

Associations between Endocrine-disrupting Heavy Metals in Maternal Hair and Gestational Diabetes Mellitus: A Nested Case-control Study in China

Background: Exposure to environmental endocrine disruptors (EDCs) may lead to abnormal glucose metabolism and, potentially, gestational diabetes mellitus (GDM).

Objective: We investigated the association between five endocrine-disrupting heavy metals (EDHMs), i.e., arsenic (As), cadmium (Cd), lead (Pb), mercury (Hg), and tin (Sn), in maternal hair and the risk of GDM.

Methods: We conducted a nested case-control study including 335 GDM cases and 343 controls without GDM based on a prospective birth cohort established in Beijing, China. Concentrations of EDHMs were analyzed in maternal hair. Log-binomial regression and multiple linear regression were used to estimate the associations between the hair concentrations of single metals and the risk of GDM, while weighted quantile sum (WQS) regression for their mixed effects.

Results: The median concentrations of Hg (0.442 vs. 0.403 $\mu\text{g/g}$) and Sn (0.171 vs. 0.140 $\mu\text{g/g}$) in the case group were significantly higher than those in the control group. No differences were found between the two groups for the other three metals. After adjusting for confounders, the prevalence ratio (PR; highest vs. lowest tertile) of GDM risk for Hg was 1.27 (95% confidence interval [CI]: 1.05–1.54), while that for Sn was 1.26 (95% CI: 1.04–1.53). Among women with a body mass index $< 24 \text{ kg/m}^2$, the PR (highest vs. lowest tertile) of GDM for Sn was 1.38 (95% CI: 1.09–1.75). The effect of exposure to the five EDHMs on the risk of GDM was estimated by WQS regression: Sn and Hg made the largest contributions to the WQS index (40.9% and 40.3%, respectively).

Conclusion: High maternal levels of EDHMs, particularly Sn and Hg, may promote the development of GDM.

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