

Obesity is a risk factor for allergic rhinitis in children of Wuhan (China)

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Background: The relationship between obesity and allergic diseases in children of China is unclear.

Objective: To analysis the relationship between obesity and overweight and the prevalence of allergic diseases and the impact of gender.

Methods: Questionnaire based on those used in National Study of Asthma and Allergies in Childhood in China. The study included 3,327 participants (23.7% aged 2–6 years, 65.8% aged 7–12 years, 10.5% aged 13–14 years) in Wuhan City. Allergic diseases were determined by physicians.

Results: Overweight was found in 35.68% of participants (8.96% of 2–6 years old, 32.83% of 7–12 years old, and 48.57% of 13–14 years old), obesity in 12.53% (4.18%, 12.01%, and 4.29%, respectively). Obesity (odds ratio [OR], 1.33) increased the prevalence of allergic rhinitis and atopic dermatitis. Obesity (OR, 1.48) affected the incidence of allergic rhinitis in girls. There was no relationship between body mass index (BMI) and asthma in child from Wuhan City. Obesity and overweight did not affect the frequency of asthma, food allergy, and drug allergy.

Conclusion: Obesity increased the prevalence of allergic rhinitis and atopic dermatitis in child. Higher BMI was no relationship with the prevalence of asthma, food allergy, and drug allergy.

Keywords: Obesity; Rhinitis, allergic; Risk factors; Dermatitis, atopic; Asthma

INTRODUCTION

Several studies have evaluated the association between obesity and asthma [1-5], atopic dermatitis [6-9] and allergic sensitization to foods [10], but obesity was negatively associated with the prevalence of allergic rhinitis or there was

no relationship [1, 11]. Gender is also likely to be important when examining the relationship between allergic disease and obesity in children and adults [3], but the evidence is inconclusive. The relationship between obesity and asthma [12] and atopic dermatitis [1] is also inconclusive. The objective of the present study, a part of the epidemiology of allergic

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disorders in Chinese study, was to analyze the association between the different body mass index (BMI) categories (normal weight, overweight, and obesity) and allergic diseases in a population of Chinese children aged 2–14 years.

MATERIALS AND METHODS

Study population

The epidemiology of allergic disorders in China study used the methodology of the National Study of asthma and Allergies in Childhood [13]. The study participants were selected by cluster-type stratified random sampling.

The first part of the project (a questionnaire survey) was carried out on a group of 4,132 participants with the response rate of 80.5% and eventually 3,327 completed questionnaires were accepted. It involved three age groups of children, 2–6 years old and 7–12 years old, and 13–14 years old. There were 787 (23.7%) 2–6 years old, 2,190 (65.8%) 7–12 years old, and 350 (10.5%) 13–14 years old. Of the respondents, 1,663 (50%) were female and 1,664 (50%) were male. In the medical evaluation part of the study, they were all assessed on an out-patient basis. The study group design is shown in Table 1.

Table 1. Baseline characteristics of the study population, part of the epidemiology of allergic disorders in Wuhan City, China

Sex	Total	2–6 Years	7–12 Years	13–14 Years
Total	3,327 (100.0)	787 (23.7)	2,190 (65.8)	350 (10.5)
Female	1,663 (50.0)	417 (25.1)	1,097 (66.0)	149 (9.0)
Male	1,664 (50.0)	370 (22.2)	1,093 (65.7)	201 (12.1)

Values are presented as number (%).

Table 2. Prevalence of obesity, overweight, and allergic diseases in the study population, epidemiology of allergic disorders in Wuhan City, China

Variable	Total	2–6 Years	7–12 Years	13–14 Years	Female	Male
Overweight	35.68	8.96	32.83	48.57	35.54	35.82
Obesity	12.53	4.18	12.01	4.29	10.46	14.60
Asthma	4.93	5.34	5.34	1.43	4.09	5.77
Allergic rhinitis	17.67	25.92	16.44	2.86	16.06	19.29
Atopic dermatitis	14.82	23.63	13.06	3.43	13.29	16.35
Food allergy	6.58	8.13	6.21	2.86	7.76	5.41
Drug allergy	9.44	10.93	9.63	2.29	9.08	9.80

Questionnaire-based survey

The questionnaire was based on the literature that has been published [13]. The diagnosis of allergic diseases was carried out by experienced doctors.

