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Associations between maternal fish intake, maternal and cord polyunsaturated fatty acid concentrations and offspring anthropometrics at birth and at 7 and 13 years of age

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Findings from animal models suggest early exposure to polyunsaturated fatty acids (PUFAs) during pregnancy may influence developmental plasticity including adiposity(1). Birth cohort studies examining associations between offspring weight and maternal n-3 PUFA status or maternal fish intakes, the richest dietary source of n-3 PUFAs have been few and have yielded inconsistent findings. Some have reported lower weight at birth and throughout childhood with increasing maternal fish intakes and n-3 PUFA status(2), whilst others have observed positive or null associations(3,4). These have focused on the first few years of life and have been conducted within low fish-consuming populations. Our study provides novel data by examining associations between maternal fish consumption and prenatal PUFA (n-3 & n-6) status and offspring weight at birth and throughout childhood (7 & 13 years) in a high fish-eating population.

Pregnant women were enrolled in the Seychelles Child Development Study Nutrition Cohort 2 between 2008-2011. Serum PUFAs were quantified in maternal blood collected at 28-weeks' gestation and in cord blood collected at delivery using gas-chromatography tandem mass spectrometry. Maternal fish consumption was assessed at 28-weeks' gestation using a Fish Use Questionnaire. Childbirth weight (kg) was measured at delivery and classified according to WHO growth standards(5) (n = 1185). Child height (m), weight (kg), waist and hip circumference (cm) were recorded at 7 (n = 1167) and 13 (n = 878) years. Statistical analysis was conducted using logistic and multiple linear regression adjusting for child sex, gestational age, maternal age, BMI, alcohol use, socioeconomic status, and parity. Models at 7 & 13 years were additionally adjusted for child height and fish intakes.

Women were consuming on average 8.49 ± 4.51 fish meals/week during pregnancy. No significant associations were found between maternal fish intakes and anthropometric outcomes at birth, 7 & 13 years. No significant associations were observed between maternal PUFAs and offspring weight at birth. At both 7 & 13 years, however, higher maternal total n-6 PUFAs were associated with increased child weight [7yr; $\beta = 0.070$, $p = 0.003$, 13yr; $\beta = 0.097$, $p = 0.004$], waist circumference [7yr; $\beta = 0.086$, $p = 0.003$, 13yr; $\beta = 0.105$, $p = 0.004$], and hip circumference [7yr; $\beta = 0.062$, $p = 0.027$, 13yr; $\beta = 0.090$, $p = 0.013$]. No significant associations were found between cord n-6 PUFAs and birth weight. In quartile analysis, cord docosahexaenoic acid (DHA; C22:6n-3) concentrations <0.071mg/ml were associated with a higher risk of large for gestational age (LGA; >90th percentile) when compared to cord DHA concentrations >0.129mg/ml [OR 4.17, $p = 0.017$]. There were no significant associations between cord PUFAs and anthropometric outcomes at 7 & 13 years.

These findings suggest lower cord DHA, an n-3 PUFA, may be associated with higher risk of LGA at birth whilst higher n-6 PUFAs during pregnancy may be associated with adiposity development throughout childhood. Future work is needed to determine the potential long-term metabolic consequences of such associations.

References

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