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The obstetric dilemma: an ancient game of Russian roulette, or a variable dilemma sensitive to ecology?

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Abstract

The difficult **birth** process of humans, often described as the "obstetric dilemma," is commonly assumed to reflect antagonistic selective pressures favoring neonatal encephalization and maternal bipedal locomotion. However, cephalo-pelvic disproportion is not exclusive to humans, and is present in some primate species of smaller body size. The fossil record indicates mosaic evolution of the obstetric dilemma, involving a number of different evolutionary processes, and it appears to have shifted in magnitude between *Australopithecus*, Pleistocene *Homo*, and recent human populations. Most attention to date has focused on its generic nature, rather than on its variability between populations. We re-evaluate the nature of the human obstetric dilemma using updated hominin and primate literature, and then consider the contribution of phenotypic plasticity to variability in its magnitude. Both maternal pelvic dimensions and fetal growth patterns are sensitive to ecological factors such as diet and the thermal environment. Neonatal head girth has low plasticity, whereas neonatal mass and maternal stature have higher plasticity. Secular trends in body size may therefore exacerbate or decrease the obstetric dilemma. The emergence of agriculture may have exacerbated the dilemma, by decreasing maternal stature and increasing neonatal growth and adiposity due to dietary shifts. Paleodemographic comparisons between foragers and agriculturalists suggest that foragers have considerably lower rates of perinatal mortality. In contemporary populations, maternal stature remains strongly associated with perinatal mortality in many populations. Long-term improvements in nutrition across future generations may relieve the dilemma, but in the meantime, variability in its magnitude is likely to persist.

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