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# The Relationship Between Preeclampsia and Arsenic Concentration in the Peripheral Blood Shows Association Rather Than Causation

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Dear Editor,

We were pleased to read the research article by H. Liu, et al. [1] which highlights the blood concentration of arsenic (As) can significantly predict the occurrence of preeclampsia (PE) and blood concentration of As may affect the occurrence of hypoproteinemia. This study provides important clues as to the prevention and treatment of PE. A number of studies found that a group of nutrients including macronutrients and micronutrients (e.g., calcium [2], iron [3, 4], magnesium [5], zinc [6], copper [7], and selenium [8], vitamins D [6], vitamins C, and vitamin E [9]) played a particularly important role in preeclampsia. However, the study only focused on the association between As exposure and PE. Thus, some questions still need further investigation.

There are many micronutrients and heavy metal that are associated with PE [10]. A retrospective cohort study found that blood lead levels had a nonlinear association with PE [11]. Another study also found that lower levels of vanadium might be associated with the development of PE [12]. Mixture analysis study provided evidence that exposure to multiple metals was associated with increased prevalence of PE, and the observed association with multiple metals was dominated by chromium and As [13]. However, the study not only explored the relationship between PE and pregnancy complications with blood concentration of As. Whether other heavy metals are associated with preeclampsia needs to be determined. Therefore, serum levels of common heavy metals should be measured.

Another problem of this study was that blood concentration of Asc as a predictor of preeclampsia is relatively arbitrary. It is well known that the greatest limitation of cross-sectional studies is the inability to make causal inferences, and this study is typical of case–control study. Another cross-sectional study found no association between arsenic exposure and risk of PE [14]. Large cohort studies and animal studies are necessary to determine the relationship between arsenic exposure and risk of PE.

Increasingly, exposure to environmental toxicants in air, soil, water, and household products was associated with risk factor of PE. Thus, environmental contaminants, specifically As, should be measured to explore the relationship between PE and environmental concentration of As. Preeclampsia is the most common pregnancy complications and is the leading cause of maternal and fetal morbidity and mortality worldwide. Defining acceptable As concentration thresholds for pregnant women in the setting of varied exposure environments will assist in identifying the populations at risk.

## Conclusion

Overall, this was an observational study, and thus, we can only report association rather than infer causation. Large-scale cohort studies and animal studies are necessary to establish a causal relationship between As exposure and PE. In addition, this study did not examine whether other heavy metals are associated with PE.

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**Data Availability** The datasets generated and analyzed during the current study are available from the corresponding author on reasonable request.

## Declarations

**Consent for Publication** All other authors have read the manuscript and have agreed to submit it in its current form for consideration for publication in the Biological Trace Element Research.

**Conflicting Interests** The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

## References


1. Liu H, Pu Y, Ai S, Wang X, He S, Wang K et al (2022) The Relationship Between Preeclampsia and Arsenic Concentration in the Peripheral Blood. Biol Trace Elem Res. https://doi.org/10.1007/s12011-021-02988-5
2. Gomes F, Ashorn P, Askari S, Belizan JM, Boy E, Cormick G et al (2022) Calcium supplementation for the prevention of hypertensive disorders of pregnancy: current evidence and programmatic considerations. Ann N Y Acad Sci. https://doi.org/10.1111/nyas.14733
3. Mate A, Reyes-Goya C, Santana-Garrido A, Vazquez CM (2021) Lifestyle, Maternal Nutrition and Healthy Pregnancy. Curr Vasc Pharmacol 19:132–140. https://doi.org/10.2174/1570161118666200401112955
4. Mahmood T, Rehman AU, Tserenpil G, Siddiqui F, Ahmed M, Siraj F et al (2019) The Association between Iron-deficiency Anemia and Adverse Pregnancy Outcomes: A Retrospective Report from Pakistan. Cureus 11:e5854. https://doi.org/10.7759/cureus.5854
5. Yuan J, Yu Y, Zhu T, Lin X, Jing X, Zhang J (2021) Oral Magnesium Supplementation for the Prevention of Preeclampsia: a Meta-analysis or Randomized Controlled Trials. Biol Trace Elem Res. https://doi.org/10.1007/s12011-021-02976-9
6. Oh C, Keats EC, Bhutta ZA (2020) Vitamin and Mineral Supplementation During Pregnancy on Maternal, Birth, Child Health and Development Outcomes in Low- and Middle-Income Countries: A Systematic Review and Meta-Analysis. Nutrients 12. https://doi.org/10.3390/nu12020491
7. Gul AZ, Atakul N, Selek S, Atamer Y, Sarikaya U, Yildiz T et al (2022) Maternal Serum Levels of Zinc, Copper, and Thiols in Preeclampsia Patients: a Case-Control Study. Biol Trace Elem Res 200:464–472. https://doi.org/10.1007/s12011-021-02660-y
8. Holmquist E, Brantsaeter AL, Meltzer HM, Jacobsson B, Barman M, Sengpiel V (2021) Maternal selenium intake and selenium status during pregnancy in relation to preeclampsia and pregnancy-induced hypertension in a large Norwegian Pregnancy Cohort Study. Sci Total Environ 798:149271. https://doi.org/10.1016/j.scitotenv.2021.149271
9. Lorzadeh N, Kazemirad Y, Kazemirad N (2020) Investigating the preventive effect of vitamins C and E on preeclampsia in nulliparous pregnant women. J Perinat Med 48:625–629. https://doi.org/10.1515/jpm-2019-0469
10. Gajewska K, Laskowska M, Almeida A, Pinto E, Skorzynska-Dziduszko K, Blazewicz A (2021) Lead Levels in Non-Occupationally Exposed Women with Preeclampsia. Molecules 26.https://doi.org/10.3390/molecules26103051
11. Wu SZ, Xu HY, Chen Y, Chen Y, Zhu QL, Tan MH et al (2021) Association of blood lead levels with preeclampsia: A cohort study in China. Environ Res 195:110822. https://doi.org/10.1016/j.envres.2021.110822
12. Ovayolu A, Turksoy VA, Gun I, Karaman E, Dogan I, Turgut A (2021) Analyses of maternal plasma cadmium, lead, and vanadium levels in the diagnosis and severity of late-onset preeclampsia: a prospective and comparative study. J Matern Fetal Neonatal Med 1–8. https://doi.org/10.1080/14767058.2020.1864318
13. Wang Y, Wang K, Han T, Zhang P, Chen X, Wu W et al (2020) Exposure to multiple metals and prevalence for preeclampsia in Taiyuan, China. Environ Int 145:106098. https://doi.org/10.1016/j.envint.2020.106098
14. Sandoval-Carrillo A, Mendez-Hernandez EM, Antuna-Salcido EI, Salas-Pacheco SM, Vazquez-Alaniz F, Tellez-Valencia A et al (2016) Arsenic exposure and risk of preeclampsia in a Mexican mestizo population. BMC Pregnancy Childbirth 16:153. https://doi.org/10.1186/s12884-016-0946-4