

Letter to the Editor

Allergic sensitization does not differ between childhood- and adolescent-onset asthma in women

To the Editor:

A highly consistent observation in asthma epidemiology is a change from a higher male to a higher female prevalence between age 10 and 20 years.¹ A second consistent observation is a strong relationship between allergic sensitization (atopy) and asthma.² However, little is known about the relationship between atopy and age of asthma onset from childhood to adulthood in women.^{3,4} Because many studies have shown that atopic children with asthma are more likely to have persistent asthma,⁵ our hypotheses were that women with current asthma persisting from childhood into adulthood (early onset) would be more likely to be atopic, and that they would have different patterns of sensitization than would women with later-onset asthma.

To examine our hypothesis, we evaluated the asthma histories and allergen-specific IgE results of pregnant women recruited into a birth cohort study, called WHEALS (Wayne County Health, Environment, Allergy and Asthma Longitudinal Study), located in Wayne County, Michigan.⁶ Pregnant women were recruited from health system maternity clinics on the basis of place of residence without consideration of allergic history. All aspects of the study were approved by the Henry Ford Health System Institutional Review Board. The women were questioned about their personal histories of asthma including age of onset, current medications, and symptoms. Current asthma was defined as a doctor's diagnosis of asthma and at least 1 acute asthma episode or at least 1 asthma medication in the previous 12 months. Early-onset asthma was defined as a doctor's diagnosis of asthma before age 15 years. Late-onset asthma was defined as a doctor's diagnosis of asthma at age 15 years or more. Allergen-specific serum IgE was measured at 1 month postpartum for 8 allergens (cat, dog, dust mite [*Dermatophagoides farinae*], cockroach [*Blattella germanica*], ragweed [*Ambrosia elatior*], timothy grass [*Phleum pratense*], *Alternaria alternata*, and hen's egg) using the UniCAP system (Thermo Fisher, Portage, Mich). Samples greater than or equal to 0.35 IU/mL were considered positive for atopy. Atopic IgE patterns were determined by latent class analyses (LCA) with Mplus 7.11 (Muthen & Muthen, Los Angeles, Calif).⁷ The Lo-Mendell-Rubin likelihood ratio test suggested that a 5-class solution was the best fit to the data. Multinomial logistic regression was used to examine the relationships between atopic groups defined as 1 or more sensitization, 2 or more sensitizations, or the LCA classes and current early- versus late-onset asthma. Effect modification of these relationships by race was examined by including an interaction term (race defined as black vs white) in the models.

Our study population was drawn from the 837 participating women who were self-described as white (245 [29.3%]) or black (592 [70.7%]) (the numbers from other minorities were insufficient for meaningful analysis). Of these 837 women, 1 did not report asthma status and 172 (20.6%) reported a doctor diagnosis of asthma. At the time of their child's birth, the women were aged 29 ± 5 years. As shown in Fig E1 in this article's Online Repository at www.jacionline.org, 51 (6.1%) women reported current, early-onset, and 37 (4.4%) reported current, late-onset asthma.

The 5 LCA classes of IgE sensitization found in the 837 women were (1) low or no sensitization ($n = 412$ [49.2%]); (2) cat- and dog-dominated sensitization ($n = 35$ [4.2%]); (3) timothy grass- and ragweed-dominated sensitization ($n = 167$ [20.0%]); (4) highly sensitized, average 4.9 positive IgE results, ($n = 104$ [12.4%]); and (5) dust mite- and cockroach-dominated sensitization ($n = 34$ [4.1%]), as shown in Fig 1.

