# ADHD

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# INTRODUCTION

**Definition :**

- ADHD is a disorder that manifests in early childhood with symptoms of **hyperactivity, impulsivity, and/or inattention**. The symptoms **affect** cognitive, academic, behavioral, emotional, and social functioning.

American Psychiatric Association. Attention-deficit/hyperactivity disorder. In: Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition, American Psychiatric Association, Arlington, VA 2013. p.59.

# EPIDEMIOLOGY
# PREVALENCE

- The prevalence of ADHD in children varies from 2 to 18 percent depending upon the diagnostic criteria and the population studied

ADHD: clinical practice guideline for the diagnosis, evaluation, and treatment of attention-deficit/hyperactivity disorder in children and adolescents
Subcommittee on Attention-Deficit/Hyperactivity Disorder, Steering Committee on Quality Improvement and Management, Pediatrics. 2014;128(5):1007

- The prevalence in school-age children is estimated to be between 8 and 11 percent, making it one of the most common disorders of childhood

Trends in the parent-report of health care provider-diagnosed and medicated attention-deficit/hyperactivity disorder: United States, 2003-2011

Visser SN, Danielson ML, Bitsko RH, Holbrook JR, Kogan MD, Ghandour RM, Perou R, Blumberg SJ
J Am Acad Child Adolesc Psychiatry. 2014 Jan;53(1):34-46.e2. Epub 2013 Nov 21.

- **IS THERE AN INCREASE IN PREVELANCE OVER YEARS ?**

- IN the 2013 National Survey of Children's Health (NSCH), the prevalence of a parent-reported diagnosis of ADHD among children aged 4 to 17 years of age in the United States was estimated to be **11 percent** compared to **7.8 percent** in 2003

Trends in the parent-report of health care provider-diagnosed and medicated attention-deficit/hyperactivity disorder: United States, 2003-2011
Visser SN, Danielson ML, Bitsko RH, Holbrook JR, Kogan MD, Ghandour RM, Perou R, Blumberg SJ
J Am Acad Child Adolesc Psychiatry. 2014 Jan;53(1):34-46.e2. Epub 2013 Nov 21.

- One-third of children were diagnosed with ADHD before age six years

  Diagnostic Experiences of Children With Attention-Deficit/Hyperactivity Disorder
  Visser SN, Zablotsky B, Holbrook JR, Danielson ML, Bitsko RH
  Natl Health Stat Report. 2015 Sep;

- ADHD is more common in boys than girls (male to female ratio 4:1 for the predominantly hyperactive type and 2:1 for the predominantly inattentive type)

# COMORBID DISORDERS

- Comorbid conditions can be primary or secondary (eg, exacerbated by the ADHD).
- In either case, they require treatment independent of the treatment for ADHD

ADHD: clinical practice guideline for the diagnosis, evaluation, and treatment of attention-deficit/hyperactivity disorder in children and adolescents.
Subcommittee on Attention-Deficit/Hyperactivity Disorder, Steering Committee on Quality Improvement and Management, Wolraich M, Brown L, Brown RT, DuPaul G, Earls M, Feldman HM, Ganiats TG, Kaplanek B, Meyer B, Perrin J, Pierce K, Reiff M, Stein MT, Visser S
Pediatrics. 2011;128(5):1007

# CLINICAL FEATURES

- ADHD is a syndrome with two categories of core symptoms: hyperactivity/impulsivity and inattention.
- Impaired functioning

American Psychiatric Association. Attention-deficit/hyperactivity disorder. In: Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition, American Psychiatric Association, Arlington, VA 2013. p.59.

# HYPERACTIVITY AND IMPULSIVITY

- Hyperactive and impulsive behaviors almost always occur together in young children.

- The predominantly hyperactive-impulsive subtype of ADHD is characterized by the inability to sit still or inhibit behavior

American Psychiatric Association. Attention-deficit/hyperactivity disorder. In: Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition, American Psychiatric Association, Arlington, VA 2013. p.59.

- **Symptoms of hyperactivity and impulsivity may include** :

- Excessive fidgetiness (eg, tapping the hands or feet, squirming in seat)
- Difficulty remaining seated when sitting is required (eg, at school, work, etc)
- Feelings of restlessness (in adolescents) or inappropriate running around or climbing in younger children
- Difficulty playing quietly
- Difficult to keep up with, seeming to always be "on the go"
- Excessive talking
- Difficulty waiting turns
- Blurting out answers too quickly
- Interruption or intrusion of others

American Psychiatric Association. Attention-deficit/hyperactivity disorder. In: Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition, American Psychiatric Association, Arlington, VA 2013. p.59.

