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Atopic dermatitis (eczema) in US female nurses: lifestyle risk factors and atopic co-morbidities

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Atopic dermatitis (AD), or eczema, has been associated with a number of modifiable risk factors, particularly obesity.^{1,2} Data on other associations, including physical activity, alcohol consumption and smoking, are sparse. We examined the association between lifestyle risk factors and AD and between AD and atopic comorbidities using a cross-sectional analysis of the Nurses' Health Study II (NHSII), a cohort of female registered nurses in the US.

In 2009, participants were asked whether they “ever had clinician-diagnosed...” “Eczema (atopic dermatitis)”, “Hayfever (allergic rhinitis)” and “Food allergies”. Participants who answered “yes” to “Eczema (atopic dermatitis)” were defined as cases of lifetime AD. Biennially from 1989, participants were asked about lifestyle characteristics and clinician-diagnosed asthma. In our analysis, we used data on body weight, physical activity, alcohol intake and smoking collected in 2009. Those who reported a diagnosis of asthma at or before the 2009 questionnaire were defined as asthma cases. Race/ethnicity was reported in 1989. Information on family history of asthma was collected in 2001.

We used logistic regression models to calculate age- and multivariate-adjusted odds ratios (OR) and 95% confidence intervals (CIs) for the association between demographic and lifestyle factors and AD and between atopic comorbidities and AD. An indicator variable was created for the missing data of a variable. All statistical analysis was performed with

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SAS, version 9.2 (SAS Institute, Inc., Cary, NC). All tests were 2-tailed, and the significance level was set at $P < 0.05$.

Return of the questionnaire was considered informed consent. The study was approved by the institutional review board of Brigham and Women's Hospital.

A total of 90,488 participants returned questionnaires in 2009, of whom 80,096 answered the question regarding a diagnosis of AD, hayfever and food allergy and were included in the final analysis. Characteristics of the participants are listed in Table 1. Of the included participants, 10.1% ($n=8,069$) had a history of AD. Associations between AD and lifestyle risk factors in 2009 and AD and other atopic comorbidities are presented in Table 2 and Supplementary Table 1, respectively. Increasing BMI was significantly associated with AD in the multivariate analysis (P for trend < 0.0001), as was a past history of smoking ($OR=1.10$, 95% CI 1.05–1.16), but not current smoking. Physical activity and alcohol consumption were not associated with AD. AD was significantly associated with asthma, hayfever and food allergy, including associations with specific allergies to peanuts, tree nuts, shellfish, milk and eggs.

Using cross-sectional data from the NHSII, we have provided further evidence supporting the association between obesity and AD. However, our study did not demonstrate a link between decreased physical activity or alcohol consumption and AD. With regards to cigarette smoking, past, but not current, smoking was associated with AD.

Our finding of increased obesity in AD is consistent with previous reports, including a recent meta-analysis.¹ A number of potential etiologies for this association, including decreased physical activity, were suggested in that review. While data from the 2010 and 2012 National Health Interview Survey (NHIS) indicated that participants with eczema had lower physical activity levels than participants without eczema,² our study did not, after adjusting for other risk factors including BMI. The NHIS data may have been confounded by other risk factors, particularly obesity.² Additionally, the association between AD and obesity was maintained in our study after adjusting for physical activity, suggesting that other etiologies may be more important.

Increased alcohol consumption was not associated with AD in our study, but was seen in the NHIS.² The reason for that potential association is unknown, but the psychological impact of AD may predispose patients to consume alcohol. Connections between AD, mental health and substance use merit further study.

We found an increased prevalence of AD in past but not current smokers. A Taiwanese study of 83 patients with adult-onset AD compared with 142 controls found current ($OR=4.99$) and ever smoking ($OR=3.62$) were associated with adult-onset AD.³ Data from the NHIS showed that adult eczema was increased in people who smoked more than 100 cigarettes in their lifetime and in current smokers.²

The major strength of our study is our large sample size, with high-quality participant characteristic data. Our study benefits from a more specific question used to determine AD history than those used by other recent studies. For example, the 2010 NHIS asked, "During

the past 12 months, have you had dermatitis, eczema, or any other red, inflamed skin rash?”² That approach may overestimate the prevalence of AD and include other skin diseases, such as psoriasis. Additionally, our population of nurses is likely more health-literate on average than the general population.

While the NHSII is a longitudinal cohort study, the present analysis is cross-sectional due to a lack of information on date of AD, hayfever and food allergy diagnosis. Our question on lifetime prevalence of AD likely excluded a number of participants due to recall bias. A similar question (“Have you ever been told by a doctor or other health professional that you had eczema or any kind of skin allergy?”) was recently validated.⁴ While sensitivity was low (0.43), specificity (0.97) and positive predictive value (0.91) were high. Factors associated with recall of AD in previous studies include eczema after age 15, taking more than 1 week of sick leave due to eczema, long duration of eczema in childhood and concomitant atopic disease.^{5,6} Therefore, our study may be biased towards more severe, persistent AD. Finally, our study population consists of female nurses only, and is predominantly of white race, limiting the generalizability of our results.

