Vitamin D deficiency in pregnancy associates with increased emotional and behavioral problems at preschool age: the Rhea pregnancy cohort, Crete, Greece

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BACKGROUND

Vitamin D deficiency is now recognized as a worldwide pandemic1 even in countries with abundant sunshine2 like Greece3. Recent epidemiological data indicate high prevalence of vitamin D deficiency in pregnant women and their infants4, whose vitamin D levels are largely dependent on their mothers’ status.

Vitamin D during pregnancy is playing an important role in fetal brain development, as it regulates proliferation and differentiation of brain cells, and has neurotrophic and neuroprotective actions5. Animal studies support an association between low maternal vitamin D levels during pregnancy and offspring longer brains6, with increased ventricular volume and a thinner neocortex as well as abnormal behaviors in adulthood6. However data in humans is scarce with conflicting results7,9,10.

OBJECTIVES

To investigate the associations of maternal 25-hydroxyvitamin D [25(OH)D] levels in early pregnancy with offspring neurodevelopment at 4 years of age, using data from a longitudinal, prospective pregnancy cohort, “Rhea” study in Crete, Greece.

METHODS

471 mother-child pairs were included in the present analyses

Exposure assessment:
Maternal plasma concentration of 25(OH)D at the first prenatal visit (13±2.4 weeks).
According to Endocrine society association (2011) maternal 25(OH)D was categorized as:
sufficiency (>75nmol/L), insufficiency (52.5-75nmol/L) and deficiency(<50nmol/L)

Outcome assessment:
✓ Offspring cognitive and motor function at 4 years of age was assessed by means of McCarthy Scales of Children’s Abilities (MSCA), which contains six scales: Verbal, Perceptual-Performance, Quantitative, General Cognitive, Memory and Motor scale.
✓ Emotional and behavioral development at 4 years was assessed by means of Strengths and Difficulties Questionnaire (SDQ) and Attention Deficit Hyperactivity Disorder (ADHD) Test.

Data analysis:
Multivariable linear regression models were used to estimate the effect of maternal vitamin 25(OH)D in early pregnancy on child neurodevelopment at 4 years of age after adjusting for multiple confounders.

RESULTS

Maternal 25(OH)D levels in early pregnancy

Maternal 25(OH)D deficiency in early pregnancy was associated with:
✓ Child hyperactivity/inattention symptoms (b-coef 0.58, 95%CI: 0.03, 1.12) and:
✓ Child peer relationship problems (b-coef: 1.15, 95%CI: 0.36, 1.94)
✓ Child total strengths and difficulties score (b-coef: 2.07, 95%CI: 0.25, 3.89)
✓ Child total ADHD-like symptoms (b-coef: 5.36, 95%CI: 0.75, 9.98)

No significant association was found between maternal 25(OH)D deficiency in early pregnancy and cognitive and motor function at 4 years of age

CONCLUSIONS

Vitamin D deficiency in early pregnancy was associated with increased emotional and behavioral problems at preschool age. Further research is needed to replicate these results and to explore potential underlying biological mechanisms.

REFERENCES