- Hyperactive and impulsive symptoms typically are observed by the time the child reaches **four years** of age and **increase** during the next three to four years, peaking in severity when the child is seven to eight years of age .
- After seven to eight years of age, hyperactive symptoms **begin to decline**; by the adolescent years, they may be barely discernible to observers although the adolescent may feel restless or unable to settle down.
- In contrast, **impulsive symptoms usually persist throughout life**

Validity of the age-of-onset criterion for ADHD: a report from the DSM-IV field trials
Applegate B, Lahey BB, Hart EL, Biederman J, Hynd GW, Barkley RA, Ollendick T, Frick PJ, Greenhill L, McBurnett K, Newcorn JH, Kerdyk L, Garfinkel B, Waldman I, Shaffer D
Am Acad Child Adolesc Psychiatry. 2007;36(9):1211.

# INATTENTION

- The predominantly inattentive subtype of ADHD is characterized by **reduced ability to focus attention and reduced speed of cognitive processing and responding** .
- The typical presenting complaints center on cognitive and/or academic problems.
- Among children born at <32 weeks gestational age, symptoms of inattention appear to be more prominent than hyperactivity and impulsivity

Inattention in very preterm children: implications for screening and detection
Brogan E, Cragg L, Gilmore C, Marlow N, Simms V, Johnson S
Arch Dis Child. 2014;99(9):834

- **Symptoms of inattention may include:**

- Failure to provide close attention to detail, careless mistakes
- Difficulty maintaining attention in play, school, or home activities
- Seems not to listen, even when directly addressed
- Fails to follow through (eg, homework, chores, etc)
- Difficulty organizing tasks, activities, and belongings
- Avoids tasks that require consistent mental effort
- Loses objects required for tasks or activities (eg, school books, sports equipment, etc)
- Easily distracted by irrelevant stimuli
- Forgetfulness in routine activities (eg, homework, chores, etc)

American Psychiatric Association. Attention-deficit/hyperactivity disorder. In: Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition, American Psychiatric Association, Arlington, VA 2013. p.59.

- The symptoms of inattention typically are not apparent until the child is **eight to nine years of age.**

- symptoms of inattention usually are a lifelong problem

American Psychiatric Association. Attention-deficit/hyperactivity disorder. In: Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition, American Psychiatric Association, Arlington, VA 2013. p.59.

# IMPAIRED FUNCTIONING

- In order to meet criteria for ADHD, core symptoms must impair function in academic, social, or occupational activities.
- Social skills in children with ADHD often are significantly impaired.
- Problems with inattention may limit opportunities to acquire social skills or to attend to social cues necessary for effective social interaction, making it difficult to form friendships.
- Hyperactive and impulsive behaviors may result in peer rejection. The negative consequences of impaired social function (eg, poor self-esteem, increased risk for depression and anxiety) may be long standing

American Psychiatric Association. Attention-deficit/hyperactivity disorder. In: Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition, American Psychiatric Association, Arlington, VA 2013. p.59.

# EVALUATION

- Includes comprehensive medical, developmental, educational, and psychosocial evaluation

- Should include review of the medical, social, and family histories; clinical interviews with the parent and patient; review of information about functioning in school or day care; and evaluation for coexisting emotional or behavioral disorders

# MEDICAL EVALUATION :

- Prenatal exposures (eg, tobacco, drugs, alcohol), perinatal complications or infections, central nervous system infection, head trauma, recurrent otitis media, and medications.
- Family history of similar behaviors
- The review of systems should include information about sleep disturbances.
- dietary history (eg, appetite, picking eating)
- It is also important to obtain a thorough child and family cardiac history and cardiac review of systems before initiating medications

Attention deficit hyperactivity disorder and sleep disordered breathing in pediatric populations: a meta-analysis.
Sedky K, Bennett DS, Carvalho KS
Sleep Med Rev. 2014 Aug;18(4):349-56. Epub 2013 Dec 24

- The physical examination of most children with ADHD is normal. However, the examination is necessary to evaluate other possibilities in the differential diagnosis.

