



Letters

The relationship of race and aeroallergen sensitization in a pediatric urban allergy clinic

Urban populations experience disproportionately high rates of asthma morbidity, especially among those of Black or African-American and Hispanic descent,¹ and indoor allergen sensitization has been implicated in poor health outcomes.² The prevalence of rhinitis is also higher in urban compared with rural populations.³ Newark has one of the highest rates of childhood asthma in New Jersey, with increased associated emergency department visits and hospitalizations.¹ In our previously uncharacterized urban population, we sought to evaluate the relationship between ethnicity (including stratifying different minority groups), allergen sensitization, allergic comorbidities, and local geography among children with asthma or rhinitis or both.

Patients aged 1 to 18 years with physician-diagnosed asthma or rhinitis or both who were seen between January 2, 2013, and January 2, 2019, in a pediatric allergy and immunology clinic in Newark, New Jersey, were examined. The study was approved by the institutional review board.

The electronic medical records of 296 patients who met the inclusion criteria were reviewed for data pertaining to demographics (sex, age at last visit, race, ethnicity, and residential Zone Improvement Plan [ZIP] code), allergic diagnoses (asthma, rhinitis, atopic dermatitis, and food allergy), and aeroallergen sensitization. Race was self-reported by their parents on a registration intake form and categorized as White, Black or African American, Hispanic, or other.

Aeroallergen sensitization was defined as allergen-specific immunoglobulin E (IgE) testing greater than 0.1 IU/mL (ImmunoCAP fluoroenzyme immunoassay; Thermo Fisher, Waltham, Massachusetts) or skin prick testing wheal response greater than or equal to 3 mm larger than that elicited by the negative control. Along with total serum IgE levels, the allergens that were evaluated included the following: (1) pollen (trees, grass, and weeds), (2) animal (cat, dog), (3) dust mite (*Dermatophagoides farinae* and *Dermatophagoides pteronyssinus*), (4) mold (*Alternaria tenuis*, *Aspergillus fumigatus*, *Cladosporium herbarum*, *Penicillium notatum*), and (5) mouse and cockroach mix (American and German).

The frequencies of specific allergen sensitivities and combinations of sensitivities were compared with reported physician-diagnosed allergic sensitivities by means of cross-tabulation. Associations of specific single and multiple allergen sensitivities and allergic diseases were analyzed by using χ^2 and Fisher exact tests. The relationships of asthma, rhinitis, atopic dermatitis, and food allergy were analyzed with specific aeroallergen sensitivities, controlling for age, sex, race, and the presence or absence of additional sensitivities by using multiple logistic regression. Separate models were run for each risk factor.

The study population included 296 patients, with a median age of 9 years (range, 1–18 years), with no considerable difference with regard to sex ($N = 150$, 50.7% boys). Most patients were Black or African American ($N = 138$, 46.6%) and Hispanic ($N = 92$, 31.1%) with the largest portion of patients living in Essex county ($N = 234$, 79.0%), which includes the City of Newark, New Jersey.

Most patients had both asthma and rhinitis ($N = 186$, 62.8%), 25 (8.4%) had asthma only, and 83 (28.0%) had rhinitis only. In terms of comorbidities, 117 (39.5%) had atopic dermatitis, and 123 (41.6%) had a food allergy.

Aeroallergen sensitivity testing (skin prick or serum specific IgE) was available for 251 (84.8%) patients studied: 43 patients (17.1%) were found to be nonatopic. In the patients identified as atopic, the median IgE was 437 IU/mL (interquartile range, 120–1260). There was a high frequency of sensitization to pollen ($N = 163$, 64.9%), followed by cat or dog ($N = 157$, 62.6%), dust mite ($N = 140$, 55.8%), cockroach ($N = 111$, 44.2%), mouse ($N = 92$, 36.7%), and mold ($N = 75$, 29.9%).

Patients with both asthma and rhinitis ($N = 186$, 62.8% of the study population) who were identified as atopic through aeroallergen sensitivity testing ($N = 174$, 69.3% of those tested), had increased odds of sensitization to mouse allergen (adjusted OR [aOR] 3.34, 95% confidence interval [CI] 1.74–6.42, $P \leq .001$) (Table 1) and dual sensitization to pollen and cat or dog (aOR 9.86, 95% CI 1.21–77.38, $P = .02$) (not shown).

In addition, in those patients identified as atopic with both asthma and rhinitis ($N = 174$), comorbid conditions included atopic dermatitis ($N = 26$, 14.9%), food allergy ($N = 33$, 19.0%), and both atopic dermatitis and food allergy ($N = 46$, 26.4%).

Racial differences demonstrated that compared with the rest of the atopic study population, Black or African-American patients with both asthma and rhinitis had an increased likelihood of sensitization to pollen (aOR 7.86, 95% CI 1.71–36.17, $P = .008$), cat or dog (aOR 11.02, 95% CI 2.43–49.99, $P = .002$), dust mite (aOR 5.32, 95% CI 1.66–17.06, $P = .002$), mouse (aOR 8.14, 95% CI 2.54–26.11, $P = .004$), and cockroach (aOR 6.38, 95% CI 2.21–18.46, $P \leq .001$) (Table 1). However, there was no significant association between aeroallergen sensitization patterns and allergic diseases among Hispanic and non-Hispanic patients.