Table I shows that there were no significant differences between the prevalence of atopic sensitization in early- and late-onset asthma for any of the 7 atopy groupings. However, comparing the odds ratios (ORs) of each latent class relative to low or no sensitization for early- versus late-onset asthma produced interesting patterns even though the CIs, due to small numbers, were imprecise. Women with early-onset asthma were more likely to be in the ragweed- and timothy grass-dominant (OR, 4.81; 95% CI, 0.91-25.5) or highly sensitized (OR, 1.51; 95% CI, 0.54-4.24) classes but less likely to be in the classes dominated by dog and cat (OR, 0.44; 95% CI, 0.091-2.08) or cockroach and mite (OR, 0.44; 95% CI, 0.07-2.76).

Women with either early- or late-onset asthma were more likely to be atopic than were women who had never had asthma as presented in Table E1 in this article's Online Repository at www.jacionline.org. Similarly, the latent classes differed between those who never had asthma and those with early- or late-onset asthma presented in Table E2 in this article's Online Repository at www.jacionline.org. When the latent classes were compared for those who never had asthma versus those with early-onset asthma, the only significant difference was for those with high sensitization (see Table E3 in this article's Online Repository at www.jacionline.org), although all the ORs were elevated. In those with late-onset asthma, differences were also seen in the dog and cat and cockroach and mite groups. To assess the effect of the age chosen to separate early- from late-onset asthma, analyses were repeated using age 12.6 years as the separation age and there were no significant changes (see Table E4 in this article's Online Repository at www.jacionline.org).

Our results suggest that neither the prevalence nor patterns of atopy are major contributors to the difference between early- and late-onset asthma in women. An important strength of this study is

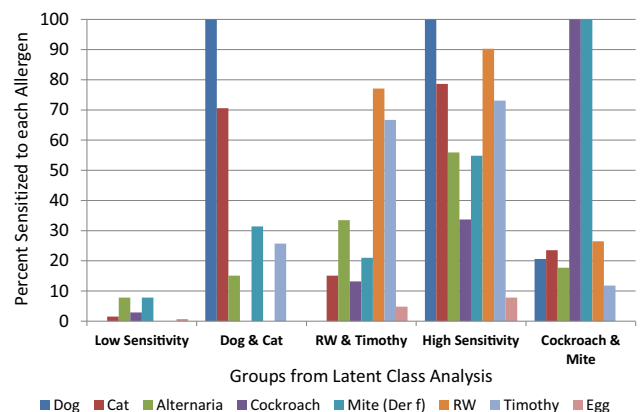


FIG 1. Percentage of 837 women sensitized (allergen-specific IgE >0.35 IU/mL) to individual allergens in each of the 5 groups defined by LCA. RW, Ragweed.

TABLE I. The ORs for current early-onset asthma compared with the current late-onset asthma with respect to different atopic groups

Atopy group*	Early-onset asthma, n (%)	Late-onset asthma, n (%)	ORs (95% CI)	P value
Atopy (≥ 1 allergen)				
Yes	38 (59.4)	26 (40.6)	1.24 (0.48-3.18)	.66
No	13 (54.2)	11 (45.8)		
Multisensitized atopy (≥ 2 allergens)				
Yes	33 (60.0)	22 (40.0)	1.25 (0.52-2.99)	.62
No	18 (54.6)	15 (45.4)		
Latent class atopic groups				
Dog and cat	3 (33.3)	6 (66.7)	0.44 (0.09-2.08)	.30
Ragweed and timothy grass	11 (84.6)	2 (15.4)	4.81 (0.91-25.5)	.065
Highly sensitized	19 (63.3)	11 (36.7)	1.51 (0.54-4.24)	.43
Cockroach and mite (<i>Dermatophagoides farinae</i>)	2 (33.3)	4 (66.7)	0.44 (0.07-2.76)	.38
Low or no sensitization	16 (53.3)	14 (46.7)	Reference group	

*Atopy defined as allergen-specific IgE >0.35 IU/mL to 1 or more of 8 individual allergens and grouped as sensitization to ≥ 1 allergen, sensitization to ≥ 2 allergens, or sensitization to 1 of the 4 sensitization groups by LCA.

