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Research Paper

Associations between neurodevelopmental disorders and factors related to school, health, and social interaction in schoolchildren: Results from a Swedish population-based survey

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Abstract

Background: Children and adolescents with autism spectrum disorder (ASD) or attention-deficit/hyperactivity disorder (ADHD) are more likely to be surrounded by different risk factors. In order to work preventively with decreasing ADHD and ASD symptoms, there is a need of more knowledge concerning risk factors.

Objective: This study aimed to investigate school, health, lifestyle and social interactions association with autism spectrum disorder (ASD) and attention-deficit/hyperactivity disorder (ADHD) among schoolchildren aged 6–17 years.

Methods: Data for 18,416 children and adolescents aged 6–17 years in the county of Värmland, Sweden, from the school year 2012/2013 and 2013/2014 were obtained from the Student Health Database, which includes information on health examinations by school nurses and self-reported information of mental and physical health, social relations, physical activity, and school conditions.

Results: Of all participants, 2.4% reported only ADHD and 1.6% reported only ASD. The results confirmed that ADHD or ASD was significantly associated with worse school experiences, lower socioeconomic status, less physical activity, more substance use, weaker social network and more impairments than those without ADHD or ASD.

Conclusions: Knowledge of risk or protective factors during school years is needed to develop interventions to reduce symptoms of neurodevelopmental disorders in children and adolescents. © 2016 Elsevier Inc. All rights reserved.

Keywords: ADHD; ASD; School children; Population-based study

Autism spectrum disorder (ASD) and attention-deficit/hyperactivity disorder (ADHD) are the two most common neurodevelopmental disorders (ND) in children and adolescents. ADHD affects 3–8% of children in the Western world[1–4] and 2.5–5% in Sweden.[5,6] The prevalence of childhood ASD is 0.6–1.0%,[7,8] with the highest proportion in adolescents.[9] Some children with ADHD go into remission but a high proportion continues to experience the disorder throughout their lifespan. ASD and ADHD diagnoses have increased in the last decade; this is partly explained by heightened awareness of the disorders[10] and possibly also by increased prevalence of risk factors such as perinatal exposure to environmental and toxic factors.[11,12]

These disorders lead to impaired quality of life as well as high costs for families and society. In Europe, the total estimated cost per year is €2.5 billion for ADHD and €15.1 billion for ASD, including direct health care costs and direct non-medical costs. Other indirect costs, not included in these estimated figures, are production loss, loss of school time, difficulties with academic performance, and reduced likelihood of entering the labor market.[13]

Most evidence suggests that ASD and ADHD are etiologically and genetically multifactorial.[14–16] Recent research suggests that inflammation can influence brain function and thus mental health[17,18] and possibly ND, although more evidence is needed.[19] Another risk factor is male sex.[3,8] There are conflicting results regarding the impact of socioeconomic status (SES).[20]

Comorbidity

Children with ADHD or ASD experience more additional mental and neurological disorders,[21–23] intellectual developmental disorders,[24] and learning and speech problems.[25] There is also a substantial overlap (14–78%) between ASD and ADHD.[21,26] Psychosomatic problems such as headache,

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recurrent abdominal pain, sleep problems, and fatigue are more common in children with ADHD and ASD.[27–29]

Substance use is more common in adolescents with ADHD,[30] but less is known about adolescents with ASD. One study found that adolescents with autistic traits had an elevated risk for use of drugs other than alcohol and tobacco.[31] De Alwis, Agrawal[32] found this group less likely to report drinking to intoxication but at elevated risk for developing alcohol, nicotine, and cannabis dependence.

Inflammatory diseases such as atopic dermatitis are associated with ND[15,16,33–36] and similar biological mechanisms mediating inflammation are involved. Results regarding the association between obesity and ND are ambiguous; some studies indicate a positive association,[37,38] while others do not.[39]

School, friends, and leisure time

Children with ASD or ADHD may have problems with social communication[40–42] and attention problems resulting in poor school performance,[43] which in turn may lead to later problems entering the workforce. The school environment can either increase or deter disruptive and aggressive behavior.[44,45] Relationships with teachers are particularly important.[46,47] As children with ADHD or ASD are more sensitive to frequent changes and intense noise,[48] they need routines and order.[49] Qualitative studies have shown that a quiet school environment with smaller classes[45,50] may be beneficial, but there is a lack of quantitative studies confirming this.[51]

Although many cross-sectional studies report that children with ASD and ADHD are less physically active compared with their peers,[52–54] the results are conflicting, probably because activity has been measured in different ways.[55–57]

This study

There is a lack of large population-based epidemiological studies that quantitatively assess detailed data of a broad range of potentially important risk factors for ND, including lifestyle, social, health, and environmental factors. Although, there is no single factor related to school and the social environment that causes these disorders; social factors may aggravate ASD and ADHD, make them clinically visible and increase the comorbid mental disorders commonly found among these children. More knowledge of factors associated with these disorders may help these children and their families to improve their mental health and well-being. Our purpose was to study the associations between school- and socially related factors, as well as physical and psychological conditions' influence on ASD and ADHD.

Methods

Participants and data collection

The Student Health Database [ELSA, in Swedish] was established in 2010 and collects yearly data on all children aged 6 years (pre-school class), 10 years (grade 4), 13 years (grade 7), and 16 years (first year in high school) in the county of Värmland, Sweden. ELSA collects data on health examinations by school nurses; and questionnaire interviews of students. For children aged 6–13 years, a parental questionnaire was also distributed. The current study was based on school years 2012/2013 and 2013/2014 and included 18,416 participants. The attrition rates were 14% in pre-school, 8% in grade 4, 10% in grade 7, and 13% in the first year in high school. The main reason for dropout were that the health questionnaire was only available in Swedish, other reasons included some caregivers/students failing to attend the data collection or not wanting to be registered on ELSA, or that the school nurse did not have the time to conduct all health visits during the collection period.

Description of the study group

There were 18,416 participants, equally distributed across sex and age groups. A total of 4.8% reported any ND (either ADHD and/or ASD), 2.4% were children with only ADHD and 1.6% children with only ASD. A significant proportion of children with ND were male ($p < 0.001$), did not live with both their parents ($p < 0.001$), and had parents who belonged to a lower socioeconomic class or did not report their occupation ($p < 0.001$) (Table 1). Further, there were totally 153 students (0.8%) who had been diagnosed with both ASD and ADHD, 0.3% among preschoolers and 1% across the rest of the grades.

Questionnaires, interviews, and health examinations

ELSA contains validated questionnaire data on mental and physical and psychological health, social relations and family structure, physical activity and school. During the first school year 2010/2011, a validation of the questions was performed. The questions derive from the Nordic questionnaire "5–15,"[58] which examines children's development; behavior and from the Strengths and Difficulties Questionnaire,[59] which is used to examine children's mental health and other validated global assessments. The ELSA project has been approved by the regional ethical research committee in Uppsala, Sweden (reg. no: 2013/160). All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Variables

The main outcome variables were ASD and ADHD measured by: "Has the child been diagnosed with any disability/illness?" (ADHD and ASD were two response alternatives). The groups are mutually exclusive. These questions were merged into a new variable (any ND), to indicate if the child was diagnosed with ADHD, ASD, or both.

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