

Childhood Obesity and Risk of Allergy or Asthma



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KEYWORDS

• Obesity • Asthma • Allergy • Airway inflammation • Adipokines

KEY POINTS

- There has been a simultaneous increase in the prevalence of obesity and allergic disorders in children, suggesting a possible link between the two.
- Obesity is associated more often with nonatopic asthma than atopic asthma, suggesting noneosinophilic inflammation and Th1 polarization.
- The evidence for the role of obesity in the augmentation of other allergic disorders is conflicting.
- The mechanisms of obesity-associated asthma possibly include deranged lung function, systemic/airway inflammation influenced by adipokines, comorbidities, and shared factors (diet, sedentary lifestyle, and genetics).

INTRODUCTION

Allergic diseases are the most common chronic diseases in children around the world. The prevalence of allergic diseases especially asthma has been found to be increasing over last 2 decades.^{1,2} The prevalence of obesity has also increased tremendously over last 3 decades.³ A simultaneous increment in the prevalence of both obesity and asthma/allergic diseases suggests a possible link between the two. Despite data suggesting the epidemiologic link between asthma and obesity, the relationship remains unclear and many confounders (gender, ethnicity, genetic factors, and comorbidities) are likely to influence the obesity–asthma link.

The aim of the current review was to focus on the consequences of obesity on allergic diseases, especially asthma in children and adolescents, and to evaluate the available evidence on the possible mechanisms.

EPIDEMIOLOGY OF OBESITY AND ALLERGIC DISEASES IN CHILDREN

In the National Health and Nutrition Examination Survey (NHANES) for 2009 through 2010, the prevalence of obesity was 16.9% in US children and adolescents (18.6%

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in boys and 15.0% in girls).³ Since 1980, the prevalence of obesity in children and adolescents has tripled. Asthma prevalence in children and adolescents (0–17 years) has increased from 3.6% in 1980 to 9.5% in 2008 through 2010.¹ The prevalence of allergic diseases (food and skin allergies) has similarly increased from 1997 to 2011 in children younger than 18 years in the United States.² Both asthma and obesity are more prevalent in children from low socioeconomic strata and minority populations.^{1,3}

Prospective, population-based studies have shown an increased risk of incident asthma in children and adults with a greater body mass index (BMI).^{4–8} Gender-based differences have been observed in some studies, with a stronger association between BMI and asthma among girls compared with boys.^{4,9–11} Reports from the International Study of Asthma and Allergies in Childhood (ISAAC) Phase Three study involving 6- and 7-year-olds from 17 countries, and 13- and 14-year-olds from 35 countries, have shown significant association between overweight/obesity and asthma/eczema symptoms, but not with rhinoconjunctivitis.¹² Data from developing countries are still lacking on the association between obesity and asthma in children. We have been following a pediatric asthmatic cohort over last 5 years; the mean BMI of 240 children in this cohort was 15.3 ± 2.6 kg/m², with only 2% overweight and obese individuals.

A recent population based longitudinal study assessing health records of 623,358 patients aged 6 to 19 years suggested that obese individuals are not only at risk of asthma, but also more likely to have severe asthma, resulting in greater health care utilization, asthma exacerbations, and aggressive asthma treatment.¹³

OBESITY AND RISK OF ATOPY/ALLERGY

Evidence is conflicting on the potential role of obesity on the development of allergy or atopy in childhood. The data from the NHANES III (1988–1994) showed significant association between BMI and asthma, but no association between BMI and atopy (as defined by positive skin prick testing) after adjusting for confounders.¹⁴ Subsequent reports from the NHANES for 1998 through 2006 survey found a stronger association between obesity and current asthma in nonatopic children (odds ratio [OR], 2.46; 95% CI, 1.21–5.02) than atopic children (OR, 1.34; 95% CI, 0.70–2.57).¹⁵ A large, multicenter, cross-sectional study of adults (aged 20–44 years) did not find any association between raised BMI and atopy (sensitization to dust mite, cat, grass, specific immunoglobulin [Ig]E against these allergens, and total IgE).¹⁶

Similarly, a large, multicenter, cross-sectional study from 8 Spanish cities concluded that obese schoolchildren (6- and 7-year-olds) were at a greater risk of nonallergic asthma than nonobese subjects, whereas the risk of allergic asthma was similar.¹⁷ This was a questionnaire-based study and the authors used rhinoconjunctivitis as a marker of atopy. A study of Portuguese schoolchildren found increased prevalence of overweight/obesity in atopic children compared with nonatopic children.¹⁸

Gender has also been found to affect the relationship between obesity and atopy. Collective data from Caucasian Australian children suggested that higher BMI was associated with an higher prevalence of atopy in girls only.¹⁹ A somewhat similar observation has been made in a birth cohort study from New Zealand.²⁰ The cohort was evaluated at various occasions between age 9 and 26 years. A higher BMI was associated with asthma and atopy in women only. BMI has also been associated with increased prevalence of atopy and allergic symptoms in Taiwanese adolescent girls.²¹

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