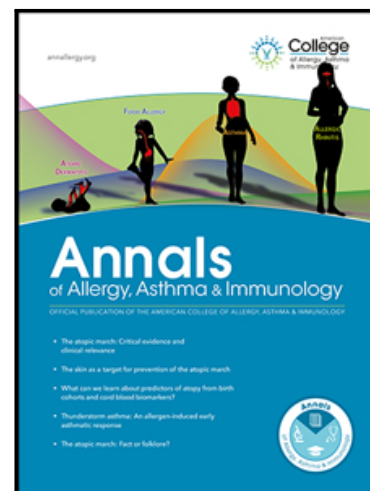


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Mona Liu , Jay P. Patel , Evie Huang , Peck Y. Ong

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History of Eczema is Associated with More Severe Hospital Course in Children Hospitalized for Asthma

Mona Liu MD^a, Jay P. Patel MD², Evie Huang MD³, Peck Y. Ong MD⁴

^aDivision of Clinical Immunology and Allergy, UCLA, Los Angeles, CA.

^bDepartment of Allergy and Immunology, Kaiser Permanente, Downey Medical Center, Downey, CA.

^cDivision of General Pediatrics, Children's Hospital of Los Angeles, Los Angeles, CA.

^dDivision of Clinical Immunology and Allergy, Children's Hospital Los Angeles, and Department of Pediatrics, Keck School of Medicine, University of Southern California, Los Angeles, CA.

Keywords

atopic dermatitis; asthma severity; house dust mites; *S. aureus*.

Corresponding Author. Division of Clinical Immunology and Allergy, Children's Hospital of Los Angeles, 4650 Sunset Blvd., MS #75, Los Angeles, CA 90027, USA, Email: pyong@chla.usc.edu

Asthma is a major cause of childhood morbidity in the United States. Poorly-controlled

asthma results in recurrent emergency room visits, hospital admissions, and even death.¹

Hospital admissions for asthma also incur significant cost to society.² Identifying risk

factors and comorbidities that contribute to severity of asthma during hospital admissions

may improve asthma control and prevent further admissions. One recent study found that

increased serum total IgE level is associated with patients admitted to the hospital for

asthma, as compared to those being treated in an outpatient setting.³ However, there is

little information on risk factors that predict severity of the inpatient course in children

hospitalized for asthma. Our study aims to evaluate possible predictors of more severe

hospital course, including serum total IgE and aeroallergen sensitizations, in children

hospitalized for asthma.

This is a prospective pilot study on children hospitalized for asthma exacerbations.

Demographics, asthma history including controller medications, medical, atopic, family,

and environmental histories were obtained from interviews and review of the medical

record. Subjects were tested for serum indoor and outdoor aeroallergen panel

(Respiratory XIII Southern California; Quest Diagnostics) and total IgE. Outcome measures for hospital course included intensive care unit (ICU) admission, length of stay, and hours of continuous albuterol use.

Forty eight subjects between the ages of 1 and 17 years old were enrolled over two years. Most were Hispanic Americans (58%; $n = 28$) or African Americans (29%; $n = 14$). Other racial groups were as follow: Caucasian Americans (6%; $n = 3$), Asian Americans (4%; $n = 2$) and others (2%; $n = 1$). African Americans were over-represented in asthma admissions as compared to the local demographic of around 10%. Seventy-two percent had serum total IgE > 200 IU/mL.³ We did not find any significant association between high serum total IgE or specific IgE sensitizations with a severe hospital course as measured by the above outcomes ($p > 0.1$). Subjects with history of eczema were found to have a longer length of stay ($p = 0.04$) and longer use of continuous albuterol treatment ($p = 0.01$)(Table 1). In addition, carpet exposure was significantly related to ICU admission ($p = 0.02$). Of the patients with carpet exposure ($n=27$), a greater proportion of those with eczema ($n = 13$) had ICU admission as compared to those without eczema ($n = 14$), but it was not statistically significant (84% vs 57%, $p = 0.21$).

We further examined if sensitization to either *D. farinae* or *D. pteronyssinus* ($n = 30$) was associated with ICU admission. Sensitization to either house dust mite was not significantly associated with ICU admission, as compared to subjects without house dust mite sensitization (57% vs 50%, $p = 0.77$). However, of the subjects with sensitization to house dust mite, a greater proportion of those with eczema ($n = 16$) had ICU admission as compared to those without eczema ($n = 14$)(69% vs 43%, $p = 0.27$). Other historical factors including chronic rhinitis, food allergy, family history of asthma or atopy, pet

exposure, cockroach exposure, and tobacco exposure were not significantly associated with a severe hospital course.

The majority of our subjects had increased serum total IgE (72%). This finding is consistent with the previous study that showed increased serum total IgE among children hospitalized for asthma.³ Although the mean serum total IgE was higher in subjects with a history of eczema (Table 1), we did not find a significant association between high serum total IgE (> 200 IU/mL) and those with a history of eczema ($p > 0.3$). We found various possible reasons for this: there was a large variation in the serum total IgE among the subjects with a history of eczema and there was a number of subjects without a history of eczema also had high serum total IgE, likely associated with their asthma. We also did not find any significant association between a racial group, including African Americans, and those with a history of eczema in this study ($p > 0.1$). Recent studies suggest that AD is not only a risk factor for asthma, but a contributor to more severe disease course. An observational study describes a high incidence of concomitant AD in patients with severe refractory asthma currently on biologic therapy,⁴ suggesting that AD may be a comorbidity for the severe asthma phenotype.

Another study demonstrated that asthmatics with AD did not respond as well to step up long-acting beta agonists therapy,⁵ as compared to those without AD, suggesting a more severe airway inflammation in the subgroup of asthmatics with AD. Interestingly, in our cohort, patients with AD required significantly longer therapy with continuous albuterol during their asthma exacerbations as compared to patients without AD.

The mechanism by which AD contributes to more severe asthma disease is unclear.

Several studies have found skin microbial IgE sensitizations in patients with AD to be

associated with persistent and more difficult to manage asthma.⁶⁻⁸ In particular, *S. aureus* skin colonization and specific sensitization to staphylococcal enterotoxins have been significantly associated with poor asthma control and increased risk for oral steroid use and hospitalizations.^{7,8} Proposed mechanisms of action include staphylococcal enterotoxin-induced inflammation and steroid-resistance, contributing to a more severe disease phenotype. These proposed mechanisms could explain the more severe hospital course in our patients with asthma and AD. Whether house dust mites may act via skin barrier defects in AD and contribute to airway inflammation of asthma will require further studies.

In summary, we found that children who were hospitalized for asthma had a more severe hospital course when there is a history of eczema, as compared to those without a history of eczema. Our study is limited by a small sample size. Larger studies are needed to confirm these findings.

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Conflict of interests

None

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Table 1. History of eczema, serum total IgE and severity of inpatient asthma admission outcomes.

	N	Outcomes		p-Value
Eczema	20	Length of Stay (days)	4.6 ± 1.8	0.04
		Hours of continuous albuterol	8.7 ± 10.5	0.01
		Mean total IgE (IU/mL)	1166 ± 1439	0.1
No Eczema	28	Length of Stay (days)	3.5 ± 1.4	

	Hours of continuous albuterol	3.5 ± 7.1	
	Mean total IgE (IU/mL)	562 ± 837	

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