Study patients lived in forty ZIP codes spanning 5 counties in New Jersey, with most patients residing in 3 ZIP codes in the City of Newark. Further evaluation of patients identified as atopic who had rhinitis and asthma and lived in those 3 ZIP codes demonstrated significantly high rates of sensitization to all aeroallergens tested in ZIP codes 07103 (clinic location) and 07107 along with significantly high rates of sensitization to all aeroallergens except pollen in ZIP code 07108 (Table 1). These ZIP codes are areas of higher poverty^{4–6} compared with the rest of the study population within Newark,

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Table 1
Clinical Characteristics of Patients With Both Asthma and Rhinitis

Allergen sensitization	Pollen	Cat or dog	Dust mite	Mold	Mouse	Cockroach
All patients (N = 174)						
n (%)	111 (63.8)	111 (63.8)	102 (58.6)	58 (33.3)	76 (43.7)	80 (46.0)
Adjusted OR ^a	0.82	1.18	1.5	1.76	3.34	1.2
(95% CI)	(0.46–1.48)	(0.67–2.06)	(0.85–2.64)	(0.93–3.34)	(1.74–6.42)	(0.69–2.08)
P value	.51	.56	.15	.09	<.001	.52
Race or ethnicity^b						
Black or AA (N = 121)						
n (%)	84 (69.4)	76 (62.8)	72 (59.5)	43 (35.5)	53 (43.8)	59 (48.8)
Adjusted OR	7.86	11.02	5.32	2.33	8.14	6.38
(95% CI)	(1.71–36.17)	(2.43–49.99)	(1.66–17.06)	(0.95–5.72)	(2.54–26.11)	(2.21–18.46)
P value	.008	.002	.002	.06	<.001	<.001
Hispanic (N = 78)						
n (%)	45 (57.7)	49 (62.8)	42 (53.9)	19 (24.4)	23 (29.5)	29 (37.2)
Adjusted OR	3.56	8	4.79	2.79	4.02	5.23
(95% CI)	(0.49–25.73)	(0.90–71.37)	(0.68–33.89)	(0.38–20.35)	(0.57–28.17)	(0.76–36.26)
P value	.21	.06	.12	.31	.16	.09
ZIP code^c						
07103 (N = 42)^d						
n (%)	30 (71.4)	29 (69.1)	30 (71.4)	14 (33.3)	19 (45.2)	27 (64.3)
Adjusted OR	3.42	4.16	3.36	2.95	6.08	3.77
(95% CI)	(1.47–7.97)	(1.79–9.70)	(1.55–7.19)	(1.46–5.97)	(2.75–13.43)	(1.84–7.73)
P value	.004	.001	.002	.003	<.001	<.001
07107 (N = 25)^e						
n (%)	13 (52.0)	16 (64.0)	13 (52.0)	6 (24.0)	9 (36.0)	7 (28.0)
Adjusted OR	0.54	4.15	3.24	2.93	6.16	3.56
(95% CI)	(0.24–1.26)	(1.78–9.68)	(1.51–6.69)	(1.45–5.94)	(2.78–13.68)	(1.75–7.26)
P value	.001	.001	.003	.003	<.001	<.001
07108 (N = 22)^f						
n (%)	15 (68.2)	15 (66.2)	14 (63.6)	13 (59.1)	11 (50.0)	10 (45.5)
Adjusted OR	1.17	4.25	3.24	2.68	5.99	3.74
(95% CI)	(0.46–2.99)	(1.80–10.07)	(1.51–6.97)	(1.31–5.50)	(2.70–13.29)	(1.82–7.70)
P value	.82	.001	.003	.007	<.001	<.001

Abbreviations: AA, African American; CI, confidence interval; OR, odds ratio; ZIP, Zone Improvement Plan.

^aOdds ratio adjusted for age, sex, and race; comparators include those without respective allergen sensitivity.^bOdds ratio adjusted for age and sex; comparators for Black or AA and Hispanic are non-Black or AA and non-Hispanic, respectively.^cOdds ratio adjusted for age, sex, and race; comparators for individual ZIP codes include study participants living outside of that ZIP code.^dMedian income of \$29,304; 36.4% living below poverty, and 77.7% achieving high school education.⁴^eMedian income of \$31,366; 28.6% living below poverty, and 69.4% achieving high school education.⁵^fMedian income of \$26,317; 38.9% living below poverty, and 80.6% achieving high school education.⁶

which has a median income of \$37,642, with 24.6% living below the poverty line and only 78.1% achieving high school education.⁷

In summary, this study found that in Newark, the urban pediatric population had both asthma and rhinitis at higher rates than either disease alone, had increased allergic comorbidities, and had sensitization to mouse allergen. The prevalence of mouse sensitization (36.7%) found in this study is comparable with sensitization rates found in larger multicenter trials located in other urban areas (Seattle, Tucson, Dallas, Chicago, Bronx, New York, Boston, and Baltimore) with rates ranging from 8.6% to 51%.^{2,8} Furthermore, minorities were largely affected in the above trials; and in this study, specifically children of Black or African-American descent who had both asthma and rhinitis had increased likelihood of sensitization to both indoor and outdoor aeroallergens than children of Hispanic descent. Understanding the clinical characteristics and knowing the environmental factors that affect our patients helps us recognize possible risk factors linked to poor health outcomes.

Larger studies have revealed that race and poverty status play a more important role in asthma than living in urban environments.⁹ Future measures to improve health outcomes should address socioeconomic and racial disparities to guide the management of minority children with asthma and allergic disease.

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