that the 837 participants were selected on the basis of area of residence and not on allergic history and that they were ethnically diverse. There was no evidence of effect modification by race in the relationship of atopic sensitization patterns to early- or late-onset asthma, because inclusion of an interaction term between latent class and race in the logistic regression model was nonsignificant ($P = .79$). We chose to define early- and late-onset as age 15 years because this is the age when the prevalence of asthma is approximately equal in several large studies⁸ but we also repeated the analyses using the average age of menarche in the United States (12.6 years)⁹ without a meaningful change in the results. Important weaknesses of this study include the inability to verify the self-reported age of asthma onset and the cross-sectional design. The fact that the women were all pregnant was considered, but the symptoms defining current asthma existed before pregnancy in nearly all women and a previous study found little change in specific IgE measurements pre- and postdelivery.

Our data do not support the hypotheses of a greater prevalence or different patterns of allergic sensitization in women with early- or late-onset asthma. However, we speculate that the modest differences in the patterns of allergen-specific IgE between early- and late-onset asthma in women might become important with further investigation.

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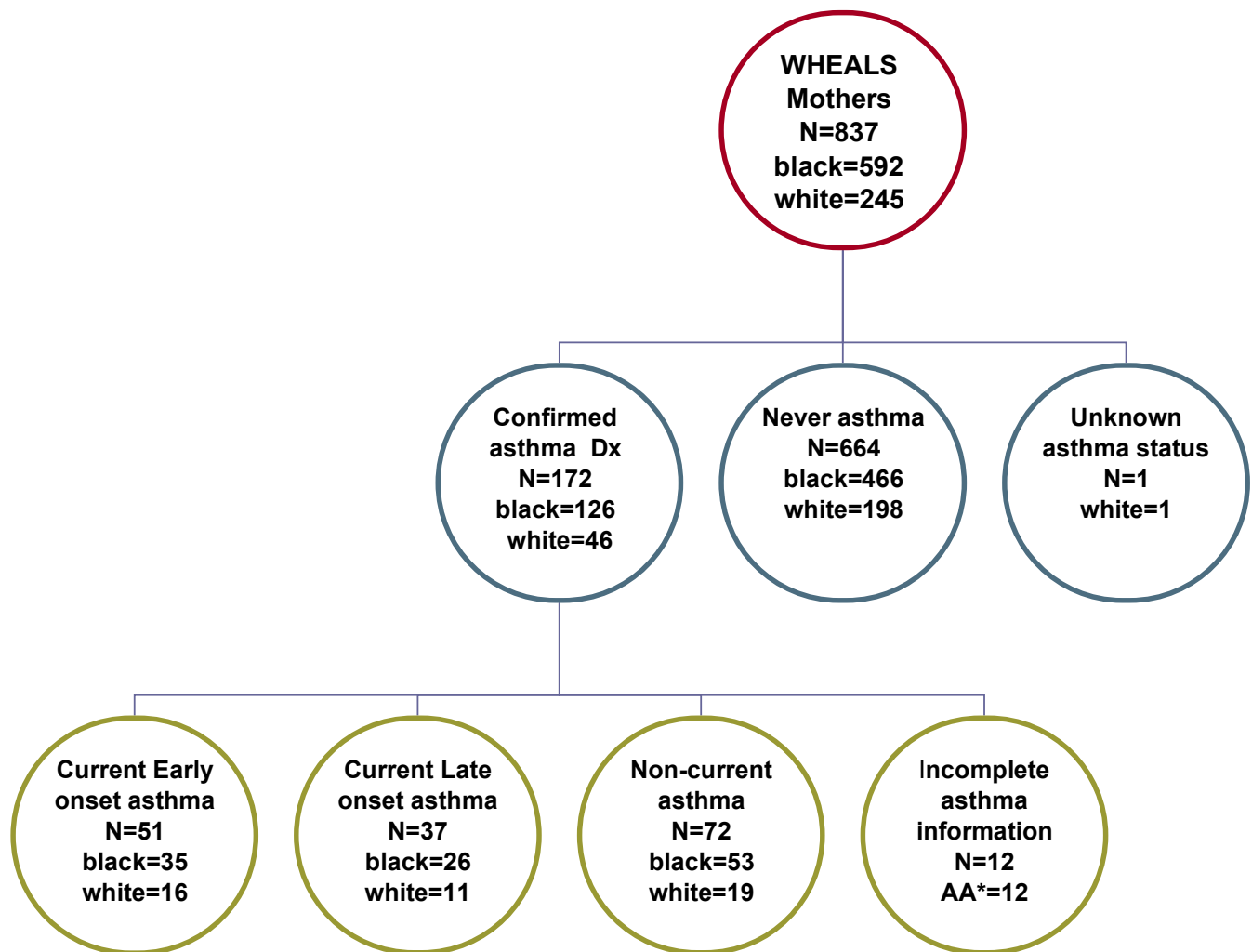


