Medical Xpress

Low parental socioeconomic status during pregnancy alters early fetal brain development

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Maternal socioeconomic status impacts babies even before birth, emphasizing the need for policy interventions to support the wellbeing of pregnant women, according to newly published research from Children's

National Hospital.

A first-of-its-kind study with 144 pregnant women finds that socioeconomic status (SES) has an impact in the womb, altering several key regions in the developing fetal brain as well as cortical features. Parental occupation and education levels encompassing populations with lower SES hinder early brain development, potentially affecting neural, social-emotional and cognitive function later in the infant's life.

Having a clear understanding of early brain development can also help policymakers identify intervention approaches such as educational assistance and occupational training to support and optimize the well-being of people with low SES since they face multiple psychological and physical stressors that can influence childhood brain development, Lu et al. note in the study published in *JAMA Network Open*.

"While there has been extensive research about the interplay between socioeconomic status and brain development, until now little has been known about the exact time when brain development is altered in people at high-risk for poor developmental outcomes," said Catherine Limperopoulos, Ph.D., director of the Developing Brain Institute and senior author. "There are many reasons why these children can be vulnerable, including high rates of maternal prenatal depression and anxiety. Later in life, these children may experience conduct disorders and impaired neurocognitive functions needed to acquire knowledge, which is the base to thrive in school, work or life."

The findings suggest that fetuses carried by women with low socioeconomic backgrounds had decreased regional brain growth and accelerated brain gyrification and surface folding patterns on the brain. This observation in lower SES populations may in part be explained by elevated parental stress and may be associated with neuropsychiatric disorders and mental illness later in life.

In contrast, fetuses carried by women with higher education levels, occupation and SES scores showed an increased white matter, cerebellar and brainstem volume during the prenatal period, and lower gyrification index and sulcal depth in the parietal, temporal and occipital lobes of the brain. These critical prenatal brain growth and development processes lay the foundation for normal brain function, which ready the infant for life outside the womb, enabling them to attain key developmental milestones after birth, including walking, talking, learning and social skills.

There is also a knowledge gap in the association between socioeconomic status and fetal cortical folding—when the brain undergoes structural changes to create sulcal and gyral regions. The study's findings of accelerated gyrification in low SES adds to the scientific record, helping inform future research, Limperopoulos added.

The Children's National research team gathered data from 144 healthy women at 24 to 40 weeks gestation with uncomplicated pregnancies. To establish the parameters for socioeconomic status, which included occupation and education in lieu of family income, parents completed a questionnaire at the time of each brain magnetic resonance imaging (MRI) visit. The researchers used MRI to measure fetal brain volumes, including cortical gray matter, white matter, deep gray matter, cerebellum and brain stem. Out of the 144 participants, the scientists scanned 40 brain fetuses twice during the pregnancy, and the rest were scanned once. The 3-dimensional computational brain models among healthy fetuses helped determine fetal brain cortical folding.

Potential proximal risk factors like maternal distress were also measured in the study using a questionnaire accounting for 60% of the participants but, according to the limited data available, there was no significant association with low and high socioeconomic status nor brain volume and cortical features.

More information: *JAMA Network Open* (2021).
jamanetwork.com/journals/jaman … etworkopen.2021.3526