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Riboflavin deficiency is associated with an increased risk of hypertension in pregnancy

B. Duffy, H. McNulty, M. Ward, E. Psara, E. O'Sullivan, G. Horigan and K. Pentieva
Nutrition Innovation Centre for Food and Health (NICHE), School of Biomedical Sciences, Ulster University, Coleraine, Northern Ireland

Clinical riboflavin deficiency is common in low- and middle-income countries, whilst sub-optimal riboflavin status occurs worldwide and may be much more widespread than generally recognized, including in high- income countries.[1] Riboflavin biomarkers are rarely assessed in humans, with most studies reliant on dietary intakes only, therefore the health consequences of riboflavin deficiency remain largely uninvestigated but may include high blood pressure (BP). Hypertension in pregnancy (HIP) affects up to 15% of pregnancies and is of concern as it can progress to serious disorders such as preeclampsia. Notably, our previous trials in non- pregnant adults demonstrated that supplemental riboflavin can significantly lower BP, specifically among individuals homozygous (TT genotype) for the common MTHFR C677T polymorphism which adversely affects folate metabolism.[2] Furthermore, recent population-based evidence from China reported an inverse association between dietary riboflavin and new onset of hypertension.[3] Little is known as regards the role of riboflavin in BP during pregnancy.

The aim of this study was to examine the association of riboflavin status with BP, heart rate and risk of hypertension in women at the 12th gestational week of pregnancy.

Observational data from healthy Irish pregnant women enrolled in the OptiPREG study (n = 2,236) were accessed. Riboflavin status was determined using the functional assay, erythrocyte glutathione reductase activation coefficient (EGRac), whereby higher values indicate lower riboflavin status.

Biomarker analysis showed that 31% of pregnant women had deficient riboflavin status (EGRac ≥1.40), despite riboflavin supplement usage reported by the majority (64%). EGRac was a significant determinant of systolic ($\beta = 3.390$, $P = 0.011$) and diastolic ($\beta = 2.875$, $P = 0.003$) BP, following adjustment for gestational age, BMI, maternal age, parity, smoking and MTHFR genotype. Riboflavin deficiency was associated with an almost 3-fold greater risk of developing HIP (OR = 2.906, P = 0.041). With increasing quartiles of riboflavin status, ranging from best (Q1) to poorest status (Q4), there were stepwise increases in heart rate (mean ± SD, bpm; 79.9 ± 10.5 [Q1]; 81.1 ± 9.7 [Q2]; 81.8 ± 10.9 [Q3]; 83.3 ± 11.3 [Q4], P = 0.037), following adjustment for BMI, maternal age and gestational age. The prevalence of HIP increased as riboflavin status deteriorated, with the highest prevalence observed among those with the poorest riboflavin status (4.3% [Q1]; 4.9% [Q2]; 6.6% [Q3]; 8.0% [Q4], P = 0.039).

Maintenance of an optimal riboflavin status in pregnancy, through improved diet, fortification and/or supplementation, may improve BP and heart rate, and reduce the risk of HIP. The observational findings presented here require confirmation in randomized trials with riboflavin in pregnancy, including the ongoing OptiPREG RCT.

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References

1. McNulte (2019) *Proc Nutr Soc* **78**, 449–62.
2. Horigan (2010) *Journal of Hypertension* **28**, 478–48.
3. Liu (2020) *Hypertension* **76**, 1–8.