ENCYCLOPEDIA
on Early Childhood
Development

Children with Attention Deficit Hyperactivity Disorder: Epidemiology, Comorbidity and Assessment

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April 2020, Éd. rév.

Epidemiology of ADHD

Children with Attention Deficit Hyperactivity Disorder (ADHD), characterized by developmentally excessive levels of inattention, over-activity and impulsiveness, are most frequently identified and treated in primary school. Studies worldwide identify a prevalence rate for ADHD equivalent to 5.29% (95% Confidence Interval: 5.01-5.56) of children and adolescents.[1] Rates are higher for boys than for girls, and for children under 12 years of age compared with adolescents.[1,2] Prevalence estimates vary based on method of ascertainment, diagnostic criteria used, and whether functional impairment criteria are included.[1] Overall, estimates are remarkably similar from country to country with the exception of African and Middle Eastern countries where rates are lower compared with North America and Europe.[1]

Symptoms generally interfere with academic and behaviour functioning at school, and often disrupt family and peer relationships.[3,4] Children with ADHD use more health services and

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sustain more injuries than those without.[5,6] While hyperactivity symptoms lessen in adolescence, the majority of children with ADHD continue to show some cognitive impairment, (eg, poor executive functioning, impaired working memory) relative to same-age peers through their teen years and into adulthood.[7,8] Childhood hyperactivity is associated with subsequent onset of other psychiatric disorders, including anxiety, conduct problems, mood disorders and suicidal behaviour and antisocial personality disorder.[9-11] Adults with childhood history of ADHD are at greater risk of psychiatric hospitalizations and incarcerations, divorce, risky sexual and driving behaviours, increased emergency room visits, serious injuries and death.[12,13] In addition, adults with ADHD documented in childhood show anatomical decrements in brain gray matter.[14] Positive factors include parent involvement through high-school and attendance at college or university as these are associated with improved functioning at age 25.[15]

ADHD is an important public health concern, not only for the long-term impairments facing individuals and families but also for the heavy burden on educational, health and criminal justice systems.[16,17]

Population studies identify that childhood inattention and hyperactivity are more common in single parent families, with low parent education attainment, parent unemployment, and low family income.[18,19] Evidence from family studies identify that symptoms of ADHD are highly heritable,[20] however, early environmental factors contribute as well. History of prenatal maternal smoking and drinking, low birth weight, and developmental problems are associated with high levels of inattention and hyperactivity.[21] Prenatal maternal smoking, maternal depression, poor parenting practices and living in a disadvantaged neighbourhood in the first year of life are all associated with later childhood behaviour problems, including inattention and hyperactivity four years later. [22-24]

Clinical identification and treatment of ADHD in North America can vary geographically, apparently reflecting differences in community practices or access to services.[25,26] Treatment with stimulant medications for inattentive and hyperactive symptoms increased in the early to mid 1990s, and likely reflects longer periods of use with treatment extended into adolescent years as well as an increased number of girls identified and treated.[27-29] Stimulant medications remain the first line pharmacological intervention for addressing symptoms of ADHD. However, combining medications with behavioural and other non-pharmacological interventions is recommended.[30]

Concurrent (or Comorbid) Disorders

Half to two thirds of school children identified with ADHD also have concurrent psychiatric and developmental disorders, including oppositional and aggressive behaviours, anxiety, low self esteem, tic disorders, motor problems, and learning or language disabilities.[31-34] Sleep difficulties, including enuresis (bed-wetting), are common, with sleep-disordered breathing, a potentially correctable reason for increased inattention.[35,36] Global impairment in children with ADHD increases with increasing numbers of concurrent disorders.[37] The concurrent conditions also increase the likelihood of additional difficulties developing as children become adolescents and young adults.[38-41]

Neurocognitive difficulties are an important source of impairment in children with ADHD. Areas of executive functioning and working memory as well as specific language and learning disorders are common in clinic groups.[42-50] Approximately a third of children referred for psychiatric, often behaviour problems, may have previously unrecognized language difficulties.[51] Whenever possible the potential for cognitive, language and developmental problems requires evaluation so that appropriate academic interventions can be implemented.

ADHD in Preschoolers

Attention Deficit Hyperactivity Disorder usually begins before children enter school. However in the preschool age group ADHD is characterized not only by impairment in attention span, excessive impulsivity and over-activity but also is frequently accompanied by severe temper tantrums, demanding, uncooperative behaviour and aggressiveness that can interfere with attendance at daycare or preschool, avoidance of family gatherings, and high family burden of care and distress.[52-54] These disruptive behaviours are often the target of parental concern, and many receive a diagnosis of oppositional defiant disorder. Initial interventions should address parenting challenges using behavioural interventions rather than medication in preschool-aged children.[55]

Assessment of ADHD in School-Age Children

Among primary school children, concerns about learning style and behaviour difficulties are often brought to the parents' attention by classroom teachers. Educators generally anticipate that by senior kindergarten and grade 1, children should be able to follow classroom routines, follow simple instructions, play cooperatively with peers, and remain focused for 15 to 20 minutes at a time on academic tasks. Concerns raised by teachers, especially experienced ones,

provide important details about a child's academic and social functioning.

