Relative age within the school year and diagnosis of attention-deficit hyperactivity disorder: a nationwide population-based study

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Summary

Background Findings are mixed on the relationship between attention-deficit hyperactivity disorder (ADHD) and younger relative age in the school year. We aimed to investigate whether relative age is associated with ADHD diagnosis in a country where prescribing rates are low and whether any such association has changed over time or relates to comorbid disorders (eg, conduct disorder [CD], oppositional defiant disorder [ODD], or learning disorder [LD]).

Methods We used nationwide population-based registers to identify all Finnish children born between Jan 1, 1991, and Dec 31, 2004, who were diagnosed with ADHD from age 7 years onwards (age of starting school). We calculated incidence ratios to assess the inter-relations between relative age within the school year, age at ADHD diagnosis, and year of diagnosis (1998–2003 vs 2004–11).

Findings Between Jan 1, 1998, and Dec 31, 2011, 6136 children with ADHD were identified. Compared with the oldest children in the school year (ie, those born between January and April), the cumulative incidence of an ADHD diagnosis was greatest for the youngest children (ie, those born between September and December); for boys the incidence ratio was 1·26 (95% CI 1·18–1·35; p<0·0001) and for girls it was 1·31 (1·24–1·54; p=0·0007). The association between relative age and age at ADHD diagnosis reflected children diagnosed before age 10 years, and the strength of this association increased during recent years (2004–11). Thus, compared with children born between January and April, for those born between May and August, the ADHD incidence ratio was 1·37 (95% CI 1·24–1·53; p<0·0001) and for those born between September and December, the incidence ratio was 1·64 (1·48–1·81; p<0·0001). The relative age effect was not accounted for by comorbid disorders such as CD, ODD, or LD.

Interpretation In a health service system with low prescribing rates for ADHD, a younger relative age is associated with an increased likelihood of receiving a clinical diagnosis of ADHD. This effect has increased in recent years. Teachers, parents, and clinicians should take relative age into account when considering the possibility of ADHD in a child or encountering a child with a pre-existing diagnosis.

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Introduction

Attention-deficit hyperactivity disorder (ADHD) is characterised by behavioural symptoms entailing hyperactivity, impulsivity, and inattention that are inappropriate for the child’s developmental level and result in functional impairment.1 Findings of epidemiological studies suggest that prevalence worldwide is fairly uniform, affecting around 5% of school-aged children; however, there is considerable international variation in rates of clinical diagnosis and treatment.1-3 Although this discrepancy might partly reflect the availability of and access to services, the perceptions and expectations of adults (eg, teachers and parents) also have a role in the awareness and recognition of possible ADHD.4 As part of a child’s clinical assessment for ADHD, information about symptoms and impairment is gathered from these adults, and their responses might reflect peer-referencing against the developmental expectations and abilities of other children within the same class or school year. However, many countries have a fixed age and date for starting school, resulting in variation of up to 12 months in age between children within the same school year. In many countries (eg, the UK or USA), the age for starting school is typically the academic year in which the child turns 5 or 6 years old, when ADHD can still be difficult to diagnose. Although immaturity could affect school readiness at a young age, by age 7 years there are likely to be increasing teacher and parent expectations that children are more able to settle and focus at school.

More than a decade ago, findings from the large, nationally representative, British Child and Adolescent Mental Health Survey (B-CAMHS)5 highlighted relative age (ie, a child’s age within their school year compared with the age of other children within the year) as a risk factor for child mental health problems. More recently, interest has been growing in the contributory role of young relative age within the school year towards the diagnosis of ADHD. This work is important because of the potential implications for diagnostic practice and educational advice and policies. In particular, findings of epidemiological studies from countries such as Canada, Iceland, Israel, and the USA—where prescribing rates
for ADHD are fairly high—have shown a relative age effect,\(^{11,12}\) whereby younger children in a school year are more likely to be diagnosed with and treated for ADHD than are their older peers in the same school year. These findings have led to concerns that ADHD might be overdiagnosed or misdiagnosed in these countries.\(^{13,14}\) By contrast, findings are mixed from large-scale studies from Nordic countries (eg, Denmark and Sweden) and Taiwan,\(^{14,15}\) where the prevalence of ADHD treatment in children is low. Hence, it is possible that a relative age effect might partly be an artefact of national patterns in the recognition and treatment of ADHD. Furthermore, some study findings suggest temporal changes in the association between relative age and the diagnosis of ADHD, although a consistent year trend has not emerged.\(^{15,16}\) For example, findings of a Danish study suggested that the strength of the relative age effect has varied in recent years, with a relative age effect present between 2000 and 2004 but subsequently disappearing and then reversing,\(^{17}\) which perhaps reflects increased awareness among parents, teachers, and clinicians about the possibility of misattributing behavioural immaturity. A particular gap in previous research is that the potential contributory role of common comorbid disorders—eg, conduct disorder (CD), oppositional defiant disorder (ODD), and learning (developmental) disorder (LD)—has not been investigated.

We aimed to investigate whether a relative age effect exists within a national context that has low rates of ADHD diagnosis and treatment and, if so, whether it has changed over time. Within the Nordic countries, Finland has the lowest prescription rates for ADHD (0·64% in children aged 7–15 years old in 2007),\(^{18}\) which suggests that ADHD diagnosis might be fairly conservative (although clinician and family treatment preferences also affect prescribing decisions).\(^1\) Using a large population-based birth cohort in Finland, we investigated ADHD diagnoses made over a 14-year period (1998–2011).
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