

The Role of Bile Acid Metabolism and Placental-Fetal Transport in Pre-eclampsia and Associated Hypertensive Disorders of Pregnancy: A review of literature

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Abstract

Liver dysfunction affects up to 3% of pregnancies and represents a spectrum spanning maternal liver disorders, pre-eclampsia (PE), and HELLP syndrome (1). Emerging metabonomic evidence demonstrates an extensive disruption of circulating bile acid homeostasis and gut–liver axis integrity in women with pre-eclampsia (2). At the molecular interface, pregnancy-specific complications are tightly regulated by non-coding RNAs, such as lncRNAs, which govern trophoblast invasion, immune adaptation, and placental vascularization, pathways intricately linked to metabolic and oxidative stress (3). Within the fetoplacental unit, maternal total bile acid (TBA) concentrations are markedly elevated in pregnancies complicated by PE and HELLP syndrome, where down-regulation of placental efflux transporters like ABCG2 reflects an altered barrier capacity to protect the fetus from maternal toxic bile load (4). Clinically, even modest elevations within the upper physiological range of maternal serum TBA serve as independent predictive biomarkers for new-onset gestational hypertension and pre-eclampsia, correlating with disease severity and unfavorable birth outcomes (5). The impact of altered maternal bile clearance is underscored by chronic maternal cholestatic diseases, where elevated serum bile acids closely correlate with preterm delivery and adverse perinatal timing (6). Moreover, pathological accumulations of primary bile acids extend into the amniotic fluid compartment during hypertensive and toxemic pregnancies, signaling compartment-wide metabolic derangement (7). Taken together, dysregulated bile acid synthesis, clearance, and transplacental transport are centrally implicated in the pathophysiology and progression of pre-eclampsia, highlighting bile acid profiles as valuable prognostic indicators and therapeutic targets.

Keywords: Bile acid metabolism, Preeclampsia, Gestational hypertension

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