Additive effect of congenital heart disease and early developmental disorders on attention-deficit/hyperactivity disorder and autism spectrum disorder: a nationwide population-based longitudinal study

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Abstract

In this retrospective nationwide population-based case–control study, we investigated the impact of congenital heart disease (CHD) on the development of attention-deficit/hyperactivity disorder (ADHD) and autism spectrum disorder (ASD), which remains unclear. Children aged <18 years that were diagnosed with CHD (n = 3552) between January 1, 1997, and December 31, 2009, were identified from the National Health Insurance Research Database in Taiwan. Non-CHD controls (n = 14,208) matched for age and sex (1:4) were selected from the same dataset. All subjects were observed until December 31, 2011, or their death. Comorbid perinatal conditions and early developmental disorders (EDD) that were diagnosed before ADHD and ASD diagnosis were also analyzed. The incidence rates of perinatal comorbidities, EDD, ADHD, and ASD were higher in the CHD group than in the control group. Multivariate Cox regression analysis revealed that the CHD group had an increased risk of developing ADHD (adjusted hazard ratio [aHR] 2.52, 95% confidence interval CI 1.96–3.25) and ASD (aHR 1.97, 95% CI 1.11–3.52) after adjusting for confounding comorbidities. EDD, but not perinatal comorbidities were also independent risk factors for ADHD and ASD after adjustment. Subgroup analysis indicated that the risk for ADHD (HR 16.59, 95% CI 12.17–22.60) and ASD (HR 80.68, 95% CI 39.96–176.12) was greatly increased in CHD subjects with EDD than in non-CHD subjects without EDD. These findings suggested that CHD at birth and EDD during early childhood were two independent risk factors for ADHD and ASD and that concurrent CHD and EDD might additively increase these risks.