



Prevalence of Co-occurring Medical and Behavioral Conditions/Symptoms Among 4- and 8-Year-Old Children with Autism Spectrum Disorder in Selected Areas of the United States in 2010

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Abstract

We compared the prevalence of various medical and behavioral co-occurring conditions/symptoms between 4- and 8-year-olds with autism spectrum disorder (ASD) from five sites in the Autism and Developmental Disabilities Monitoring Network during the 2010 survey year, accounting for sociodemographic differences. Over 95% of children had at least one co-occurring condition/symptom. Overall, the prevalence was higher in 8- than 4-year-olds for 67% of co-occurring conditions/symptoms examined. Further, our data suggested that co-occurring conditions/symptoms increased or decreased the age at which children were first evaluated for ASD. Similarly, among the 8-year-olds, the prevalence of most co-occurring conditions/symptoms was higher in children with a previous ASD diagnosis documented in their records. These findings are informative for understanding and screening co-occurring conditions/symptoms in ASD.

Keywords Autism spectrum disorder · Autism · Prevalence · Co-occurring conditions · Comorbid conditions

Introduction

Autism spectrum disorder (ASD) is a group of neurodevelopmental disorders characterized by deficits in social communication and interaction and the presence of restricted

and repetitive patterns of behaviors, interests, and activities (American Psychiatric Association 2013). In addition, affected individuals may have co-occurring conditions/symptoms. The most frequently reported are: intellectual disability (ID); Attention Deficit Hyperactivity Disorder (ADHD); developmental regression; behavioral, sleep, sensory processing, and gastrointestinal problems; and ASD-associated genetic conditions, such as Down syndrome, Fragile X syndrome (Bauman 2010; Gurney et al. 2006; Kiehl et al. 2004; Krakowiak et al. 2008; Levy et al. 2010; Lundstrom et al. 2015; Simonoff et al. 2008; Supekar et al. 2017; Wiggins et al. 2009).

In 8-year-olds with ASD from the Autism and Developmental Disabilities Monitoring (ADDMM) Network, Levy et al. (2010) reported that 83% had at least one co-occurring developmental diagnosis, 16% had at least one co-occurring neurologic diagnosis, and 10% at least one psychiatric diagnosis. Further, other studies have reported that co-occurring conditions/symptoms tend to cluster in the same individual (Boulet et al. 2009; Fulceri et al. 2016; Hirata et al. 2016; Levy et al. 2010; Lundstrom et al. 2015; Magnusdottir et al. 2016; Simonoff et al. 2008). Using the National Health Interview Survey data, Boulet et al. (2009) found that 96% of children with ASD had one or more co-occurring developmental disabilities. Likewise,

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Simonoff et al. (2008) found that 70% of children with ASD had at least one co-occurring condition/symptom and 41% had two or more co-occurring conditions/symptoms.

Co-occurring conditions/symptoms contribute to the heterogeneity in ASD phenotype and may influence its recognition. Some co-occurring conditions/symptoms can mask or modify the expression of the core ASD symptoms, which may result in later age of diagnosis or loss of a previous diagnosis (Blumberg et al. 2016; Close et al. 2012; Davidovitch et al. 2015; Jonsdottir et al. 2011; Levy et al. 2010; Mandell et al. 2007; Mazurek et al. 2014; Wiggins et al. 2012; Wu et al. 2016). For example, Davidovitch et al. (2015) found that children with language or cognitive deficits, or attention or motor problems were more likely to be diagnosed with ASD after the age of 6 years, even though they were initially evaluated at a younger age. A current or past developmental condition (e.g., developmental delay, hearing problem) or other disorders, such as anxiety or epilepsy, was associated with a loss of a previous ASD diagnosis (Close et al. 2012). Studies have documented sociodemographic differences in the prevalence of some co-occurring conditions. For example, Supekar et al. (2017) reported sex differences in ADHD and epilepsy in those with ASD. Likewise, Non-Hispanic White children were more likely to have a diagnosis of ADHD than children from other racial/ethnic groups (Coker et al. 2016).

Co-occurring conditions/symptoms increase the societal impact of ASD, since they often contribute to a higher level of impairment, increased need for services, including medications and emergency rooms visits for injuries, impacting the quality of life of children with ASD and their families (Gurney et al. 2006; Ianuzzi et al. 2015; Malow et al. 2016; Peacock et al. 2012; Posserud et al. 2018; Schieve et al. 2012; Sikora et al. 2012; Vohra et al. 2016).

Most past studies had methodological limitations, including (1) use of clinic-based samples, which may not be representative of those with ASD; (2) reliance on parental report for the diagnosis of ASD and co-occurring conditions/symptoms; (3) no adjustment for sociodemographic characteristics that may differ among children with ASD at different ages, and (4) assessment of a limited set of co-occurring conditions/symptoms. Further, while a few studies reported differences in the prevalence of co-occurring conditions/symptoms between age groups (Croen et al. 2015; Lever and Geurts 2016; Mannion and Leader 2016; Supekar et al. 2017), there is a need for large population-based studies. In this study, we compared the prevalence of various medical and behavioral co-occurring conditions/symptoms between 4- and 8-year-old children in a population-based sample, accounting for sociodemographic differences. Secondly, we evaluated whether the presence of co-occurring conditions/symptoms affected the age at which children were first evaluated for ASD.

Methods

Study Design

This is a cross-sectional, secondary analysis of data from the ADDM Network surveillance system collected during the 2010 survey year. Data collection was done under the ADDM protocol, which was approved by the institutional review board at each ADDM site.

Data Source and Participants

Since 2000, the ADDM Network has been tracking the prevalence of ASD among 8-year-old children in selected areas of the United States (Yeargin-Allsopp et al. 2003). Surveillance among 4-year-old children was added in 2010 in a subset of sites to assess early identification of ASD. The ADDM Network is an active, multisite surveillance system for ASD and other developmental disabilities that use information from children's health and education records to determine case classification. During the 2010 survey year, 11 sites conducted surveillance among 8-year-old children (born in 2002) and five of these sites (Arizona, Missouri, New Jersey, Utah, and Wisconsin) also conducted surveillance among 4-year-old children (born in 2006). This analysis includes only data from these five sites. Previous ADDM studies have shown that the reported ASD prevalence was consistently lower in sites with access to health records only versus sites with access to both health and education records, suggesting a potential under-ascertainment in the former group (Christensen et al. 2016; Soke et al. 2017). During the 2010 survey year, Arizona, New Jersey, and Utah had access to health and education records and were classified as "sites with more complete case ascertainment", while Missouri and Wisconsin used health records only and were considered "sites with less complete case ascertainment" (Soke et al. 2017).

In all ADDM sites, case determination follows a standardized, validated, multi-step common approach, which is detailed in other publications (CDC 2016; Christensen et al. 2016; Soke et al. 2017; Yeargin-Allsopp et al. 2003). In brief, health records (all sites) and health and education records (some sites) of children, who (1) live in the ADDM catchment areas, (2) are 4 or 8-years old during the surveillance year, and (3) have international classification of diseases (ICD) and special education codes indicative of ASD or other developmental disabilities, are first screened. This screening consists of determining whether these records contain social deficits symptoms associated with ASD, a documented or suspected diagnosis of ASD by a qualified professional, eligibility for autism special