

Excess fluoride linked to cognitive impairment in children

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Representative children's drawings of a donkey for children in different F exposure groups. The figures were selected by averaging the scores at each community and picked a drawing close to the mean score. Note that the label on each figure represents water concentration of F⁻ (mg/L) / drawing score. Credit: *Neurotoxicology and Teratology* (2023). DOI: 10.1016/j.ntt.2023.107293

Long-term consumption of water with fluoride levels far above established drinking water standards may be linked to cognitive impairments in children, according to a new pilot study from Tulane University.

The study, published in the journal [*Neurotoxicology and Teratology*](#), was conducted in rural Ethiopia where farming communities use wells with varying levels of naturally occurring [fluoride](#) ranging from 0.4 to 15.5 mg/L. The World Health Organization recommends fluoride levels below 1.5 mg/L.

Researchers recruited 74 [school-aged children](#) and rated their ability to draw familiar objects such as a donkey or a house, with scores reflecting any missing details. They used a standard computerized memory test which is language and culture neutral as another tool to measure cognitive ability.

The study found that higher exposure to fluoride in drinking water was linked to more errors on the drawing and memory tests. Lead author Tewodros Godebo, assistant professor of environmental health sciences at Tulane University School of Public Health and Tropical Medicine, said that the "[causal relationship](#) between fluoride exposure and neurotoxicity remains unclear," but he hopes these preliminary findings will spur more research into the potential cognitive impacts of fluoride exposure.

"Though further epidemiological studies are needed to validate the findings, these results add to the growing concern about the potential neurotoxic effects of fluoride, especially during early brain development and childhood," Godebo said. "These tests affirmed a clear association between high fluoride and cognitive impairment."

Fluoride is essential for preventing tooth decay. However, excess intake

of fluoride has been linked to lower IQs in past [epidemiological studies](#) in [rural communities](#) in China and India.

Additionally, past animal research has shown that fluoride can cross the placenta and blood-brain barriers. In regions with no alternative water sources, this means excess fluoride exposure could be a chronic issue that begins at conception.

Over 200 million people worldwide are estimated to be exposed to high fluoride levels in their drinking water. The Ethiopian Rift Valley, where this study was conducted, is an ideal research area for investigations of potential impacts because those raised in the area have consistent exposure to stable, naturally occurring [fluoride levels](#) and share similar lifestyles with surrounding villages, limiting the risk of confounding factors.

Godebo hopes to replicate the results in Ethiopia with a larger cohort of children and study the cognition of children in low-fluoride Ethiopian communities for potential signs of cognitive impact.

"We have a unique opportunity to study low fluoride communities in the same setting as high fluoride communities, so we can determine if fluoride is a neurotoxicant at low levels," Godebo said. "Such studies are important to the public and government agencies to determine the safety and risk of water fluoridation in drinking [water](#) supply systems."

Co-authors for the study included Nati Pham and Arti Shankar of Tulane University, Marc Jeuland of Duke University, Amy Wolfe of University of Kentucky, and Redda Tekle-Haimanot and Biniyam Alemayehu of Addis Ababa University.

More information: Tewodros Rango Godebo et al, Association between fluoride exposure in drinking water and cognitive deficits in

children: A pilot study, *Neurotoxicology and Teratology* (2023). [DOI: 10.1016/j.ntt.2023.107293](https://doi.org/10.1016/j.ntt.2023.107293)

Provided by Tulane University

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