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Gestational vitamin D status and brain morphology in children aged 10 years: A population-based study

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A lack of vitamin D during pregnancy has been associated with adverse neurodevelopmental outcomes and behavioral difficulties in children. However, the underlying neurobiological mechanism remains largely unknown. Embedded in the Generation R Study, we aimed to investigate association between gestational vitamin D status and brain morphology in children at the age of 10 years. In the study population consisting of 2597 children, linear regression was performed to examine the association between gestational 25-hydroxyvitamin D [25(OH)D] concentration, assessed in maternal venous blood in mid-gestation and umbilical cord blood at delivery, and brain volumetric measures and surface-based metrics including cortical thickness, surface area, and gyrification. After adjusting for covariates, exposure to higher maternal 25(OH)D concentration in mid-gestation was associated with slightly larger cerebellar volume in children (b=0.02, 95% CI 0.002 to 0.04). In a follow-up analysis, we found larger cerebellar brain volume was associated less autistic traits measured by the Social Responsiveness Scale. In addition, compared to children exposed to consistently sufficient vitamin D [25(OH)D concentration ≥50 nmol/L] through mid-gestation to delivery, those exposed to consistently insufficient or deficient vitamin D showed smaller total brain volume, as well as cerebral gray matter and white matter volumes at 10 years. No association between gestational vitamin D status and cortical thickness, surface area, or gyrification was observed. Further studies are needed not only to replicate our findings and explore other modalities, but also to ascertain the established associations of gestational vitamin D status with child cognitive and psychopathological development.