Medical evaluation

Asthma was diagnosed according to the criteria [13] based on Global Initiative for Asthma, allergic rhinitis using the Allergic Rhinitis and its Impact on Asthma criteria and atopic dermatitis using the Hanifin and Rajka criteria.

Anthropometric measurements

In those participating, we measured weight without shoes or outer clothing (to nearest 0.1 kg) and height (to nearest 0.1 cm). BMI was calculated as weight/height² (kg/m²). BMI was analyzed as a categorical variable divided into three categories (normal weight, overweight, and obesity). According to the accepted definition in epidemiological studies, Children's BMI referred to the new Chinese growth charts and obesity was diagnosed when BMI was >95th percentile, overweight when BMI was >85th and <95th percentile and normal weight when BMI was >3rd and <85th percentile [14].

Statistical evaluation

A chi-square test or Fisher exact test (for small sample sizes) was used in the statistical analysis. To determine the strength of association and the dependence between variables, chi-square statistics and odds ratios were calculated. Results were considered to be statistically significant at $p < 0.05$.

Ethics

The study was approved by the Bioethics Committee of Hubei Maternity and Child Hospital.

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Table 3. Relationship between overweight and obesity and the prevalence of allergic diseases in the study population, epidemiology of allergic disorders in Wuhan City, China

Variable	Overweight		Obesity	
	OR	95% CI	OR	95% CI
Asthma	0.99	0.71–1.37	1.09	0.68–1.72
Allergic rhinitis	1.00	0.83–1.21	1.33*	1.04–1.72*
Atopic dermatitis	1.02	0.84–1.25	1.33*	1.02–1.74*
Food allergy	0.84	0.63–1.12	1.03	0.68–1.55
Drug allergy	1.02	0.80–1.29	1.19	0.85–1.66

OR, odds ratio; CI, confidence interval.

* $p < 0.05$, statistically significant.

RESULTS

The prevalence of obesity and overweight and of allergic disease in the study population is shown in Table 2. Obesity children had no increase of asthma, food allergy, and drug allergy. We found no effect of being overweight on allergy, diseases. Detailed data are shown in Table 3.

There was a significantly higher prevalence of allergic rhinitis in obese (odds ratio [OR], 1.48; $p < 0.05$) girls. Detailed data are shown in Table 4.

DISCUSSION

To our knowledge, the present study is first one in this part of middle southern-China assessing the relationship between overweight and obesity and the prevalence of allergic diseases among children.

In the literature, there are conflicting reports about the influence of BMI on allergic status. Although the association between obesity and asthma has been gaining more attention, few studies have been conducted concerning the relationship between obesity and other allergic diseases. The results are ambiguous and often contradictory. Most of the published studies suggest that being overweight and obese has a positive association with atopic dermatitis in children and adults. However, there are also reports of the nonexistence of such a relationship. We found obesity was significantly associated with an increased prevalence of allergic rhinitis and atopic dermatitis. In conclusion, our cross-sectional study showed that being obese is associated

Table 4. Association of different body mass index categories with the prevalence of allergic diseases according to gender, study population part of the epidemiology of allergic disorders in Wuhan City, China

Variable	Overweight		Obesity	
	OR	95% CI	OR	95% CI
Asthma				
Female	0.59	0.34–1.04	1.15	0.54–2.44
Male	1.36	0.90–2.07	1.00	0.58–1.79
Allergic rhinitis				
Female	0.81	0.61–1.07	1.48*	1.00–2.18*
Male	1.20	0.93–1.54	1.20	0.86–1.67
Atopic dermatitis				
Female	0.74	0.55–1.01	1.42	0.93–2.16
Male	1.31	1.01–1.71	1.24	0.87–1.75
Food allergy				
Female	0.74	0.50–1.10	1.14	0.65–2.00
Male	0.99	0.63–1.54	0.99	0.54–1.81
Drug allergy				
Female	0.98	0.69–1.39	1.44	0.88–2.34
Male	1.05	0.75–1.47	1.01	0.64–1.60

OR, odds ratio; CI, confidence interval.

* $p < 0.05$, statistically significant.

with an increased prevalence of allergic rhinitis and atopic dermatitis. Higher BMI was no relationship with the occurrence of asthma, food allergy, and drug allergy, in this research.

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