- Measurement of height, weight, head circumference, and vital signs
- Assessment of dysmorphic features and neurocutaneous abnormalities
- A complete neurologic examination, including assessment of vision and hearing
- Observation of the child's behavior in the office setting

# ANCILLARY EVALUATION

- Speech and language evaluation
- Occupational therapy evaluation
- Mental health evaluation
- Blood lead level (lead poisoning)
- Thyroid hormone levels
- Genetic testing and/or genetics consultation (fragile X syndrome)
- Neurology consultation or electroencephalography (neurologic or seizure disorder)

# DIAGNOSIS

**Diagnostic criteria:**

- The American Psychiatric Association has defined consensus criteria for the diagnosis of ADHD
- Diagnostic and Statistical Manual of Mental Disorders Fifth Edition (DSM-5)
- For children <17 years, the DSM-5 diagnosis of ADHD requires ≥6 symptoms of hyperactivity and impulsivity or ≥6 symptoms of inattention.
- For adolescents ≥17 years and adults, ≥5 symptoms of hyperactivity and impulsivity or ≥5 symptoms of inattention are required;

American Psychiatric Association. Attention-deficit/hyperactivity disorder. In: Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition, American Psychiatric Association, Arlington, VA 2013. p.59.

## The symptoms of hyperactivity/impulsivity or inattention must:

- Occur often
- Be present in more than one setting (eg, school and home)
- Persist for at least six months
- Be present before the age of 12 years
- Impair function in academic, social, or occupational activities
- Be excessive for the developmental level of the child

American Psychiatric Association. Attention-deficit/hyperactivity disorder. In: Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition, American Psychiatric Association, Arlington, VA 2013. p.59.

# TREATMENT

## GENERAL PRINCIPLES :

- Care coordination :

  Involvement of patient and family.

- Target goals : realistic, achievable, and measurable.
  - Improved relationships with parents, teachers, siblings, or peers (eg, plays without fighting at recess)
  - Improved academic performance (eg, completes academic assignments)
  - Improved rule following (eg, does not talk back to the teacher)

American Academy of Pediatrics, National Initiative for Children's Healthcare Quality. How to establish a school-home daily report card. http://www.nichq.org/toolkits_publications/complete_adhd/12HowToEstabSchlHomeDailyRepCa.pdf (Accessed on November 17, 2015

**Preschool children :**

- For preschool children (age 4 through 5 years) who meet the diagnostic criteria for ADHD, the recommendation is behavior therapy rather than medication as the initial therapy.
- Behavior therapy can be administered by the parents or teachers

ADHD: clinical practice guideline for the diagnosis, evaluation, and treatment of attention-deficit/hyperactivity disorder in children and adolescents
Pediatrics. 2011;128(5):1007

## School-age children :

- For most school-aged children and adolescents (≥6 years of age) who meet the diagnostic criteria for ADHD and specific criteria for medication, the recommendation is initial treatment with stimulant medication combined with behavioral therapy, to improve core symptoms and target outcomes.

ADHD: clinical practice guideline for the diagnosis, evaluation, and treatment of attention-deficit/hyperactivity disorder in children and adolescents
Pediatrics. 2011;128(5):1007

Treatment of Attention-Deficit/Hyperactivity Disorder in Adolescents: A Systematic Review
Chan E, Fogler JM, Hammerness PG
JAMA. **2016** May;315(18):1997-2008.

# TREATMENT

- Stimulants :
  - Methylphenidate
  - Amphetamines
- ATOMOXETINE (selective norepinephrine reuptake inhibitor)
- Alpha-2-adrenergic agonists (eg, extended release clonidine or guanfacine)

# Autism spectrum disorder

# DEFINITION

- Autism spectrum disorder (ASD) is a biologically based neurodevelopmental disorder characterized by impairments in two major domains:

1) deficits in social communication and social interaction

2) restricted repetitive patterns of behavior, interests, and activities

- ASD encompasses disorders previously known as autistic disorder (classic autism, sometimes called early infantile autism, childhood autism, or Kanner's autism), childhood disintegrative disorder, pervasive developmental disorder-not otherwise specified, and Asperger disorder (also known as Asperger syndrome)

American Psychiatric Association. Autism spectrum disorder. In: Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition, American Psychiatric Association, Arlington, VA 2013. p.50.

# EPIDEMIOLOGY

- **Prevalence :**
- ASD is approximately four times more common in males than females
- The prevalence of ASD in the United States and other countries has increased since the late 1990s till now.
- In the mid-1990s the prevalence of approximately 1 in 1000 for autism and 2 in 1000 for ASD

Systematic review of prevalence studies of autism spectrum disorders
Arch Dis Child. 2006;91(1):8.

- Rate in siblings :

The prevalence of ASD without associated medical conditions in siblings of children with ASD has been estimated to range from 3 to 10 percent.

