

Chronic high blood sugar may be detrimental to the developing brain of young children

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Credit: Robert Kraft/public domain

Young children who have long-term high blood sugar levels are more likely to have slower brain growth, according to researchers at centers including the National Institutes of Health.

Researchers did not find significant cognitive differences between the

healthy children and those with type 1 [diabetes](#), but they believe a continuing study with the same groups of children may show changes there as well.

The findings could lead to a major shift in the way children with type 1 diabetes are treated, said Dr. Karen Winer, a co-author of the study and a pediatric endocrinologist at the NIH's Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD), which co-funded the 18-month study. The findings were published online in the journal *Diabetes*.

"We found that chronic [high blood sugar](#) may be detrimental to the developing brain of [young children](#)," Winer said. "We have never linked this before to brain structure in a young child."

The study tracked 144 children ages 4 to 9 who had been living with type 1 diabetes for an average of 2 and one-half years. Researchers used MRI scans to examine brain structure and function in the children with type 1 diabetes compared with 72 healthy children, including siblings. The children were well-matched for age, body mass index and socioeconomic status. Researchers found significantly slower brain growth overall, as well as in specific brain regions.

"We believe the results are remarkable and show the potential vulnerability of the young developing brain to abnormally elevated glucose levels," said Dr. Nelly Murras, lead author of the article and head of Pediatric Endocrinology at Nemours Children's Clinic in Jacksonville, Florida. Five Clinical Pediatric Diabetes Centers that comprise the Diabetes Research in Children Network (DirecNet) conducted the study.

It is difficult to quantify the extent of the slowed [brain growth](#), said Dr. Allan Reiss, Robbins Professor of Psychiatry, Radiology and Pediatrics

and director of the Center for Interdisciplinary Brain Sciences Research at Stanford University School of Medicine, Stanford, California. Reiss and Mauras will lead a continued study with the same children, funded by NICHD.

"We certainly hope that these differences can be reversed with better diabetes control," Reiss said.

Traditionally, pediatricians have allowed young [children](#) with [type 1 diabetes](#) to maintain above-normal [blood sugar levels](#). The theory was that it was safer to run high than low, since consistently [low blood sugar](#) levels could risk a child having a seizure, Winer said. This study shows that chronic high blood sugar levels may slow growth in the brain's gray matter, which affects cells and signals, as well as in the brain's white matter, which affects the brain's wiring.

"I think this is a really powerful study," Winer said. "The differences they saw in the brain scans were unequivocal."

In addition to high blood sugar levels, researchers found that blood sugar levels often varied, spiking too high and dropping too low. These sharp swings raised concerns about the impact to brain function.

"This is the thing that parents always worry about when it comes to a child with a chronic illness," Winer said, "Does it affect their [brain](#)? The good news here is that there are some viable solutions on the horizon that parents should be aware of."

New technology allows doctors to monitor blood sugar levels quickly, accurately and continuously. This technology is more accessible than before, and doctors can anticipate lower [blood sugar](#) levels and deal with them proactively, she said.

"The future of diabetes is very promising because technology has come so far," Winer said.

Provided by National Institutes of Health

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