FIG E1. Consort diagram of 837 women from the WHEALS cohort who were black or white and had IgE measured at the 1-month postpartum visit.

TABLE E1. ORs between atopy* (at least 1 allergen-specific IgE ≥ 0.35) and either current early-onset, current late-onset, or never diagnosed asthma groups of participating women

Comparison	ORs (95% CI)	P value
Early-onset to never asthma	2.48 (1.30-4.74)	.006
Late-onset to never asthma	2.20 (1.05-4.65)	.038
Early-onset to late-onset asthma	1.12 (0.43-2.95)	.81

*Early-onset asthma (age <15 years) 74.5% atopic, late-onset asthma (age ≥ 15 years) 72.2% atopic, never asthma 54.1% atopic.

TABLE E2. Relationships between 5 groups defined by LCA of sensitization patterns and never asthma, early-onset, or late-onset asthma, with age 15 y considered the dividing line between early- and late-onset asthma

Latent class group	Never asthma, N (%,%)*	Early-onset current asthma, N (%,%)*	Late-onset current asthma, N (%,%)*	χ^2 P value
Low sensitization	382 (92.7%, 57.5%)	16 (3.9%, 31.4%)	14 (3.4%, 37.8%)	<.001
Dog and cat sensitization	26 (74.3%, 3.9%)	3 (8.6%, 5.9%)	6 (17.1%, 16.2%)	
Ragweed and timothy grass sensitization	154 (92.2%, 23.2%)	11 (6.6%, 21.6%)	2 (1.2%, 5.4%)	
High sensitization	74 (71.1%, 11.4%)	19 (18.3%, 37.3%)	11 (10.6%, 29.7%)	
Cockroach and mite (<i>Dermatophagoides farinae</i>) sensitization	28 (82.3%, 4.2%)	2 (5.9%, 3.9%)	4 (11.8%, 10.8%)	

*N (%,%) is the number of participants followed by the percentage of the participants in the row and then the percentage of the participants in the column.

TABLE E3. ORs of early- or late-onset asthma compared with never asthma by classes of allergic sensitization defined by LCA

Latent class group*	ORs	95% CI	P value
Early-onset asthma to never asthma			
Dog and cat sensitization	2.76	0.75-10.1	.13
Ragweed and timothy Sensitization	1.71	0.77-3.76	.19
High sensitization	6.13	3.01-12.5	<.001
Cockroach and mite (<i>D farinae</i>) sensitization	1.71	0.37-7.79	.49
Late-onset asthma to never asthma			
Dog and cat sensitization	6.30	2.24-17.74	<.001
Ragweed and timothy grass sensitization	0.35	0.08-1.58	.17
High sensitization	4.10	1.77-9.28	.001
Cockroach and mite (<i>D farinae</i>) sensitization	3.90	1.20-12.6	.023

*The low to no sensitization is the reference group for comparisons.