * Continuous Performance Test.(CPT)
- * The freedom from Distractibility Index of the Wechsler Intelligence Scale for children-III.
- * Porteus mazes.
- * The Trail Making Test (A&B).

Physical Evaluation: According to European clinical guidelines for hyperkinetic disorder, child's height, weight, and head circumference should always be recorded. A general examination is always needed including, assessment of physical health. The examination should look particularly for any evidence of neurodevelopmental immaturity in gross and fine motor functions and for motor and vocal tics. Investigations should not be routine but guided by history and physical examination.²⁸ If there is history suggestive of seizures, an EEG should be carried out.

MANAGEMENT

Psycho education, behavioral intervention, medication and diet are all used for children with hyperkinetic disorders. As most children with ADHD have many problems, multimodal intervention is usually indicated.²⁹

Table-I: Symptoms of ADHD

<i>Inattention</i>	<i>Hyperactivity/Impulsivity</i>
<ul style="list-style-type: none"> * Failing to pay close attention to details or making careless mistakes when doing schoolwork or other activities. * Difficulty sustaining attention in tasks. * Appearing not to listen, when spoken to. * Failing to follow instructions or finishing tasks. * Difficulty organizing tasks and activities. * Avoiding tasks that require high amount of mental effort. * Frequently losing items required to facilitate tasks or activities. * Excessive distractibility. * Forgetful in daily activities. 	<ul style="list-style-type: none"> * Fidgeting with hands or feet or squirming in seat. * Leaving seat often, even when inappropriate. * Running or climbing at inappropriate times. * Difficulty in quiet play. * Often on the go. * Excessive speech. * Answering a question before the speaker has finished. * Failing to wait one's turn. * Interrupting the activities of others at inappropriate times.

Psychoeducational Measures: Education regarding illness symptoms, aetiology, clinical course, prognosis, and treatment should be provided. Consultation with school after parental consent is mostly needed.

The American Academy of Child and Adolescent Psychiatry parameters for treating ADHD³⁰ stresses the importance of support and education of parents and teachers in effective behavioral-psychosocial treatment of ADHD.

Parent training and behavioral interventions in the family: These interventions have been shown to be very effective.³¹ According to expert consensus guidelines³² behavioral-psychosocial treatment is an appropriate first level treatment in the following instances:

- * For milder ADHD.
- * For pre-school-age children with ADHD.
- * When there is the presence of co-morbid internalizing disorders.
- * When there is the presence of co-morbid social skills deficits.
- * When the family prefers psychosocial treatment.

The most widely relevant techniques are paying positive attention to appropriate behaviour and compliance, giving commands more effectively, and using appropriate negative consequences for problem behaviors.

Behavioural interventions in the school: These are known to be effective in reducing hyperactive behaviour and promoting social adjustment. Some behavioral interventions which are found to be helpful in classrooms include.³³

- * Having the child seated close to the teacher.
- * Brief academic assignments.
- * Reinforcement and repetition.
- * Posting daily schedules and assignments.
- * Using graphic organizers.
- * Providing a notebook for recording homework assignments.
- * Interspersing classroom lectures with brief periods of physical exercises, may be helpful.

Psychopharmacological Treatment: There is substantial evidence for the use of medications in the treatment of ADHD. The challenge for the doctor is to establish a treatment regimen that has a rapid predictable onset of action, a duration of action that does not require redosing, no negative side effects (eg sleep problems, anorexia, mood alteration) and a beneficial effect on co morbidities.

Multimodal treatment of children with ADHD (MTA Study)³⁴ randomized 579 children with ADHD from age 7 to almost 10 years of age to different groups: medication management alone, medication and behaviour management, behaviour management alone, and

