

Maternal Plasma One-Carbon Metabolites and Adverse Pregnancy Outcomes: Findings from New Zealand SCOPE Cohort

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Abstract

Background: Maintaining optimal maternal homocysteine, folate, B12, and other one-carbon metabolites (OCMs) may help mitigate the risk of adverse pregnancy outcomes, including spontaneous preterm births (sPTB), preeclampsia, and small-for-gestational-age births (SGA). However, current evidence linking maternal plasma OCMs with these complications is limited and inconsistent.

Objectives: This study aimed to examine the association of maternal plasma OCMs in early pregnancy and pregnancy outcomes in the New Zealand Screening for Pregnancy Endpoints (SCOPE) cohort.

Methods: Data from 1906 nulliparous pregnant women from the New Zealand SCOPE cohort were analysed in this prospective cohort. Maternal plasma levels of OCMs, including homocysteine, B12, folate, methionine, choline, betaine, and cysteine, were categorized into quartiles due to their non-normal distribution, and metabolite ratios were derived. Associations with pregnancy outcomes were examined using univariable and multivariable logistic regression models adjusted for potential confounders.

Results: Plasma betaine levels in the lowest quartile were significantly associated with higher odds of sPTB (aOR = 3.26, 95% CI: 1.51–7.83). Higher choline/betaine ratios were found to be significantly associated with increased odds of sPTB in Q3: aOR = 3.26, 95% CI: 1.41–8.45 and Q4: aOR = 4.04, 95% CI: 1.79–10.40 compared to Q1. Participants in the lowest B12 quartile exhibited significantly higher odds of preeclampsia; however, this association did not retain statistical significance after adjustment for confounders. No significant relationships were observed between any of the OCMs and SGA.

Conclusion: The results highlight the importance of choline–betaine pathways, as indicated by lower betaine concentrations and increased choline-to-betaine ratios, both of which were linked to an elevated risk of sPTB. Future research incorporating single-nucleotide polymorphisms

(SNPs) in OCM-related genes is recommended to validate these associations and assess the potential influence of genetic variation.

Key words: One-carbon metabolism; homocysteine; folate; vitamin B12; choline; betaine; spontaneous preterm birth

Disclosure: The authors declare no conflict of interest.

Ethics: This study received ethical approval from the New Zealand Health and Disability Ethics Committee (AKX/02/00/364, April 2003), and participants provided informed consent.

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