

Early maternal anemia tied to intellectual disability, ADHD and autism

18 September 2019



From left: Renee Gardner, project coordinator at the Department of Public Health Sciences at Karolinska Institutet, with student Aline Wieggersma. Credit: Ulf Sirborn

The timing of anemia—a common condition in late pregnancy—can make a big difference for the developing fetus, according to research at Karolinska Institutet published in *JAMA Psychiatry*. The researchers found a link between early anemia and increased risk of autism, ADHD and intellectual disability in children. Anemia discovered toward the end of pregnancy did not have the same correlation. The findings underscore the importance of early screening for iron status and nutritional counseling.

An estimated 15 to 20 percent of pregnant women worldwide suffer from [iron deficiency anemia](#), a lowered ability of the blood to carry oxygen that is often caused by a lack of [iron](#). The vast majority of [anemia](#) diagnoses are made toward the end of [pregnancy](#), when the rapidly growing fetus takes up a lot of iron from the mother.

In the current study, the researchers examined what impact the timing of an anemia diagnosis had on the fetus' neurodevelopment, in particular if

there was an association between an earlier diagnosis in the mother and the risk of intellectual disability (ID), autism spectrum disorder (ASD) and attention-deficit/hyperactivity disorder (ADHD) in the child.

Overall, very few women are diagnosed with anemia early in pregnancy. In this study of nearly 300,000 mothers and more than half a million children born in Sweden between 1987-2010, less than 1 percent of all mothers were diagnosed with anemia before the 31st week of pregnancy. Among the 5.8 percent of mothers who were diagnosed with anemia, only 5 percent received their diagnosis early on.

The researchers found that children born to mothers with anemia diagnosed before the 31st week of pregnancy had a somewhat higher risk of developing autism and ADHD and a significantly higher risk of intellectual disability compared to healthy mothers and mothers diagnosed with anemia later in pregnancy. Among the early anemic mothers, 4.9 percent of the children were diagnosed with autism compared to 3.5 percent of children born to healthy mothers, 9.3 percent were diagnosed with ADHD compared to 7.1 percent; and 3.1 percent were diagnosed with intellectual disability compared to 1.3 percent of children to non-anemic mothers.

After considering other factors such as [income level](#) and maternal age, the researchers concluded that the risk of autism in children born to mothers with early anemia was 44 percent higher compared to children with non-anemic mothers, the risk of ADHD was 37 percent higher and the risk of intellectual disability was 120 percent higher. Even when compared to their siblings, children exposed to early maternal anemia were at higher risk of autism and [intellectual disability](#). Importantly, anemia diagnosed after the 30th week of pregnancy was not associated with a higher risk for any of these conditions.

"A diagnosis of anemia earlier in pregnancy might represent a more severe and long-lasting nutrition deficiency for the fetus," says Renee Gardner, project coordinator at the Department of Public Health Sciences at Karolinska Institutet and the study's lead researcher. "Different parts of the brain and nervous system develop at different times during pregnancy, so an earlier exposure to anemia might affect the brain differently compared to a later exposure."

The researchers also noted that early anemia diagnoses were associated with infants being born small for gestational age while later anemia diagnoses were associated with infants being born large for gestational age. Babies born to mothers with late-stage anemia are typically born with a good iron supply unlike babies born to [mothers](#) with early anemia.

Although the researchers couldn't disentangle anemia caused by iron deficiency from anemia caused by other factors, iron deficiency is by far the most common cause of anemia. The researchers say the findings could be the result of iron deficiency in the developing brain and may thus support a protective role for iron supplementation in maternity care. The researchers emphasize the importance of early screening for iron status and nutritional counseling but note that more research is needed to find out if early maternal iron supplementation could help reduce the risk of neurodevelopmental disorders in [children](#).

Adult women typically need 15 mg of iron per day, though needs may increase later in pregnancy. Since excessive iron intake can be toxic, [pregnant women](#) should discuss their iron intake with their midwife or doctor.

More information: "Association of Prenatal Maternal Anemia With Neurodevelopmental Disorders" *JAMA Psychiatry* (2019). DOI: [10.1001/jamapsychiatry.2019.2309](https://doi.org/10.1001/jamapsychiatry.2019.2309)

Provided by Karolinska Institutet

APA citation: Early maternal anemia tied to intellectual disability, ADHD and autism (2019, September 18) retrieved 6 August 2022 from <https://medicalxpress.com/news/2019-09-early-maternal-anemia-tied->

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