

Antibiotic Exposure and Adverse Long-Term Health Outcomes in Children

A Systematic Review and Meta-Analysis

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Master thesis in Medicine

Background: Antibiotics are among the most commonly used drugs in children. In addition to inducing antibiotic resistance, antibiotic exposure has been associated with long-term adverse health outcomes.

Methods: A systematic search using PRISMA Guidelines to identify original studies reporting associations between antibiotic exposure and long-term adverse health outcomes in children. Overall pooled estimates of the odds ratios (ORs) were obtained using fixed or random-effects models.

Results: We identified 160 observational studies investigating 21 outcomes in 22,103,129 children. Antibiotic exposure was associated with an increased risk of atopic dermatitis (OR 1.40, 95% confidence interval (CI) 1.30-1.52, $p < 0.01$), allergic symptoms (OR 1.93, 95%CI 1.66-2.26, $p < 0.01$), food allergies (OR 1.35, 95%CI 1.20-1.52, $p < 0.01$), allergic rhinoconjunctivitis (OR 1.66, 95%CI 1.51-1.83, $p < 0.01$), wheezing (OR 1.81, 95%CI 1.65-1.97, $p < 0.01$), asthma (OR 1.96, 95%CI 1.76- 2.17, $p < 0.01$), increased weight gain or overweight (OR 1.18, 95%CI 1.11-1.26, $p < 0.01$), obesity (OR 1.21, 95%CI 1.05-1.40, $p < 0.01$), juvenile idiopathic arthritis (OR 1.74, 95%CI 1.21-2.52, $p < 0.01$), psoriasis (OR 1.75, 95%CI 1.44-2.11, $p < 0.01$), autism spectrum disorders (OR 1.19, 95%CI 1.04-1.36, $p = 0.01$) and neurodevelopment disorders (OR 1.29, 95%CI 1.09-1.53, $p < 0.01$). Dose-response effects and stronger effects with broad-spectrum antibiotic were often reported. Antibiotic exposure was not associated with an altered risk of allergic sensitisation, infantile colic, abdominal pain, inflammatory bowel disease, celiac disease, type 1 diabetes, fluorosis, and attention deficit hyperactivity disorder.

Conclusion: Although a causal association cannot be determined from these studies, the results support the meticulous application of sound antibiotic stewardship to avoid potential adverse long-term health outcomes.

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