Association Between Atopic Dermatitis and Chronic Obstructive Pulmonary Disease Among US Adults in the 1999-2006 NHANES Survey

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PRACTICE POINTS

- Various comorbidities are associated with atopic dermatitis (AD). Currently, research exploring the association between AD and chronic obstructive pulmonary disease is limited.
- Understanding the systemic diseases associated with inflammatory skin diseases can assist with adequate patient management.

To the Editor:

Atopic dermatitis (AD) is an inflammatory skin condition that affects approximately 16.5 million adults in the United States.[1] Atopic dermatitis is associated with skin barrier dysfunction and the activation of type 2 inflammatory cytokines. Multiorgan involvement of AD has been demonstrated, as patients with AD are more prone to asthma, allergic rhinitis, and other systemic diseases.[2] In 2020, Smirnova et al[3] reported a significant association (adjusted odds ratio [AOR], 1.58; 95% CI, 1.30-1.92) between AD and chronic obstructive pulmonary disease (COPD) in a large Swedish population. Currently, there is a lack of research evaluating the association between AD and COPD in a population of US adults. Therefore, we explored the association between AD and COPD (chronic bronchitis or emphysema) in a population of US adults utilizing the 1999-2006 National Health and Nutrition Examination Survey (NHANES), as these were the latest data for AD available in NHANES.[4]

We conducted a population-based, cross-sectional study focused on patients 20 years and older with psoriasis from the 1999-2006 NHANES database. Three outcome variables—emphysema, chronic bronchitis, and COPD—and numerous confounding variables for each participant were extracted from the NHANES database. The original cohort consisted of 13,134 participants, and 43 patients were excluded from our analysis owing to the lack of response to survey questions regarding AD and COPD status. The relationship between AD and COPD was evaluated by multivariable logistic regression analyses utilizing Stata/MP 17 (StataCorp LLC). In our logistic regression models, we controlled for age, sex,

race/ethnicity, education, income, tobacco usage, diabetes mellitus and asthma status, and body mass index (eTable).

Our study consisted of 13,091 participants. Multivariable logistic regressions were utilized to examine the association between AD and COPD (Table). Approximately 12.5% (weighted) of the patients in our analysis had AD. Additionally, 9.7% (weighted) of patients with AD had received a diagnosis of COPD; conversely, 5.9% (weighted) of patients without AD had received a diagnosis of COPD. More patients with AD reported a diagnosis of chronic bronchitis (9.2%) rather than emphysema (0.9%). Our analysis revealed a significant association between AD and COPD among adults aged 20 to 59 years (AOR, 1.43; 95% CI, 1.13-1.80; P=.003) after controlling for potential confounding variables. Subsequently, we performed subgroup analyses, including exclusion of patients with an asthma diagnosis, to further explore the association between AD and COPD. After excluding participants with asthma, there was still a significant association between AD and COPD (AOR, 1.57; 95% CI, 1.14-2.16; P=.007). Moreover, the odds of receiving a COPD diagnosis were significantly higher among male patients with AD (AOR, 1.54; 95% CI, 1.06-2.25; P=.03).

Our results support the association between AD and COPD, more specifically chronic bronchitis. This finding

Association Between AD and COPD in Adults in NHANES 1999-2006 Utilizing Multivariable Logistic Regression

	Weighted %[a]		OR (95% CI)		P value	
Variable	AD	No AD[b]	Unadjusted	Adjusted[c]	Unadjusted	Adjusted[c]
All participants (aged 20–59 y)						
COPD	9.7	5.9	1.73 (1.44-2.07)	1.43 (1.13-1.80)	<.001[d]	.003[d]
Emphysema	0.9	0.8	1.21 (0.63-2.31)	0.99 (0.43-2.23)	.57	.97
Chronic bronchitis	9.2	5.5	1.73 (1.41-2.11)	1.41 (1.11-1.79)	<.001[d]	.005[d]
Males						
COPD	7.1	4.1	1.76 (1.24-2.50)	1.54 (1.06-2.25)	.002[d]	.03[d]
Emphysema	0.9	0.7	1.24 (0.51-3.04)	1.26 (0.46-3.42)	.63	.65
Chronic bronchitis	6.3	3.7	1.74 (1.19-2.54)	1.50 (1.00-2.27)	.005[d]	.05
Females						
COPD	11.8	7.6	1.62 (1.21-2.16)	1.38 (0.99-1.92)	.002[d]	.06
Emphysema	1.0	0.9	1.16 (0.55-2.45)	0.80 (0.30-2.13)	.70	.65
Chronic bronchitis	11.4	7.3	1.63 (1.19-2.22)	1.37 (0.97-1.95)	.003[d]	.07
Excluding asthma patients						
COPD	6.1	3.8	1.64 (1.23-2.21)	1.57 (1.14-2.16)	.001[d]	.007[d]
Emphysema	0.7	0.5	1.40 (0.47-4.13)	1.21 (0.38-3.89)	.54	.74
Chronic bronchitis	5.4	3.6	1.56 (1.16-2.11)	1.49 (1.08-2.05)	.004[d]	.02[d]

Abbreviations: AD, atopic dermatitis; BMI, body mass index; COPD, chronic obstructive pulmonary disease; NHANES, National Health and Nutrition Examination Survey; OR, odds ratio.

[a]Weighted percentage will not reflect raw numbers, as they were calculated using NHANES survey design parameters.

[b]Reference group for logistic regression models.

[c]Adjusted for age, sex, race/ethnicity, education, income, tobacco usage, diabetes mellitus and asthma status, and BMI.

