Traffic-related air pollution exposure and adult asthma in the Sister Study

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Background: Previous epidemiologic research has suggested an association between air pollution exposure and incident asthma in children. However, there exists limited research specifically focusing on the effect of air pollution on the recurrence of childhood asthma in adults.

Aims: A prospective analysis was performed to estimate the association between ambient air pollution exposures (NO2, PM2.5) and adult recurrence of asthma, incident asthma, and incident onset of respiratory symptoms.

Methods: The Sister Study is a national population-based cohort (n=50,884) of sisters of women with diagnosed breast cancer. Participants were asked questions about medical conditions at enrollment and again at follow-up, an average of 2.9 years later. Participant exposures were year 2006 annual average ambient PM2.5 and NOx concentrations estimated at participant baseline addresses using a national land-use regression spatial smoothing model. The main outcomes were adult recurrence of childhood asthma and incident self-reported doctor-diagnosed asthma at follow-up in individuals who were asthma-free at baseline. Secondary outcomes were new onset of wheeze or cough in individuals who did not report asthma, wheeze, or cough at baseline. Logistic regression was used to assess the relationship between participant exposure and outcomes at follow-up.

Results: At follow-up, there were 84 participants with adult recurrence of asthma, 282 with asthma, 1,143 with wheeze, and 1,711 with cough. The difference between 75th percentile and 25th percentile of exposure (interquartile range or IQR) of estimated PM2.5 and NO2 were 3.5 µg/m3 and 5.8 ppb respectively. PM2.5 and NO2 were not significantly associated with adult recurrence of asthma. The adjusted OR of incident asthma for PM2.5 was 1.20 (95% CI: 0.99-1.45, p=0.069) for an IQR difference in estimated PM2.5 exposure. The adjusted OR of onset wheeze for PM2.5 was 1.13 (95% CI: 1.02-1.25, p=0.015) for an IQR difference in PM2.5 exposure. PM2.5 was not significantly associated with cough or the combined outcome of cough and wheeze. NO2 was not significantly associated with the either incident asthma or onset of wheeze and/or cough.

Conclusions: PM2.5 exposure may be a risk factor in the development of incident asthma or wheeze, the cardinal symptom of asthma, in adult women.

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