High levels of prenatal air pollution exposure and stress increase childhood asthma risk

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Prenatal stress and air pollution may increase asthma risk in kids. Credit: ATS

A new study has found that children, especially boys, whose mothers were exposed to higher levels of outdoor particulate air pollution at the same time that they were very stressed were most likely to develop

asthma by age six. The study was presented at the 2017 American Thoracic Society International Conference.

The team, led by senior investigator Rosalind Wright, MD, MPH, co-director of the Institute for Exposomics Research at the Icahn School of Medicine at Mount Sinai, conducted this study because of their overarching interest in understanding how these and other environmental factors interact to produce respiratory health disparities.

"We know from prior research that lower income, ethnically mixed urban populations are more greatly burdened with asthma and other respiratory health problems," said lead author Alison Lee, MD, MS, of the Icahn School of Medicine at Mount Sinai. "Given that populations disproportionately exposed to ambient air pollution are also more likely to be exposed to social stressors such as financial strain, discrimination, housing difficulties, and crime or violence, we were particularly interested in combined effects of both factors starting in early development, even in pregnancy."

Dr. Lee and colleagues looked at the daily exposure of 736 primarily African American and Latina, urban pregnant women to ambient particulate matter, a type of air pollution caused mainly by traffic and industrial emissions. They also looked at the women's prenatal stress levels through a survey that gave a "negative life event" score. The women reported a greater number of negative events characterized as experiencing more stress. Their full-term infants were followed to the age of six years.

The researchers found associations between high particulate exposure during the second trimester of pregnancy and increased odds of developing asthma for all children. Further examination found that boys born to mothers reporting higher levels of prenatal stress, who were also more highly exposed to air pollution, were particularly affected.

"Our data are the first to show that when they occur together, the effect is multiplied," said Dr. Lee. "It isn't clear at this point why boys are more impacted, but scientists think it may be related to the fact that boys' lungs mature at a slower rate compared to girls. This, coupled with male fetuses' increased risk for specific types of injury, such as oxidative stress, may increase the risk of respiratory disease when co-exposure to ambient air pollution and stress occurs during the prenatal period."

Dr. Lee concluded: "Our data suggest that all children born to women experiencing increased levels of air pollution and stress during the prenatal period are particularly at increased risk of developing asthma in early childhood. As we continue efforts to reduce outdoor air pollution, our study suggests that we must also focus on co-exposures such as stress. Prevention is not a matter of eliminating stress but rather, we need to develop strategies to reduce stress to more normative levels - for example, implementing prenatal programs that provide resources to address the more prevalent stressors or to promote better coping strategies, particularly among disadvantaged, high-risk populations."

More information: Abstract 8941: Prenatal Exposure to Fine Particulate Matter Is Associated with Early Childhood Asthma: Influence of Exposure Timing and Effect Modification by Prenatal Stress and Child Sex

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