

Babies born to native high-altitude mothers have decreased risk of low birth weight

May 18 2009



This is the cover of the May issue of *American Journal of Physiology* -*Regulatory, Integrative and Comparative Physiology.* Credit: The American Physiological Society

Pregnant women who are indigenous to the Andes Mountains deliver more blood and oxygen to their fetuses at high altitude than do women of European descent. The study helps explain why babies of Andean descent born at high altitude weigh more than European babies born at altitude.

The research, published in The American Journal of Physiology-Regulatory, Integrative and Comparative Physiology found that at high altitude:



- the uterine artery of Andean women delivered more blood and oxygen to the fetus compared to women of European descent
- the babies of Andean women weighed an average of nine ounces more at birth
- the greater the mother's Andean heritage, the greater the uterine artery <u>blood flow</u>, the greater the oxygen delivery to the fetus and the greater the baby's <u>birth weight</u>

These differences between the Andean and European women and their babies did not exist at low altitude.

The question of why babies born at high altitude are smaller is not an academic one. Low birthweight is associated with higher rates of illness and mortality. By understanding this physiology, researchers hope to find out how to protect from reductions in fetal growth even in low-oxygen environments.

The study, "Augmented uterine artery blood flow and oxygen delivery protect Andeans from altitude-associated reductions in fetal growth." was done by Colleen Glyde Julian, Megan J. Wilson, Henry Yamashiro and Lorna G. Moore of the University of Colorado; Wilma Tellez, Armando Rodriguez and Enrique Vargas of Universidad Mayor de San Andrés, La Paz, Bolivia; Abigail Bigham and Mark Shriver of Pennsylvania State University; and Miriam Lopez of Clínica del Sur, La Paz, Bolivia. Dr. Yamashiro is also affiliated with Clinica Siraní, Santa Cruz de la Sierra, Bolivia and Dr. Moore is also affiliated with Wake Forest University, Winston-Salem, North Carolina.

Birth weight differences



High-altitude pregnancies typically produce lower birth weight infants, even among women whose families have lived in high altitude for centuries. However, the babies of these women weigh more at birth compared to women whose ancestors have not lived at high altitude. European infants are three times more likely to be born small for their gestational age compared to Andean babies.

The same is true when comparing groups of women in other areas of the world, according to Dr. Julian, the study's lead author. Native Tibetan women's babies weigh more than the babies of Han women, a Chinese population that recently moved to the high altitude of Tibet. It is not clear what accounts for these differences, but they may occur because of differences in:

- how much oxygen the mother is able to deliver through the uterine artery
- how much nutrition and/or oxygen the mother is able to deliver through the placenta
- a combination of both uterine artery and placental factors

Most likely, it is both the placenta and the uterine artery that accounts for these differences between Europeans and Andeans, Dr. Julian said.

More than 12,000 feet

The study took place in Bolivia and included two groups: pregnant women living at sea level and pregnant women living in the Andes Mountains (12,000 to14,000 feet). Each group included women of Andean and European ancestry. The researchers determined Andean ancestry through a combination of three methods: genetic testing,



interviews and surnames.

The research focused on the uterine artery, which dilates to increase blood flow to the fetus during pregnancy. The low-oxygen environment at altitude affects the uterine artery, reducing blood flow and oxygen delivery to the infant. Reduced blood flow and oxygen slows fetal metabolism and results in slower growth.

The study predicted that this reduction in blood flow at altitude would be much less pronounced in the Andean women, who have adapted genetically to the high altitude. The researchers measured uterine artery blood flow by ultrasound at 20 weeks and 36 weeks of pregnancy, and three months post-partum. They also tracked fetal growth across pregnancy using ultrasound to measure fetal head and abdominal circumference, femur length and estimated fetal weight. The study found the following:

- At sea level, the changes in uterine artery size during pregnancy were about the same for both the Andean and European women. There were no differences in fetal growth or birth weight between the two groups.
- At high altitude, the uterine artery of both groups dilated less, reflecting the oxygen-poor environment.
- Among the high-altitude group, the Andean women's blood flow was 68% greater at 20 weeks of pregnancy compared to the nonpregnant state, and the fetuses were larger at this stage. This suggests that the uterine artery is playing a causal role in the lower birth weight, as opposed to being a result of having a smaller baby and needing less oxygen or fewer nutrients, Dr. Julian said.



• Among the high-altitude group, oxygen delivery to the fetus was nearly 2-fold greater in the Andean <u>women</u> at week 36.

The researchers also found a relationship at high altitude between the percent of indigenous Andean ancestry and the uterine artery blood flow, uterine oxygen delivery, and birth weight. In other words, the more Andean a woman was, the greater the uterine artery blood flow, the more nutrients delivered to the infant and the greater the birth weight.

This research may one day have implications for the development of therapeutic strategies to increase uterine artery blood flow or to change the way the blood vessels respond during pregnancies that are complicated by hypoxia and/or reduced fetal growth.

Source: American Physiological Society (<u>news</u> : <u>web</u>)

Citation: Babies born to native high-altitude mothers have decreased risk of low birth weight (2009, May 18) retrieved 27 April 2024 from <u>https://medicalxpress.com/news/2009-05-babies-born-native-high-altitude-mothers.html</u>

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