ECHO
Environmental influences on Child Health Outcomes
A program supported by the NIH

Study Summary

Maternal Smoking During Pregnancy May Be Associated with Increased Childhood Blood Pressure, ECHO Study Finds

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Who sponsored this study?

The Environmental influences on Child Health Outcomes (ECHO) Program, Office of the Director, National Institutes of Health supported this research.

Why was this study needed?

Blood pressure that is higher than normal in childhood, including diagnosed high blood pressure, can increase the risk of developing high blood pressure as an adult, which is a major risk factor for heart disease. Past studies looking at smoking during pregnancy and children's blood pressure have had mixed results. Many relied on parents' self-reports of smoking or focused only on systolic blood pressure, the top number in a blood pressure reading that reflects pressure when the heart beats. Fewer studies examined diastolic blood pressure, the bottom number that reflects pressure when the heart rests between beats.

To better understand these links, researchers needed a large U.S. study that included objective lab measures of smoking during pregnancy. Using data from the ECHO Cohort, researchers examined how smoking during pregnancy was related to both systolic and diastolic blood pressure in children.

What were the study results?

Children whose mothers smoked during pregnancy—whether occasionally or regularly—were more likely to have higher blood pressure and a greater risk of hypertension (higher than normal blood pressure at three or more doctors' visits). The study distinguished between "any reported smoking," which is based on what mothers shared in surveys or medical records, and "active smoking," which is confirmed by a urine test for cotinine, a marker of recent tobacco use. Active smoking, identified by these lab tests, was linked to even higher blood pressure in children.

What was the study's impact?

This study reinforces that smoking during pregnancy is a risk factor for increased childhood blood pressure and hypertension and underscores the importance of smoking reduction during pregnancy for children's heart health. The use of objective laboratory measures strengthens these findings and more accurately identifies children at risk.

Who was involved?

The study included 13,120 children born between 1999 and 2020 from 52 ECHO Cohort Study Sites in the U.S. All children had at least one blood pressure measurement taken between the ages of 3 and 18 years. A nearly equal number of male and female children from a range of sociodemographic groups were included.

What happened during the study?

Researchers collected smoking data from pregnant women using self-report surveys, medical records, and/or urine specimens. Children's blood pressure was measured when they were between 3 and 18 years of age. Using these measurements, the researchers performed a statistical analysis to compare blood pressure levels between children exposed to smoking during pregnancy and children not exposed. The researchers also assessed whether there were any differences in the relationships between smoking and blood pressure by child sex.

Footnote: Results reported here are for a single study. Other or future studies may provide new information or different results. You should not make changes to your health without first consulting your healthcare professional.

What happens next?

More studies could help researchers better understand how smoking during pregnancy may contribute to higher blood pressure in children. Future studies could use biological measures of prenatal smoke exposure, which may help capture individual differences in how children are affected and make it easier to identify those at higher risk

Where can I learn more?

Access the full journal article, titled "Association of Maternal Smoking During Pregnancy with Childhood Blood Pressure and Hypertension in the ECHO Cohort," in *Circulation*.