Bowel Health, Brain Age, Brain Volume and Cognitive Function in the Boston Puerto Rican Health Study

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Objectives: The gut-brain axis has been shown to play an important role in neurodegeneration. Bowel dysfunction, such as constipation, is a marker of gut dysbiosis, which has been associated with risk of dementia in prior studies. However, no work has been done in Puerto Ricans, who have unique dietary and lifestyle characteristics impacting both gut and brain health. We aimed to study the association between constipation and cognitive outcomes including MRI-derived brain age, brain volume and cognitive function in a cohort of Puerto Ricans.

Methods: This analysis was conducted within the Boston Puerto Rican Health Study (BPRHS), an ongoing longitudinal cohort that enrolled 1502 self-identified Puerto Rican adults residing in the Boston area, aged 45–75 y at baseline through wave-4 (mean 12.7 ± 1.2 y from baseline). Our study was comprised of 179 participants at wave-4 (12.7 y). Brain age was derived from magnetic resonance imaging (MRI) features that included cortical thickness, area, volume, cerebellar-subcortical and cortical summary, using a machine learning model. Brain age deviation score was used to represent the difference of the participants' brain age from their biological age, with higher scores representing more advanced brain aging. Constipation was estimated from self-reported bowel health and defined as bowel frequency < 1/d. Global cognitive score (GCS) is a composite of executive function, memory and attention factors. Covariate-adjusted linear regression was used to examine the association between bowel health and brain age, brain volume and GCS at wave-4 (12.7 y).

Results: Among 179 participants with MRI, cognitive function (GCS), and bowel health measures at wave-4 (12.7 y), 45 (25.1%) self-reported constipation, defined as bowel frequency < 1/d (age 66.5 ± 7.8 y; female 75.6%). In covariate adjusted multivariable analyses, we observed that constipation was associated with higher brain age deviation (poorer brain health) ($\beta = 0.377$, $P = 0.0451$). We did not observe an association between constipation and brain volume ($P = 0.175$) or constipation and cognitive function ($P = 0.573$).

Conclusions: In this study of older, Boston–Area Puerto Ricans, we observed an association between constipation and brain age, but no association between constipation and brain volume or cognitive function.

Funding Sources: NIH