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RESEARCH ARTICLE

The sex-specific association between maternal urinary paraben levels and offspring size at birth

Yaghoub Hajizadeh[1,2] · Maryam Moradnia[3] · Ghasem Kiani Feizabadi[4,3] · Nasim Rafiei[4,5] · Masoumeh Tahmasbizadeh[3] · Mohammad Darvishmotevalli[6] · Saeid Fadaei[3] · Hossein Karimi[3]

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Abstract

Parabens are a group of antimicrobial preservatives applied in an extensive range of products and are suspected to impair fetal growth because of their disrupting effect on the endocrine system. We aimed to examine maternal urinary paraben concentrations and their neonates' outcome indexes. Methylparaben (MP), ethylparaben (EP), propylparaben (PP), and butylparaben (BP) concentrations were measured in 105 maternal urine samples collected before delivery. Length, weight, and head circumference at birth were extracted from the mothers' delivery files. A multivariable linear regression analysis was performed to evaluate the association between paraben levels and neonatal anthropometric indices. The median levels of urinary parabens, especially BP, were higher than those in other countries. Prenatal urinary concentration of MP and BP showed a significantly positive association with birth weight in all neonates (β = 0.79, 95% CI: 0.16, 1.41, and β = 8.56, 95% CI: 3.95, 13.17, respectively), while these chemicals showed a significant negative association with head circumference (β = − 0.002, 95% CI: − 0.004, − 0.000, and β = − 0.016, 95% CI: − 0.030, − 0.002, respectively). A significant positive association between MP and birth length was also found (β = 0.004, 95% CI: 0.00, 0.00) in all the neonates. In sex-stratified adjusted models, MP and BP were found to be associated, respectively, with higher birth length and weight in male neonates (β = 0.008, 95% CI: − 0.001, 0.017, and β = 7.948, 95% CI: 1.045, 14.851). In girls, maternal urinary MP, PP, and BP were associated with increased birth weight (β = 0.831, 95% CI: 0.043, 1.620; β = 4.178, 95% CI: 0.877, 7.480; and β = 10.821, 95% CI: 3.545, 18.097, respectively), and MP and BP were associated with reduced head circumference at birth (β = − 0.003, 95% CI: − 0.005, − 0.001, and β = − 0.035, 95% CI: − 0.055, − 0.016). These results revealed potential impacts between neonatal growth and maternal exposure to parabens. However, these findings should be interpreted while considering the limitations of the present study.

Keywords Endocrine disruptors · Prenatal exposure · Maternal urine · Urinary parabens · Birth outcomes

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✉ Ghasem Kiani Feizabadi
ghasem_kia@yahoo.co; ghkiani@semums.ac.ir

[1] Environment Research Center, Research Institute for Primordial Prevention of Non-Communicable Disease, University of Medical Sciences, Isfahan, Iran

[2] Department of Environmental Health Engineering, School of Health, Isfahan University of Medical Sciences, Isfahan, Iran

[3] Student Research Committee, School of Health, Isfahan University of Medical Sciences, Isfahan, Iran

[4] Department of Environmental Health Engineering, School of Health, Semnan University of Medical Sciences, Semnan, Iran

[5] Environment Research Center, Research Institute for Primordial Prevention of Non-Communicable Disease, University of Medical Sciences, Isfahan, Iran

[6] Research Center for Health, Safety and Environment (RCHSE), Alborz University of Medical Sciences, Karaj, Iran

Introduction

Parabens are a group of alkyl esters of para-hydroxybenzoic acid utilized as antimicrobial preservatives in numerous consumer products such as foodstuffs, personal care products (PCPs), and medications (Andersen 2008; Giulivo et al. 2016). Humans can be exposed to these compounds via different ways, including continuous oral intake, dermal absorption, and inhalation (Soni et al. 2005). Generally, most of the parabens are promptly absorbed, conjugated, and excreted through urine after exposure (Boberg et al. 2010). Biomonitoring can be used as one of the methods to estimate the cumulative exposure of humans to pollutants (Cowan-Ellsberry and Robison 2009). Various studies have been conducted to monitor the urinary concentration of different environmental chemicals like PAHs, BTEX, and parabens, among the population of different countries (Honda et al. 2018; Kiani Feizabadi et al. 2020a; Ma et al.