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

Study Summary

Prenatal Vitamin D Levels Associated with Children's Brain Development, ECHO Study Suggests

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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?

Vitamin D deficiency is one of the most common nutrient deficiencies in the world. In the U.S., it affects 80% of Black pregnant women and nearly half of pregnant women with incomes below the federal poverty level. Low vitamin D during pregnancy may harm childhood brain development, leading to lower academic achievement in adolescence. This study aimed to clarify how vitamin D levels during pregnancy may influence children's brain development, particularly in varied groups and into later childhood. While prior research suggests prenatal vitamin D plays an important role in early brain development, few studies have examined whether these effects persist beyond early childhood or vary across groups that may be at higher risk for vitamin deficiencies. For example, Black people often have lower vitamin D levels because their skin has more pigment, which makes it harder for the skin to produce vitamin D from sunlight. Researchers sought to build on previous evidence by studying a varied cohort of mothers and their children, followed until ages 7 to 12.

What were the study results?

Researchers found that children whose mothers had higher vitamin D levels while pregnant tended to perform better on cognitive tests assessing skills like problem-solving and processing new information at ages 7 to 12. However, vitamin D levels were not linked to skills based on learned knowledge, such as vocabulary. The link between vitamin D and thinking skills was stronger in children of Black mothers compared to other racial groups. Results also suggested that vitamin D levels early in pregnancy were most important for children's brain development. The largest differences in children's cognitive skills—between those with the highest and lowest scores—were linked to their mothers' vitamin D levels early in pregnancy, suggesting this may be a critical time for brain development.

What was the study's impact?

The study provides evidence that early pregnancy may be a critical period when vitamin D has the greatest potential to support brain development. Interventions prior to or earlier in pregnancy, and those focused on Black women and others at high risk of deficiency, may have the greatest impact.

Who was involved?

The study included 912 biological mother-child pairs from five ECHO Cohort research sites. Approximately 38% of participants were vitamin D-deficient.

What happened during the study?

Researchers measured vitamin D levels in pregnant women's blood during pregnancy or in their babies' cord blood at birth. They tested the children's fluid and crystallized cognition when they were 7 to 12 years old using a standard set of cognitive tests. They analyzed how vitamin D levels during pregnancy were linked to children's cognitive scores, while considering other factors that could affect the results. They also looked at whether certain times during pregnancy mattered more by comparing vitamin D levels across pregnancy in mothers of children with higher versus lower cognitive scores. This helped them identify when vitamin D might have the greatest impact on brain development.

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?

Future research, including randomized trials, could help researchers identify the optimal dose and timing of vitamin D supplementation for children's cognitive development.

Where can I learn more?

Access the full journal article, titled "Gestational vitamin D concentration and child cognitive development: a longitudinal cohort study in the Environmental influences on Child Health Outcomes Program," in *The American Journal of Clinical Nutrition*.

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