Recurrence risk for autism spectrum disorders: a Baby Siblings Research Consortium study.
Ozonoff S, Young GS, Carter A, Messinger D, Yirmiya N, Zwaigenbaum L, Bryson S, Carver LJ, Constantino JN, Dobkins K, Hutman T, Iverson JM, Landa R, Rogers SJ, Sigman M, Stone WL
Pediatrics. 2011;128(3):e488

# ASSOCIATED CONDITIONS

- **Intellectual disability** (mental retardation) was present in approximately between 50 and 75 percent

  Mental health in the United States: parental report of diagnosed autism in children aged 4-17 years--United States, 2003-2004. MMWR Morb Mortal Wkly Rep. 2006;55(17):481.

  Prevalence of autism in a United States population: the Brick Township, New Jersey, investigation Pediatrics. 2001;108(5):1155.

- **Seizures** also occur in 11 to 39 percent of cases , higher in individuals with more severe intellectual disability

  A longitudinal study of epilepsy and other central nervous system diseases in individuals with and without a history of infantile autism Brain Dev. 2011;33(5):361.

## Feeding Disturbances and Gastrointestinal Problems

In 19–24 percent . Diarrhea , constipation

H. Elder: The gluten-free, casein-free diet in autism: an overview with clinical implications. Nutr Clin Pract. 23 (6):583-588 2008

**Sleep disturbances**: particularly abnormalities in sleep-wake cycles

The majority of children with autism have sleep problems, often severe, and usually involving extreme sleep latencies, lengthy nighttime awakenings, shortened night sleep and early morning awakenings

M.T. Harvey, C.H. Kennedy: Polysomnographic phenotypes in developmental disabilities. Int J Dev Neurosci. 20 (3–5):443-448 2012 Special Issue: NICHD Mental Retardation Research Centers

# PATHOGENESIS

- The pathogenesis of ASD is incompletely understood

- Genetic factors
- Neurobiologic factors
- Environmental and perinatal factors
- Parental age
- association with immunizations ?!

# DX

- IMPAIRED SOCIAL COMMUNICATION AND INTERACTION .
- RESTRICTED AND REPETITIVE BEHAVIOR, INTERESTS, AND ACTIVITIES .

# IMPAIRED SOCIAL COMMUNICATION AND INTERACTION

- Is a hallmark of autism spectrum disorder (ASD)

- Social reciprocity :
- Individuals with ASD have deficits in social or emotional reciprocity

- Joint attention :
- ASD may lack or show reduced spontaneous seeking to share enjoyment, interests, or achievements with other people

Recognition of autism before age 2 years
Pediatr Rev. 2008;29(3):86

- Nonverbal communication :
- impaired ability to use and interpret nonverbal behaviors such as eye-to-eye gaze, facial expression, gestures, and body postures.

Volkmar F, Wiesner L. Autism and related disorders. In: Developmental-Behavioral Pediatrics, 4th ed, Carey WB, Crocker AC, Coleman WL, et al (Eds), Saunders Elsevier, Philadelphia 2009. p.675

- Social relationships

fail to develop and maintain peer relationships appropriate to their developmental level

# RESTRICTED AND REPETITIVE BEHAVIOR, INTERESTS, AND ACTIVITIES

- Stereotyped behaviors :
- Stereotyped and repetitive motor mannerisms or complex whole-body movements (eg, hand or finger flapping or twisting, rocking, swaying, dipping, walking on tip-toe [toe walking])
- Echolalia and idiosyncratic phrases
- Motor mannerisms are reported in 50 to 75 % often manifest during the preschool years,
- Self-injurious behaviors are more common among ASD patients with cognitive disability

Practice parameter: screening and diagnosis of autism: report of the Quality Standards Subcommittee of the American Academy of Neurology and the Child Neurology Society.
Neurology. 2000;55(4):468

- Insistence on sameness :

✓ have significant difficulty with transitions and may need the same routine identically every day.

- Restricted interests :

✓ Encompassing preoccupation with one or more stereotyped and restricted patterns of interest that is abnormal in either intensity or focus and persistent preoccupation with unusual objects

- Intellectual impairment :

- Cognitive skills of individuals with ASD are usually uneven, regardless of the general level of intelligence
- Verbal skills are usually weaker than nonverbal skills

Autism.
Volkmar FR, Pauls D
Lancet. 2003;362(9390):1133

- **Special skills :**
- Some individuals have special skills (ie, "savant" skills) in memory, mathematics, music, art, or puzzles, despite profound deficiencies in other domains
- calendar calculation (determining the day of the week for a given date)
- hyperlexia (spontaneous and precocious mastery of single-word reading)

Annotation: Hyperlexia: disability or superability
Grigorenko EL, Klin A, Volkmar F
J Child Psychol Psychiatry. 2013;44(8):1079.

