



Cholik, R. and Suliburska, J. (2025)  
'Association between zinc, copper, iron, calcium, magnesium,  
and preeclampsia development: a narrative review',  
*Journal of Elementology*, 30(3), ,  
available: <https://doi.org/10.5601/jelem.2025.30.1.3545>



RECEIVED: 26 March 2025

ACCEPTED: 14 July 2025

REVIEW PAPER

# Association between zinc, copper, iron, calcium, magnesium, and preeclampsia development: a narrative review\*

Rafsan Cholik, Joanna Suliburska

Department of Human Nutrition and Dietetics  
Poznan University of Life Sciences, Poznan, Poland

## Abstract

Preeclampsia is defined as hypertension and proteinuria or as hypertension and end-organ dysfunction with or without proteinuria, typically presenting after 20 weeks of gestation. This condition remains a leading cause of fetal and maternal morbidity worldwide. Its pathogenesis is associated with detrimental processes such as endothelial dysfunction, oxidative stress, and inflammation. The regulation of immune system activity, vascular health, and oxidative stress mitigation is influenced by minerals, which play a key role in pregnancy. Examples include zinc, copper, iron, calcium and magnesium. This narrative review aimed to establish a possible connection between the concentrations of these minerals in various biological samples (serum, urine, placenta and plasma) and the development of preeclampsia. Elevated dietary intake of these metals and the association between mineral intake and the risk of preeclampsia development were also considered. A literature search was conducted in scientific databases, including ScienceDirect and PubMed, to address the research question by collecting relevant studies published between 2014 and 2024. Evidence suggests that mineral status disturbances may contribute to oxidative stress, endothelial damage and inflammatory imbalance in preeclampsia. Specifically, zinc deficiency exacerbates oxidative stress, while higher copper concentrations are associated with increased oxidative damage. Elevated iron levels in both the diet and serum have been shown to contribute to ferroptosis through the generation of reactive oxygen species. Additionally, calcium and magnesium deficiencies have been reported to impair blood pressure regulation and vascular tone. The association between minerals and preeclampsia is complex and depends on multiple factors, including race, location, gestational age, maternal age, diet and ratios between elements.

**Keywords:** minerals, preeclampsia, pregnancy

Prof. dr hab. Joanna Suliburska, Department of Human Nutrition and Dietetics, Poznan University of Life Sciences, ul. Wojska Polskiego 31, 60-624 Poznań, e-mail: [joanna.suliburska@up.poznan.pl](mailto:joanna.suliburska@up.poznan.pl)

\* The source of funding is National Science Centre (grant no 2021/43/B/NZ9/00177).