

Imbalanced diet and inadequate exercise may underlie asthma in children

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Even children of a healthy weight who have an imbalanced metabolism due to poor diet or exercise may be at increased risk of asthma, according to new research, which challenges the widespread assumption that obesity itself is a risk factor for asthma.

"Our research showed that early abnormalities in lipid and/or glucose metabolism may be associated to the development of asthma in childhood," said lead author Giovanni Piedimonte, M.D., who is professor and chairman of the Department of Pediatrics at West Virginia University School of Medicine, physician-in-chief at WVU Children's Hospital and director of WVU's Pediatric Research Institute. "Our findings also imply a strong and direct influence of metabolic pathways on the immune mechanisms, both innate and adaptive, involved in the pathogenesis of asthma in children."

The research, which was published online ahead of the print edition of the American Thoracic Society's [American Journal of Respiratory and Critical Care Medicine](#), implicates metabolic disorders directly in the development of asthma, and points to a new way of viewing diet and lifestyle as risk factors for asthma, even in children who are not obviously obese or overweight.

The researchers gathered demographic data, estimates of [body mass index](#) (BMI), and asthma prevalence on a sample of nearly 18,000 children from West Virginia who were four to 12 years old and were participating in the Coronary Artery Risk Detection in Appalachian

Communities (CARDIAC) Project. Metabolic data was available for all children in the study, and the researchers investigated a suite of markers for early metabolic dysfunction, including [triglyceride levels](#) and evidence of acanthosis nigricans (AN), a brown to black hyperpigmented skin rash that is a biomarker for developing insulin resistance and hyperinsulinemia.

They found that while asthma prevalence generally increased with BMI, it was significantly higher in obese and morbidly obese children than in children with healthy BMI, but that simple overweight status did not appear to be linked to increased asthma prevalence. However, after controlling for BMI and other confounding variables, asthma prevalence was significantly associated with triglyceride levels and the presence of AN independently of BMI.

"The metabolic problems we investigated may have confounded the widely publicized epidemiologic link between obesity and asthma, because high triglyceride levels (dyslipidemia) and AN (hyperinsulinemia) are very common in obesity and metabolic syndrome," said Dr. Piedimonte.

The results suggest that only above a certain threshold metabolic factors participate in the disease process of airway inflammation and hyperreactivity, which ultimately leads to asthma. More importantly, the association between asthma, triglyceride levels and the presence of AN exists regardless of body weight, suggesting that children who are a healthy weight, and even those who are underweight, may be at risk for developing asthma because of a subtle metabolic dysfunction leading to increased triglyceride levels and the presence of AN.

"Both imbalanced nutrition and inadequate exercise may play a role in metabolic syndrome, and our experience suggests that degree of physical activity may be as important as nutrition," said Dr Piedimonte. "Our

present data suggest that strict monitoring and dietary control of triglyceride and glucose levels starting in the first years of life may have a role in the management of chronic asthma in children. Furthermore, another paper just published by our group in Pediatrics supports universal lipid screening rather than the current National Cholesterol Education Program-recommended selective screening based on family history of premature heart disease. The rationale is that by using selective screening, we would have missed over a third of children with significant genetic dyslipidemia."

Furthermore, Dr. Piedimonte noted that animal studies recently presented by his group suggest a link between maternal diets high in fat and calories, the subsequent triglyceride levels of offspring, and the development of airway hyperreactivity in early life, hinting at a potential role of maternal diet in the prevalence of asthma in their offspring.

"The primary implication of the present study is that early metabolic abnormalities induced by imbalanced diet during pregnancy and childhood constitute the central hub from which the asthma-obesity-diabetes triad originates, at least in a subpopulation of patients," said Dr. Piedimonte. "This opens a Pandora's box of questions concerning the role of pre- and early post-natal nutrition as a critical determinant of chronic diseases throughout life. The ultimate goal is to elucidate the chronologic sequence of early-life events and the specific molecular mechanisms linking hypertriglyceridemia, [insulin resistance](#), and the inflammation seen in obesity and [asthma](#), which may open a new chapter in the management of these medical conditions that are among the most prevalent today."

Provided by American Thoracic Society

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