

Epidemiology of attention-deficit/hyperactivity disorder in the community

Attention-deficit/hyperactivity disorder (ADHD) is a neurodevelopmental disorder affecting around 5% of school-aged children. However, in the UK, the majority of children with ADHD remain undiagnosed. This article reviews the epidemiology of ADHD in terms of its prevalence, correlates, recognition and outcomes with regard to community and clinical samples.

This article is based on a review of the literature and key policy documents. After outlining the key features and outcomes of attention-deficit/hyperactivity disorder (ADHD), it summarizes the diagnostic classifications of hyperactivity disorders. Following this, the article addresses the epidemiology of ADHD within the community in terms of prevalence rates, correlates and issues related to comorbidity. Factors affecting the recognition of children in the community and referral to specialist services are described. Finally, the issue of referral bias is highlighted with reference to clinic samples.

What is ADHD?

Many children display inattentive, overactive or impulsive behaviours intermittently. The diagnosis of ADHD reflects the point at which a cut-off is applied. This has resulted in concerns and controversy about its validity as a disorder. However, this approach to definition has parallels with other medical conditions such as hypertension. These behaviours are considered to meet criteria for ADHD when they are persistent, out of keeping with the child's developmental age and result in impairment of function.

ADHD is a neuro-developmental disorder affecting up to 5% of school-aged children. It has considerable impact on affected children and their families. These difficulties can affect children's future development in terms of their mental health and functioning with regard to education, employment and relationships. ADHD is a risk factor for the onset of other problems (Table 1). Symptoms often persist into adulthood and undiagnosed ADHD may also present in adulthood to health or criminal justice services through these sequelae.

Diagnostic classification

Attentional and hyperactivity disorders are described in both the main classification systems. The 10th edition of the *International Classification of Diseases* (ICD-10; World Health Organisation, 1992) has traditionally guided clinical practice in the UK and Europe. It

describes a more restricted category of hyperkinetic disorder consisting of persistent traits of all three core features (inattentiveness, overactivity and impulsiveness). These behaviours must have been present before the age of 6 years, be pervasive (i.e. present in at least two settings such as home and school), and be abnormal for the child's developmental age. Hyperkinetic disorder has been described as a severe subtype of the broader ADHD (National Institute for Clinical Excellence (NICE), 2000).

ADHD is the term used in the 4th edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV; American Psychiatric Association, 1994). This has broader criteria as all three core features are not necessary. This is reflected in the description of three sub-types: predominantly inattentive, predominantly overactive/impulsive, and combined (both inattentive and overactive/impulsive). The combined subtype has the most overlap with hyperkinetic disorder. Other differences between the two systems are that the age of onset for ADHD is by 7 years and, unlike hyperkinetic disorder, only the impairment from symptoms rather than the symptoms themselves needs to be pervasive across settings. The key features of ADHD are summarized in Tables 2 and 3.

Table 1. Attention-deficit/hyperactivity disorder as a risk factor for other problems

Educational underachievement and expulsion from school
Low self esteem
Problems with peer and family relationships
Conduct disorder: defiant, disruptive, antisocial behaviours
Substance misuse
Personality disorders
Employment problems
Parenting difficulties
Social exclusion
Criminality

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Table 2. Summary of Diagnostic and Statistical Manual of Mental Disorders (4th edn) diagnostic criteria

Core symptoms persistent for at least 6 months
Onset before the age of 7 years
Symptoms abnormal for developmental age
Result in functional impairment
Impairment from symptoms pervasive across situations (home and school)
Subtypes: predominantly inattentive, hyperactive/impulsive, combined

From American Psychiatric Association (1994)

Epidemiology in the community

Rates of ADHD

The differences in criteria between the two classification systems mean that prevalence rates for hyperkinetic disorder (1–2% of school-aged children) are much lower than those for ADHD. A number of methodological factors can influence estimates of the prevalence rate of ADHD. These include the level of adherence to diagnostic criteria (e.g. with regard to pervasiveness or impairment); rules about how reports of symptoms from parents and teachers are combined; and the types of sample (e.g. with regard to age or setting) and measures used. As symptoms of ADHD are distributed throughout the population, prevalence rates for ADHD vary according to where the cut-off is set. For example, when impairment criteria are applied, the reported prevalence rate reduces by one-half (Wolraich et al, 1998).

Although reported prevalence rates for ADHD have been found to vary between 1.7% and 17.8% (Elia et al, 1999), in general, most epidemiological studies estimate the prevalence of ADHD to be between 4 and 8% (Faraone et al, 2003). When valid and reliable measures are used and DSM-IV diagnostic criteria applied, rates are fairly similar across different countries. For example, the methodologically robust study of child mental health in the UK carried out by the Office of National Statistics found a prevalence of 2.2% in 5–15-year-olds (Ford et al, 2003).

Correlates of ADHD

Rates of ADHD are higher in clinical populations, e.g. among attenders at primary care and hospital paediatric clinics and accident and emergency departments (Meltzer et al, 2000; Glazebrook et al, 2003). Epidemiological studies have found that clinical correlates of ADHD include neuro-developmental disorders (such as cerebral palsy, epilepsy, muscle disease or weakness, and coordination difficulties) and reading difficulties (Ford et al, 2004). ADHD is more common in boys than in girls.

The gender ratio for ADHD ranges from 2:1 to 4:1 in community samples (Gaub and Carlson, 1997; Ford et al, 2004), suggesting that the prevalence of ADHD is about 9% in boys and 3% in girls.