In conclusion, in a large population of U.S. female nurses, obesity is increased in AD, while decreased physical activity and alcohol consumption are not. The relationship with smoking is complex, with past but not current smoking associated with AD. These findings suggest a possible increased risk of cardiovascular disease in AD.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1

Characteristics of Nurses' Health Study II participants in 2009 with and without a lifetime history of atopic dermatitis

	No atopic dermatitis (n=72,027)	Atopic dermatitis (n=8,069)
Age *	54.5 (4.6)	54.5 (4.6)
Race/ethnicity, White, %	95.0	93.6
Body mass index (kg/m ²)	27.6 (6.4)	28.1 (6.7)
Total activity MET/wk ^a	23.7 (30.0)	23.0 (29.2)
Alcohol (g/day)	6.3 (10.2)	6.3 (10.4)
Current smokers, %	6.2	5.6
Family history of asthma, %	23.2	33.6
Asthma, %	16.9	32.1
Hayfever, %	23.8	49.2
Food allergy, %	7.1	20.4
Peanut allergy, %	0.6	2.4
Tree nut allergy, %	0.8	3.2
Shellfish allergy, %	1.7	4.5
Milk allergy, %	1.3	4.9
Egg allergy, %	0.8	3.5
Other food allergy, %	4.6	14.3

Values are means (SD) or percentages and are standardized to the age distribution of the study population.

* Value is not age adjusted

MET, metabolic equivalent hours

Table 2

Association of demographic and lifestyle factors as well as family history of asthma with atopic dermatitis

		n/n (non-cases/cases)	Age-adjusted analysis (OR (95% CI))	Multivariate-adjusted analysis (OR (95% CI))*
Age per 5 years' increase		72,027/8,069	0.99 (0.97, 1.01)	0.98 (0.95, 1.003)
Race/ethnicity	White	68,430/7,551	1.00	1.00
	Hispanic	1146/129	1.02 (0.85, 1.22)	1.00 (0.83, 1.20)
	Black	1007/141	1.27 (1.06, 1.52)	1.23 (1.03, 1.48)
	Asian	1020/188	1.67 (1.43, 1.96)	1.73 (1.47, 2.03)
Body mass index (kg/m²)	<25	29385/3109	1.00	1.00
	25–29.9	21651/2398	1.05 (0.99, 1.11)	1.04(0.98, 1.10)
	30–34.9	11649/1359	1.10 (1.03, 1.18)	1.10 (1.02, 1.18)
	35+	8918/1170	1.24 (1.16, 1.33)	1.23 (1.14, 1.32)
	<i>P</i> for trend	<.0001	<.0001	
Physical activity (MET/week)	1st quintile	13928/1598	1.00	1.00
	2nd quintile	14062/1608	1.00 (0.93, 1.07)	1.02 (0.95, 1.10)
	3rd quintile	13997/1628	1.01 (0.94, 1.09)	1.06 (0.98, 1.14)
	4th quintile	13979/1600	1.00 (0.93, 1.07)	1.06 (0.98, 1.14)
	5th quintile	14171/1519	0.93 (0.86, 1.00)	1.00 (0.93, 1.08)
	<i>P</i> for trend		0.09	0.70
Alcohol consumption (g/day)	0	22031/2606	1.00	1.00
	1–4	20287/2227	0.93 (0.87, 0.98)	0.94 (0.89, 1.00)
	5–9	9129/973	0.90 (0.83, 0.97)	0.93 (0.86, 1.00)
	10–14	5487/604	0.93 (0.85, 1.02)	0.97 (0.88, 1.07)
	15–29	5881/628	0.90 (0.82, 0.99)	0.93 (0.85, 1.03)
	30+	2588/318	1.04 (0.92, 1.18)	1.09 (0.96, 1.24)
	<i>P</i> for trend		0.48	0.59
Smoking status (cigarettes/day)	Never	46993/5168	1.00	1.00
	Past smokers	20484/2448	1.09 (1.04, 1.15)	1.10 (1.05–1.16)
	Current smokers (< 15)	2500/235	0.86 (0.75, 0.98)	0.93 (0.81–1.07)
	Current smokers (15–24)	1461/159	0.99 (0.84, 1.17)	1.10 (0.93–1.30)
	Current smokers (25+)	474/52	1.00 (0.75, 1.34)	1.06 (0.79–1.42)
Family history of asthma	No	49493/4846	1.00	1.00
	Yes	14913/2455	1.68 (1.60, 1.77)	1.67 (1.58, 1.75)

* Adjusted for age, race/ethnicity, BMI, physical activity, alcohol intake, cigarette smoking, and family history of asthma.

MET, metabolic equivalent hours