# DIAGNOSIS

- Include a complete history, physical examination, neurologic examination, and direct assessment of the child's social, language, and cognitive development
- History:
- Examination:
  - Growth parameters
  - Wood's lamp
  - dysmorphic features.
  - Neurological exam

- Ancillary testing :
- necessary to exclude conditions that may produce symptoms suggestive of ASD, to identify potentially treatable conditions
- ●Vision and hearing assessment
- ●Speech, language, and communication assessments
- ●Developmental/intelligence testing with separate estimates for verbal and nonverbal skills; overall levels of function determine eligibility for services in many states
- ●Assessment of adaptive skills to document the presence of associated intellectual disability and to help establish priorities for treatment planning
- ●Neuropsychologic and/or achievement testing
- ●Sensorimotor and/or occupational therapy evaluation

Practice parameter for the assessment and treatment of children and adolescents with autism spectrum disorder
Volkmar F, Siegel M, Woodbury-Smith M, King B, McCracken J, State M, American Academy of Child and Adolescent Psychiatry (AACAP) Committee on Quality Issues (CQI)
Am Acad Child Adolesc Psychiatry. 2014 Feb;53(2):237-57

# DSM-5 CRITERIA FOR DIAGNOSIS

- diagnosis of ASD requires all of the following:
- Persistent deficits in social communication and social interaction in multiple settings; demonstrated by deficits in all three of the following (either currently or by history):
- •Social-emotional reciprocity (eg, failure of back-and-forth conversation; reduced sharing of interests, emotions)
- •Nonverbal communicative behaviors used for social interaction (eg, poorly integrated verbal and nonverbal communication; abnormal eye contact or body language; poor understanding of gestures)
- •Developing, maintaining, and understanding relationships (eg, difficulty adjusting behavior to social setting; difficulty making friends; lack of interest in peers)

- Restricted, repetitive patterns of behavior, interests, or activities; demonstrated by ≥2 of the following (either currently or by history):
- •Stereotyped or repetitive movements, use of objects, or speech (eg, stereotypes, echolalia, ordering toys, etc)
- •Insistence on sameness, unwavering adherence to routines, or ritualized patterns of behavior (verbal or nonverbal)
- •Highly restricted, fixated interests that are abnormal in strength or focus (eg, preoccupation with certain objects; perseverative interests)
- •Increased or decreased response to sensory input or unusual interest in sensory aspects of the environment (eg, adverse response to particular sounds; apparent indifference to temperature; excessive touching/smelling of objects)

# MANAGEMENT

- Management must be individualized according to the child's age and specific needs.
- Requires a multidisciplinary approach.
  - ●Developmental pediatrician, child neurologist, child psychiatrist
  - ●Psychologist or neuropsychologist
  - ●Geneticist or genetics counselor
  - ●Speech language pathologist
  - ●Occupational therapist
  - ●Audiologist
  - ●Social worker

- Goals:
  - Improve social functioning and play skills
  - Improve communication skills (both functional and spontaneous)
  - Improve adaptive skills
  - Decrease nonfunctional or negative behaviors
  - Promote academic functioning and cognition

- **TREATMENT MODALITIES :**
- Behavioral and educational interventions
- Pharmacologic interventions
- Complementary and alternative therapies

- Risperidone and aripiprazole are the only psychotropic medications approved by the FDA specifically for treatment of individuals with ASD.
- Medications should be started at lower doses, and doses should be increased slowly
- Pharmacologic agents for comorbid conditions (eg, attention deficit hyperactivity disorder, obsessive compulsive disorder, anxiety, etc).

Treatment of inattention, overactivity, and impulsiveness in autism spectrum disorders. Child Adolesc Psychiatr Clin N Am. 2008;17(4):713

# PROGNOSIS

- It is difficult to predict outcome especially for children younger than three years.
- Factors that have been associated with positive outcomes include
- ●Presence of joint attention
- ●Functional play skills
- ●Higher cognitive abilities
- ●Decreased severity of ASD symptoms
- ●Early identification
- ●Involvement in intervention
- ●A move toward inclusion with typical peers

- Factors that have been associated with less favorable outcomes include:
- ●Lack of joint attention by four years of age
- ●Lack of functional speech by five years of age
- ●IQ <70
- ●Seizures or other comorbid medical or neurodevelopmental conditions
- ●Severe ASD symptoms

Intervention for optimal outcome in children and adolescents with a history of autism
Orinstein AJ, Helt M, Troyb E, Tyson KE, Barton ML, Eigsti IM, Naigles L, Fein DA
Dev Behav Pediatr. 2014 May;35(4):247-56

# THANK YOU