Comorbidity

Comorbidity refers to the presence of more than one disorder. ADHD is often comorbid with other disorders such as oppositional defiant or conduct disorder, emotional disorders (anxiety and depression), tic disorders and learning disabilities. Specific developmental disorders such as dyslexia or dyspraxia are present in 20% of children with ADHD (Jensen et al, 1997).

Recognition and referral

The *National Service Framework for Children* (Department of Health, 2004) has highlighted the need for the early identification of and intervention for children with mental health problems in order to improve their outcomes. There is a strong professional consensus for the recognition and management of children with ADHD. Evidence-based pharmacological and psychological treatments are available. Despite all these factors, most children with ADHD in the UK remain undiagnosed.

Table 3. Symptoms of attention-deficit/hyperactivity disorder (abbreviated list from Diagnostic and Statistical Manual of Mental Disorders (4th edn))*

Inattention	Careless mistakes/fails to pay attention
	Loses interest
	Not listening
	Not finishing things
	Disorganised
	Avoids tasks
	Loses things
	Easily distracted
	Forgetful
	Hyperactivity/impulsivity
Can't stay seated	
Runs or climbs unnecessarily	
Difficulty playing quietly	
Hard to calm down	
Goes on talking	
Blurts out answers	
Hard to wait turn	
Interrupts	

* Symptoms need to be out of keeping with the child's developmental age and the expectations of behaviour within the particular situation/setting under consideration. From American Psychiatric Association (1994)

The recognition rate of ADHD is much lower than its epidemiological prevalence. NICE (2000) has noted that only a small proportion of children with ADHD have been diagnosed. For example, only 32% of children with ADHD had seen specialist health services in their lifetime (Sayal et al, 2006).

Clinical practice guidance (NICE, 2000) recommends that assessment and treatment with medication should only be carried out by specialists. Hence the receipt of available evidence-based interventions is contingent upon referral to specialist services. In terms of pathways to care, parents and teachers are the adults who are best placed to recognize ADHD symptoms in children. However, adult recognition appears to be more dependent on the impact of the symptoms on the adult rather than the severity of symptoms or associated impairment for the child (Sayal et al, 2003). Parents often present their initial concerns to professionals such as teachers, health visitors, or GPs. Work has quantified the barriers within primary care to the recognition and treatment of children with ADHD (Sayal et al, 2002). Parental perception of hyperactivity behaviours as a problem appears to play a much greater role than child factors (such as severity or associated comorbidity) in determining which children are presented to services. However, GP recognition is based on both child (conduct problems) and parent (request for referral) factors. If the GP does not recognize a disorder, then children with symptoms of ADHD are unlikely to be referred to specialist services.

Although the prevalence of ADHD is similar across countries, the recognition rate varies considerably. The latter is influenced by cultural and societal factors as well as access to and provision of services. For example, Leung et al (1996) found that Chinese parents were more likely than English parents to give their sons higher ratings on hyperactivity scales. However, the Chinese boys had lower levels of activity when they were assessed objectively.

Although recognition rates remain much lower in Europe than in the USA, the recognition of ADHD and

prescribing of methylphenidate has increased here considerably over the last decade (Bramble, 2003). There is more awareness of ADHD among parents, teachers and health professionals. In association with this, there has also been considerable concern about over-diagnosis and the use of stimulant medication as a mainstay of treatment. In the USA, increases in prescription rates have been prominent in girls, adolescents and children with inattentive symptoms. The increased prescribing among pre-schoolers has been of considerable societal concern (Zito et al, 2000). These prescribing trends in these groups are likely to follow here.

Clinical samples

Most research about ADHD has involved clinically referred samples. Findings about the aetiology and correlates of ADHD from these samples might be confounded by referral bias. Boys are more likely than girls to be referred to specialist services with ratios of up to 9:1 being reported (Cantwell, 1996). Referred children with ADHD are also more likely than unreferred children to have greater severity of hyperactivity and comorbid problems (such as emotional and conduct problems), parents with mental health problems and family difficulties (Sayal et al, 2003). This suggests the need for services that are adequately resourced to address these additional difficulties.

Conclusions

Although effective treatments are available, few children with ADHD receive specialist services. It is likely that ADHD remains under-diagnosed for several reasons including limited awareness of ADHD and service availability, stigma, and concerns about medication. Based on estimates that 5% of school-aged children meet criteria for ADHD, it is thought that 345 000 6–16-year-olds in England have ADHD (NICE, 2000). However, fewer than one-third of these children have been seen by specialist services.

As many parents might describe their children as being overactive or inattentive, it is important that clinicians are able to clarify the nature of the problems and enquire whether symptoms are pervasive across settings (Ford et al, 2005). In deciding about the possible need for specialist referral, an account about associated impairment in terms of learning, activities, friendships, and family life is important. In contrast, making a diagnosis of ADHD requires accurate and detailed specialist assessment as there are considerable risks associated with misdiagnosis. The identification of associated comorbid and psychosocial problems is also important as these factors can affect the child's response to treatment and their prognosis. **BJHM**

Conflict of interest: Dr Sayal is a Special Advisor to the National Institute for Health and Clinical Excellence (NICE) Guideline Development Group for ADHD.

KEY POINTS

- The prevalence of attention-deficit/hyperactivity disorder (ADHD) in school-aged children is around 5%.
- ADHD is commonly comorbid with other mental health and developmental disorders.
- ADHD is more common in clinical populations.
- If untreated, it is more likely to be associated with adverse outcomes.
- Although treatment rates have been increasing in recent years, ADHD remains under-recognized.
- If a parent raises concerns about possible symptoms, all clinicians are well-placed to make basic initial enquiries relating to the duration and pervasiveness of symptoms and the associated impact.

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