

Polyunsaturated Fatty Acids in Mother, Infant, and Placental Tissue, and Their Relationship With Pre-Pregnancy BMI

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Objectives: Maternal obesity produces inflammation, which may result in adverse pregnancy outcomes such as preterm birth. Polyunsaturated fatty acids (PUFA), including omega-6 (n-6) and omega-3 (n-3) fatty acids, regulate inflammation and may mitigate the negative effects of inflammation. Previous studies report higher n-6 and lower n-3 PUFA concentration in early to mid-pregnancy for individuals with higher pre-pregnancy BMI (pBMI). However, the relationship between PUFA concentration at delivery and pBMI are not well understood. The purpose of this study is to determine the relationship between pBMI and maternal plasma, umbilical cord plasma, and placental PUFA concentrations, as well as PUFA intrauterine transfer percentage (IUTP).

Methods: Following IRB approval, maternal plasma, umbilical cord plasma, and placental samples were collected at delivery from 55

maternal-infant dyads. IUTPs for each PUFA (linoleic acid (LA), α -linolenic acid (ALA), arachidonic acid (AA), docosapentaenoic acid (DPA), docosahexaenoic acid (DHA), eicosapentaenoic acid (EPA)) were calculated as [cord blood]/[maternal blood] \times 100. Spearman's correlations assessed relationships between PUFA levels, PUFA IUTP, and pBMI. Linear regression models were adjusted for smoking status. A p-value $<$ 0.05 was considered statistically significant.

Results: The mean pBMI for our cohort was 28.7 kg/m². Preceding pregnancy, 21% of mothers were normal or underweight, 36% overweight, and 43% obese. Maternal LA ($R = -0.3$, $p = 0.03$), maternal DHA ($R = -0.27$, $p = 0.04$), and placental EPA ($R = -0.42$, $p = 0.02$) were significantly correlated with maternal pBMI. After adjusting for smoking status, no correlations remained significant. PUFA cord levels and PUFA IUTP were not correlated to pBMI.

Conclusions: To our knowledge, this is the first study exploring relationships between pBMI and PUFA levels at delivery. Our findings contrast with previous research reporting correlations between PUFA levels and pBMI in early to mid-pregnancy. The effects of pBMI on PUFA status may be most prominent early in pregnancy. Future research should explore the relationship between pBMI and PUFA levels across all stages of pregnancy.

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