[d]Statistically significant (2-sided P≤.05).

Data from National Center for Health Statistics.[4]

may be due to similar pathogenic mechanisms in both conditions, including overlapping cytokine production and immune pathways.[5] Additionally, Harazin et al[6] discussed the role of a novel gene, collagen 29A1 (*COL29A1*), in the pathogenesis of AD, COPD, and asthma. Variations in this gene may predispose patients to not only atopic diseases but also COPD.[6]

Limitations of our study include self-reported diagnoses and lack of patients older than 59 years. Self-reported diagnoses could have resulted in some misclassification of COPD, as some individuals may have reported a diagnosis of COPD rather than their true diagnosis of asthma. We mitigated this limitation by constructing a subpopulation model with exclusion of individuals with asthma. Further studies with spirometry-diagnosed COPD are needed to explore this relationship and the potential contributory pathophysiologic mechanisms. Understanding this association may increase awareness of potential comorbidities and assist clinicians with adequate management of patients with AD.

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APPENDIX

eTABLE. Characteristics of Adults With and Without AD[a] in NHANES 1999-2006 (N=13,091)

Characteristic	AD	No AD	P value
COPD status,[b] n (weighted %[c])			
Yes	123/1391 (9.7)	608/11,700 (5.9)	<.0001[d]
No	1268/1391 (90.3)	11,092/11,700 (94.1)	
Emphysema,[e] n (weighted %[c])			
Yes	15/1391 (0.9)	76/11,700 (0.8)	.57
No	1376/1391 (99.1)	11,624/11,700 (99.2)	
Chronic bronchitis,[f] n (weighted %[c])			
Yes	113/1391 (9.2)	569/11,700 (5.5)	<.0001[d]
No	1278/1391 (90.8)	11,131/11,700 (94.5)	
Asthma,[g,h] n (weighted %[c])			
Yes	231/1389 (17.1)	1361/11,692 (12.5)	<.0001[d]
No	1158/1389 (82.9)	10,331/11,692 (87.5)	
Mean age (SD), y	40.01 (7.36)	38.83 (8.33)	.004[d]
Sex, n (weighted %[c])			
Male	584/1391 (43.4)	5491/11,700 (50.0)	<.001[d]
Female	807/1391 (56.6)	6209/11,700 (50.0)	
Annual household income,[i] n (weighted %[c])			
≥$20,000	1082/1291 (88.5)	8589/10,755 (84.6)	<.001[d]
<$20,000	209/1291 (11.5)	2166/10,755 (15.4)	
Race/ethnicity, n (weighted %[c])			
Non-Hispanic White	825/1391 (78.1)	5181/11,700 (67.1)	<.0001[d]
Non-Hispanic Black	255/1391 (8.5)	2566/11,700 (12.3)	
Other Hispanic/Mexican American	240/1391 (8.2)	3434/11,700 (15.2)	
Other race/multiracial	71/1391 (5.2)	519/11,700 (5.4)	
Education,[j] n (weighted %[c])			
Did not graduate high school	220/1389 (10.7)	3228/11,688 (18.2)	<.0001[d]
High school graduate	292/1389 (22.4)	2793/11,688 (25.2)	
Some college	477/1389 (35.7)	3343/11,688 (31.4)	
College graduate	400/1389 (31.2)	2324/11,688 (25.1)	

eTABLE. (continued)

Characteristic	AD	No AD	P value
Diabetes mellitus status,[k,l] n (weighted %[c])			
Yes	84/1390 (5.4)	592/11,694 (4.5)	.12
No	1306/1390 (94.6)	11,102/11,694 (95.5)	
Tobacco use,[m,n] n (weighted %[c])			
Yes	704/1391 (53.1)	5207/11,689 (47.7)	.01[d]
No	687/1391 (46.9)	6482/11,689 (52.3)	
Mean BMI[o] (SD)	28.60 (4.90)	28.12 (4.92)	.05[d]

Abbreviations: AD, atopic dermatitis; BMI, body mass index (calculated as kg/m^2); COPD, chronic obstructive pulmonary disease; NHANES, National Health and Nutrition Examination Survey.

[a]Atopic dermatitis status was assessed by the questions, "During the past 12 months, have you had dermatitis, eczema, or any other type of red, inflamed skin rash?" (1999-2004) and "Has a doctor or other health professional ever told you that you have eczema?" (2005-2006)

[b]Patients with COPD include individuals who received a diagnosis of emphysema or chronic bronchitis (evaluated by the 2 questions below).

[c]Weighted percentage was calculated using NHANES survey design parameters.

[d]Values that are statistically significant (2-sided $P \le .05$).

[e]Emphysema status was assessed by the question, "Has a doctor or other health professional ever told you that you had emphysema?"

[f]Chronic bronchitis status was assessed by the question, "Has a doctor or other health professional ever told you that you had chronic bronchitis?"

[g]Asthma status was assessed by the question, "Has a doctor or other health professional ever told you that you have asthma?"

[h]Patients missing: 10.

[i]Patients missing: 1045.

[j]Patients missing: 14.

[k]Diabetes status was assessed by the question, "Other than during pregnancy, have you ever been told by a doctor or health professional that you have diabetes or sugar diabetes?"

[l]Patients missing: 7.

[m]Tobacco use was assessed by the question, "Have you smoked at least 100 cigarettes in your entire life?"

[n]Patients missing: 11.

[o]Patients missing: 864.

Data from National Center for Health Statistics.[4]