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Hypertensive Disorders of Pregnancy are Associated with Differences in Maternal Serum Concentrations of Arachidonic Acid Metabolites

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Background: Hypertensive disorders of pregnancy (HDP), including gestational hypertension, chronic hypertension, and preeclampsia, are a significant cause of maternal morbidity and mortality in the United States. Dysregulation of inflammation is thought to play a role in the development of HDP. Maternal diet has the potential to alter the risk of HDP by modulating inflammation. Arachidonic acid (AA) is a dietary polyunsaturated fatty acid which can be metabolized into both pro- and anti-inflammatory bioactive metabolites.

Significance of Problem: HDP places women and their infants at risk for potentially severe pregnancy complications including placental abruption, embolism, end-organ failure, or death. Few treatments are currently available for HDP.

Question: The objective of this study was to describe how maternal AA metabolites serum concentrations are associated with diagnosis of HDP.

Experimental Design: Serum was collected from 121 pregnant women admitted to the labor and delivery unit at Nebraska Medical Center. Women were divided into normotensive or hypertensive groups based on definitions from the American College of Obstetricians and Gynecologists (ACOG). Concentrations of AA metabolites were measured using liquid chromatography-mass spectrometry. Descriptive statistics were generated, and Mann-Whitney U tests were used to compare metabolite concentrations between groups.

Results: Women with HDP had significant higher serum concentrations of PGF2α ($p=0.02$) and 15-HETE ($p=0.04$), two metabolites with known inflammatory and vasoconstrictive properties. Women with HDP had significantly lower serum concentrations of 8(9)-DiHET ($p=0.04$), 11(12)-DiHET ($p=0.04$), and 14(15)-DiHET ($p=0.001$), which are all associated with vasodilation. Unexpectantly, hypertensive mothers also had lower serum concentrations of 5-HETE ($p=0.02$), which is associated with vasoconstriction.

Conclusion: Overall, our study reveals that mothers diagnosed with HDP had significantly higher serum concentrations of vasoconstrictive AA metabolites and significantly lower serum concentrations of vasodilating AA metabolites compared to normotensive mothers. Future directions include analyzing differences in maternal metabolite profile separately for mothers with chronic hypertension, gestational hypertension, and preeclampsia compared to normotensive mothers. Results from these analyses will guide nutritional recommendations for women at risk of developing HDP.