The formal diagnosis of ADHD reflects pervasive and detrimental levels of inattention, distractibility, overactivity and impulsiveness. The child's symptoms must be developmentally excessive and cause impaired functioning, most often in academic or social skills, peer or family relationships. Difficulties generally have been present since preschool, although not always recognized. The troublesome behaviours are present in more than one context, at home, at school or in the community, for example on outings to the park or to a grocery store.

There are two sets of formal diagnostic rules used in Canada, DSM 5 (Diagnostic and Statistical Manual, Fifth Edition) and ICD-11 (International Classification of Disorders, Eleventh Edition, accepted in 2019 and in effect in 2022). Both sets of formal diagnostic rules classify ADHD as a neurodevelopmental disorder, in the ICD-11, the term ADHD replaces hyperkinetic disorder from ICD-10.[56,57] There are three presentations of ADHD, predominantly inattentive presentation, where the child shows six of nine prescribed inattentive symptoms, predominately hyperactive-impulsive presentation, where the child shows six out of nine hyperactive-impulsive symptoms, and combined presentation, where the child shows high levels of both types of symptoms (see Chart 1 for diagnostic symptoms).

The clinical assessment of a child with ADHD is best done by a health professional familiar with pediatric mental health and psychosocial assessments. Since young children frequently respond to stressful circumstances with increased levels of activity and distractibility as well as difficulties in learning and social relationships, assessments of developmental, family and social contexts are required to identify alternative explanations for the impairing symptoms where appropriate. Physical contributions such as poor sleep, or chronic medical conditions should also be evaluated as explanations for or contributors to the child's difficulties. Ideally, the clinician can obtain information about the child's social and academic functioning from more than one informant who knows the child in different situations, for example, the child's parent and a teacher. Self-report surveys for parents and teachers are widely used to elicit information about specific child's behaviours in the home or school settings, respectively.[4] In addition, a detailed clinical interview with the parents of younger children, and, for older children, with the child or youth themself, is essential. Reviewing school reports over several years is also helpful to provide a longitudinal perspective from several teachers. An important aspect of the assessment includes identification of concurrent disorders, including learning and language disorders, as reviewed in the section above. Psychosocial or developmental concerns should also be identified

as they may complicate treatment of the ADHD and impact the long-term prognosis.

Chart 1: DSM 5 Criteria for Attention Deficit Hyperactivity Disorder[57]

A. A persistent pattern of inattention and/or hyperactivity-impulsivity that interferes with functioning or development, as characterized by **(1)** and/or **(2)**:

(1) six (or more) of the following symptoms of inattention have persisted for at least 6 months to a degree that is inconsistent with developmental level and that negatively impacts directly on social and academic activities:

Inattention

a. often fails to give close attention to details or makes careless mistakes
b. often has difficulty sustaining attention in tasks or play activities
c. often does not seem to listen when spoken to directly
d. often does not follow through on instructions and fails to finish schoolwork, chores or duties
e. often has difficulty organizing tasks and activities
f. often avoids, dislikes, or is reluctant to engage in tasks that require sustained mental effort
g. often loses things necessary for tasks or activities
h. is often easily distracted by extraneous stimuli
i. is often forgetful in daily activities

(2) six or more of the following symptoms of hyperactivity-impulsivity have persisted for at least 6 months to a degree that is inconsistent with developmental level and that negatively impacts directly on social and academic activities:

Hyperactivity and Impulsivity

a. often fidgets with or taps hands or feet or squirms in seat
b. often leaves seat in situations where remaining seated is expected
c. often runs about or climbs excessively in situations in which it is inappropriate

d. often unable to play or engage in leisure activities quietly

e. is often “on the go”, acting as if “driven by a motor” (unable to be still for extended time)

f. often talks excessively

g. often blurts out an answer before a question has been completed

h. often has difficulty waiting his or her turn

i. often interrupts or intrudes on others

B. Several inattentive or hyperactive-impulsive symptoms were present prior to age 12 years.

C. Several inattentive or hyperactive-impulsive symptoms are present in two or more settings (eg, at school and home, in other activities).

D. There is clear evidence that the symptoms interfere with, or reduce the quality of, social, academic or occupational functioning.

E. The symptoms do not occur exclusively during the course of schizophrenia, or another psychotic disorder and are not better explained by another mental disorder (eg, mood disorder, anxiety disorder, dissociative disorder, personality disorder, substance intoxication or withdrawal).

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