Table-II: Drugs used in the treatment of ADHD

<i>Drug Name</i>	<i>Dosage</i>	<i>Side Effects</i>
* Methylphenidate (Ritalin)	2.5-20mg. (needs 2-3 doses /day)max 60 mg/day	Loss of appetite, sleeplessness, tics, nervousness, changes of blood pressure, growth can be affected
* Methylphenidate concerta SR	18mg, 36mg, 54 mg	Same as for methylphenidate.
* Dextroamphetamine	2.5-10mg	Same as for methylphenidate.
* Atomoxetine	40-100mg /day insingle undivided doses.	Anorexia, nausea, dry mouth, tachycardia, increase in blood pressure,headache, depression.
* Tricyclics antidepressants. (imipramine)	2.5mg/kg/day Starting with 10 mg, increasing gradually up to 50-80mg for patients 14 years of age.	Drowsiness, sleep disturbances, anxiety, headaches, dry mouth, constipationMay produce arrhythmias.
* Clonidine	Usually 3-5i g/kg/day in two divided doses.	Fatigue, dizziness, dry mouth, hyperactivity and irritability.
* Guanfacine(Tenex)	1 mg tablets	Dizziness, dry mouth, hyperactivity, irritability and other behaviour problems.

a standard community care group. Both groups that involved medication showed a substantial decrease in important ADHD symptoms over a 14 month period. The combined treatment group showed improved academic measures, measures of conduct, and some specific ADHD symptoms compared to the single treatment groups.

In reviewing most of the studies comparing behaviour therapy with stimulants alone, there seems to be a much stronger effect from stimulants than with behaviour therapy.³⁵

A variety of short and long acting stimulants, antidepressants, alpha and beta blockers, mood stabilizers, and major tranquilizers are available to help physicians manage ADHD.

Indications: Experts agree that starting with the combination of both medication and psychosocial treatment is favoured in most situations, especially the following:³¹

- * For more severe cases of ADHD.
- * Where significant aggression or severe problems in school are present.
- * Where there is severe family disruption caused by ADHD symptoms.
- * Where there is a need for a rapid response.

- * For all three types of ADHD, especially the combined type.
- * For all age groups except preschool.
- * With the presence of co morbid externalizing disorders, mental retardation, or central nervous system problems (eg, epilepsy, migraine).

Psychostimulants: Trials have reported improvements in the most salient and impairing behavioral symptoms of ADHD. In the classroom, stimulants decrease interrupting, fidgetiness, and finger tapping, and increase on task behaviour. At home, stimulants improve parent child interactions, on task behaviors and compliance. In social settings, stimulants improve peer nomination ranking of social standing and increase attention during sports activities. Stimulants may even show positive benefit on the co morbid disorders. (Such as conduct disorder and anxiety disorder).

Initial medication should be a trial and methylphenidate is usually the first choice in most children. Dextroamphetamine and pemoline are other stimulants used in ADHD. Long acting preparations of Methylphenidate (like concerta) is also available, although not yet in

Pakistan and is being widely prescribed. The relevant doses and side effects of stimulants are given in the Table-II.

Monitoring stimulant medications: At baseline, in accordance with the most recent American Academy of Child and Adolescent psychiatry (AACAP) practice parameters, before starting stimulants medications, the basic workup recommended involves Physical examination, weight, height, pulse and blood pressure. These should then be monitored at regular intervals.

Contraindications of psycho stimulants:

- * Schizophrenia.
- * Hyperthyroidism.
- * Cardiac arrhythmias.
- * Angina pectoris.
- * Glaucoma.
- * Previous hypersensitivity to the drug.

Caution is needed in presence of depression, tics, pervasive developmental disorders, severe mental retardation, or a history of drug dependence or alcoholism.

Atomoxetine: A novel agent atomoxetine (Strattera) was approved in 2003 as a nonstimulant medication for the treatment of ADHD. Atomoxetine is a norepinephrine reuptake inhibitor and does not affect dopamine. Recently the UK Medicines and Healthcare products Regulatory Agency has issued an updated warning on risk of suicidal thoughts with Atomoxetine.³⁶ The healthcare professionals have been advised to carefully monitor patients on atomoxetine for signs of depression, suicidal thoughts or suicidal behaviours.

Second line drugs with efficacy in ADHD: These include alpha adrenergic agonists clonidine, Guanaficine, antidepressants like venlafaxine, bupropin and tricyclics (imipramine, desipramine).

CONCLUSIONS

ADHD has emerged from the 20th century with a large amount of scientific work investigating its validity and clarifying clinical controversies.³⁷ The disorder is highly prevalent worldwide, is associated with significant impairments and frequently persists in adulthood.

The emerging knowledge about the causes and pathophysiology of ADHD should lead to an improved understanding of the neural mechanisms underlying the disorder, which should improve diagnostic and treatment strategies.

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