Modification of food allergy on the associations between early-life exposure to size-specific particulate matter and childhood allergic rhinitis

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Abstract

Background: Exposure to ambient particulate matter (PM) has been associated with an increased risk of allergic rhinitis in children. However, it is unclear whether food allergy modifies the association between PM exposure and childhood allergic rhinitis. **Objectives:** We aimed to evaluate the modification of food allergy on the association between PM exposure and allergic rhinitis in preschool children. **Methods:** We adopted a cross-sectional study and conducted a questionnaire survey among preschool children aged 3 to 6 years in 7 cities in China from June 2019 to June 2020 to collect information on allergic rhinitis. A mature machine learning-based space-time extremely randomized trees model was applied to estimate early-life, prenatal, and first-year exposure of PM_{1}, $PM_{2.5}$ and PM_{10} at 1 × 1-km resolution. We used a combination of multilevel logistic regression and restricted cubic spline functions to quantitatively assess whether food allergy modifies the associations between size-specific PM exposure and the risk of childhood allergic rhinitis. **Results:** The adjusted ORs for childhood allergic rhinitis among the children with food allergy as per interquartile range (IQR) increase in early-life PM_{1}, $PM_{2.5}$ and PM_{10} were significantly higher than the corresponding ORs among the children without food allergy [e.g. OR: 1.57, 95% CI (1.32, 1.87) vs. 1.29, 95% CI (1.18, 1.41), for per IQR increase in PM_{1} (9.8 $\mu g/m^{3}$)]. The similar patterns were observed for both prenatal and first-year size-specific PM exposure. The interactions between food allergy and size-specific PM exposure on childhood allergic rhinitis were statistically significant (all $p\text{-}_{int} < 0.001$). **Conclusions:** Food allergy, as an important part of the allergic disease progression, may modify the association between ambient PM exposure and the risk of childhood allergic rhinitis. Children with food allergy should pay more attention to minimize outdoor air pollutants exposure to prevent the further progression of allergic diseases.

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