Prenatal Phthalates, Maternal Thyroid Function, and Risk of Attention-Deficit Hyperactivity Disorder in the Norwegian Mother and Child Cohort


Abstract

BACKGROUND:
There is growing concern that phthalate exposures may have an impact on child neurodevelopment. Prenatal exposure to phthalates has been linked with externalizing behaviors and executive functioning defects suggestive of an attention-deficit hyperactivity disorder (ADHD) phenotype.

OBJECTIVES:
We undertook an investigation into whether prenatal exposure to phthalates was associated with clinically confirmed ADHD in a population-based nested case-control study of the Norwegian Mother and Child Cohort (MoBa) between the years 2003 and 2008.

METHODS:
Phthalate metabolites were measured in maternal urine collected at midpregnancy. Cases of ADHD (n=297) were obtained through linkage between MoBa and the Norwegian National Patient Registry. A random sample of controls (n=553) from the MoBa population was obtained.

RESULTS:
In multivariable adjusted coexposure models, the sum of di-2-ethylhexyl phthalate metabolites (∑DEHP) was associated with a monotonically increasing risk of ADHD. Children of mothers in the highest quintile of had almost three times the odds of an ADHD diagnosis as those in the lowest [OR=2.99 (95% CI: 1.47, 5.49)]. When ∑DEHP was modeled as a log-linear (natural log) term, for each log-unit increase in exposure, the odds of ADHD increased by 47% [OR=1.47 (95% CI: 1.09, 1.94)]. We detected no significant modification by sex or mediation by prenatal maternal thyroid function or by preterm delivery.

CONCLUSIONS:
In this population-based case-control study of clinical ADHD, maternal urinary concentrations of DEHP were monotonically associated with increased risk of ADHD. Additional research is needed to evaluate potential mechanisms linking phthalates to ADHD.