

# Study finds association between oxygen deprivation before birth and ADHD

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Children who had in-utero exposure to ischemic-hypoxic conditions, situations during which the brain is deprived of oxygen, were significantly more likely to develop attention deficit hyperactivity disorder later in life as compared to unexposed children, according to a Kaiser Permanente study published in the journal *Pediatrics*. The findings suggest that events in pregnancy may contribute to the occurrence of ADHD over and above well-known familial and genetic influences of the disorder.

The population-based study examines the association between IHC and ADHD. Researchers examined the [electronic health records](#) of nearly 82,000 children ages 5 years old and found that [prenatal exposure](#) to IHC – especially [birth asphyxia](#), neonatal respiratory distress syndrome, and preeclampsia – was associated with a 16 percent greater risk of developing ADHD. Specifically, exposure to birth asphyxia was associated with a 26 percent greater risk of developing ADHD, exposure to neonatal [respiratory distress syndrome](#) was associated with a 47 percent greater risk, and exposure to preeclampsia ([high blood pressure](#) during pregnancy) was associated with a 34 percent greater risk. The study also found that the increased risk of ADHD remained the same across all race and ethnicity groups.

"Previous studies have found that hypoxic injury during [fetal development](#) leads to significant structural and functional brain injuries in the offspring," said study lead author Darios Getahun, MD, PhD, of the Kaiser Permanente Southern California Department of Research &

Evaluation. "However, this study suggests that the adverse effect of hypoxia and ischemia on prenatal brain development may lead to functional problems, including ADHD."

Researchers also found that the association between IHC and ADHD was strongest in preterm births and that deliveries that were breech, transverse (shoulder-first) or had cord complications were found to be associated with a 13 percent increased risk of ADHD. These associations were found to be the case even after controlling for gestational age and other potential risk factors.

"Our findings could have important clinical implications. They could help physicians identify newborns at-risk that could benefit from surveillance and early diagnosis, when treatment is more effective," said Getahun. "We suggest future research to focus on pre- and post-natal conditions and the associations with adverse outcomes, such as ADHD."

During critical periods of fetal organ development, IHC may result in a lack of oxygen and nutrient transport from the mother's blood to fetal circulation. The result may be compromised oxygen delivery to tissues and cerebrovascular complications. However, this study suggests that the adverse effect of hypoxia on prenatal brain development may lead to functional problems, including ADHD.

In 2005, the Centers for Disease Control and Prevention estimated the annual cost of ADHD-related illness in children under 18 years of age to be between \$36 billion and \$52.4 billion, making the condition a public health priority. In 2010, approximately 8.4 percent of children ages 3 to 17 had been diagnosed with ADHD. For about half the affected children, the disease persists into adulthood, according to CDC statistics. Symptoms of ADHD in children may include attention problems, acting without thinking, or an overly active temperament.

This study is part of Kaiser Permanente's ongoing research to understand the relationship between prenatal conditions and adverse medical outcomes. Earlier this year, Kaiser Permanente researchers found that in-utero exposure to relatively high magnetic field levels was associated with a 69 percent increased risk of being obese or overweight during childhood compared to lower in-utero magnetic field level exposure. And a Kaiser Permanente study conducted last year found exposure to selective serotonin reuptake inhibitors anti-depressants in early pregnancy may modestly increase the risk of autism spectrum disorders.

Provided by Kaiser Permanente

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