Title: The Impact of Maternal Undernutrition on Offspring Systolic Blood Pressure Across the Life Course: A Narrative Review

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Background/introduction: Maternal undernutrition during pregnancy, defined as insufficient intake of essential macro- and micronutrients, remains a global health concern. Beyond affecting fetal growth and birth weight, evidence suggests long-term consequences for offspring cardiovascular health, particularly systolic blood pressure (SBP), through mechanisms described in the Developmental Origins of Health and Disease (DOHaD) framework.

Aim(s)/objectives: This review aims to synthesise human and animal evidence on the relationship between maternal undernutrition and offspring SBP, examining timing of exposure, underlying biological mechanisms, and modifying factors such as postnatal growth and socioeconomic context.

Methods: A literature review was conducted, including human cohort studies (e.g., European famine cohorts, sub-Saharan African populations) and animal models. Studies examining prenatal undernutrition, fetal growth indicators, postnatal growth, and SBP outcomes were included. Mechanistic pathways, including structural, metabolic–endocrine, and epigenetic changes, were evaluated.

Results: Maternal undernutrition, particularly in early gestation, is associated with higher offspring SBP across the life course. Mechanisms include reduced nephron number, metabolic and endocrine adaptations of the thrifty phenotype, and epigenetic changes affecting vascular and neuroendocrine regulation. Postnatal growth modifies risk: rapid catch-up amplifies prenatal undernutrition. European famine cohorts provide consistent evidence, whereas sub-Saharan African populations show more heterogeneous findings, reflecting environmental, ethnic, and socioeconomic influences.

Discussion/conclusion:
Maternal nutritional environment programs long-term SBP regulation, supporting the DOHaD framework. Preventive strategies should prioritise optimising maternal nutrition and promoting proportionate postnatal growth, particularly among individuals born with low birth weight. Future research should integrate longitudinal human studies with mechanistic animal data to clarify causal pathways and explore global variability.