

Association between Atopic Dermatitis and Depression in US Adults

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TO THE EDITOR

Atopic dermatitis (AD) is associated with intense pruritus, high rates of sleep disturbance (Silverberg *et al.*, 2015b), stigma, increased healthcare costs (Silverberg, 2015) and poor quality of life (Silverberg *et al.*, 2015b). All of these might contribute toward higher rates of depression. Previous studies found that Taiwanese adolescents/adults with AD have a higher incidence of major depressive disorder than those without AD (1.42 vs. 0.20 per 1,000 person-years) (Cheng *et al.*, 2015), as well as a higher prevalence of depression in Korean males (10.4 vs. 5.3%) (Kim *et al.*, 2015). A recent study found that US children with AD had significantly higher prevalences of ever having depression (6.5%) and current depression (3.9%) compared with those without AD (3.4% and 1.8%, respectively) (Yaghmaie *et al.*, 2013). However, the prevalence of depression in US adults with AD is not known.

We studied participants from the 2005–2006 NHANES and 2012 National Health Interview Survey. Both surveys were sponsored and conducted by National Center for Health Statistics (NCHS) of Centers for Disease Control and Prevention. Households were selected through a stratified, randomized, multistage, and probability-cluster design. Health interviews were conducted in the home in either English or Spanish. The survey results were weighted to represent the population of non-institutionalized adults nationally and in each state using data from the U.S. Bureau of the Census, and to account for the complex survey

design, survey non-response and post-stratification. This study was approved by the institutional review board at the Northwestern University.

The questions used to assess for history of eczema and depression are shown in Supplementary Table 1 online. In NHANES, respondents were asked questions from the Patient Health Questionnaire (PHQ), a validated self-reported assessment based on the nine DSM-IV symptoms for depression (Spitzer *et al.*, 1999; Arroll *et al.*, 2010). A binary variable was also created based on the SIGECAPS criteria (acronym for depression symptoms), which are predictive of major depressive disorder when $\geq 4/8$ positive responses are combined with depressed mood for at least two week (Carlat, 1998). PHQ scores were classified as none (score 0–4), mild (score 5–9), moderate (score 10–14), and severe (score 15–27) depression.

All data processing and statistical analyzes were performed with SURVEY procedures in SAS version 9.4 (SAS Institute, Cary, NC). Complete data analysis was performed. Associations between AD and depression were tested via logistic regression models. In NHANES, the dependent variables included the nine PHQ9 questions, SIGECAPS, and total PHQ9 depression score. In NHIS, the dependents variables were self-reported history of depression ever or in the past year. The independent variable was history of AD. Multivariate models included age, gender, race/ethnicity, level of education, family poverty income ratio, history of asthma and hay fever. Crude

and adjusted prevalence odds ratios (OR) and 95% confidence intervals (CIs) were estimated.

A total of 5,555 adults (≥ 18 years) were included in NHANES 2005–2006. The prevalence of AD was 6.2% (95% CI: 5.6–6.8%). AD was associated with female gender, poverty income ratio ≥ 4 , greater than high school or GED equivalent education, history of asthma and hay fever (Supplementary Table 2 online). One hundred and nine adults (31.0%) with AD reported one or more symptoms of depression. In multivariate survey logistic regression models of NHANES data that controlled for socio-demographics, history of asthma and hay fever, AD was associated with higher odds of having little interest in doing things, feeling down, depressed or hopeless, feeling tired or having little energy, having a poor appetite, feeling bad themselves, having trouble concentrating and moving or speaking slowly or too fast and having thoughts of being better off dead (Table 1).

The prevalence of depression as judged by the SIGECAPS criteria was higher in adults with AD compared with adults who did not have eczema (17.5 vs. 10.5%; adjusted OR (95% CI): 1.89 (1.28–2.77)). Moreover, AD was associated with higher odds of moderate (2.24 (1.20–4.17)) and severe (5.64 (2.88–11.07)) depression as judged by the PHQ9 score.

A total of 34,613 adults were included in NHIS 2012. The US prevalence (95% CI) of eczema in adults was 7.2% (6.9–7.6%). The associations of adult eczema in NHIS 2012 were previously described (Silverberg *et al.*, 2015b). The lifetime prevalence of health-care diagnosed depression was higher in adults with AD compared with adults who did not have AD (26.9 vs.

Abbreviations: AD, atopic dermatitis; CI, confidence interval; NHANES, National Health and Nutrition Examination Survey; NHIS, National Health Interview Survey; OR, odds ratio; PHQ, Patient Health Questionnaire; SIGECAPS, depression acronym for disturbances in at least 4/8 symptoms with depressed mood: sleep, interest, guilt, energy, concentration, appetite, psychomotor disturbance

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Table 1. Association between depression and eczema in US adults from NHANES 2005–2006 ($n = 5,555$)

Variable	Outcomes	Eczema							
		No			Yes				
		Freq.	Percent (95% CI)	Freq.	Percent (95% CI)	Crude OR (95% CI)	P-value	Adjusted OR (95% CI)	P-value
Little interest in doing things	None	3,616	81.34 (79.93, 82.75)	232	74.59 (68.78, 80.41)	1.00	—	1.00	—
	Several days	620	13.61 (12.35, 14.87)	51	16.51 (11.45, 21.57)	1.32 (0.90, 1.94)	0.15	1.26 (0.85, 1.88)	0.26
	More than half the days	160	3.03 (2.44, 3.62)	20	5.98 (2.92, 9.04)	2.17 (1.21, 3.89)	0.009	2.45 (1.35, 4.47)	0.003
Feeling down depressed, or hopeless	Nearly every day	114	2.02 (1.57, 2.48)	10	2.92 (0.77, 5.07)	1.57 (0.71, 3.47)	0.27	1.94 (0.85, 4.42)	0.12
	None	3,542	80.22 (78.79, 81.66)	225	72.86 (66.99, 78.72)	1.00	—	1.00	—
	Several days	715	15.09 (13.79, 16.40)	52	16.10 (11.25, 20.95)	1.19 (0.82, 1.73)	0.37	1.25 (0.84, 1.85)	0.27
Trouble sleeping or sleeping too much	More than half the days	157	2.89 (2.32, 3.45)	22	6.25 (3.09, 9.41)	2.39 (1.34, 4.26)	0.003	2.57 (1.40, 4.71)	0.002
	Nearly every day	99	1.80 (1.35, 2.24)	15	4.79 (1.93, 7.65)	2.91 (1.48, 5.73)	0.002	3.32 (1.63, 6.78)	0.001
	None	2,957	65.20 (63.43, 66.97)	192	61.99 (55.61, 68.36)	1.00	—	1.00	—
Feeling tired or little energy	Several days	997	23.23 (21.64, 24.82)	73	23.82 (18.22, 29.43)	1.09 (0.79, 1.52)	0.59	1.00 (0.70, 1.42)	0.98
	More than half the days	265	5.91 (5.04, 6.78)	21	5.62 (2.62, 8.62)	1.01 (0.56, 1.83)	0.98	0.97 (0.53, 1.78)	0.93
	Nearly every day	293	5.66 (4.85, 6.48)	27	8.57 (4.96, 12.17)	1.58 (0.97, 2.59)	0.07	1.68 (0.99, 2.86)	0.06
Poor appetite or overeating	None	2,298	51.43 (49.58, 53.29)	129	39.31 (32.92, 45.70)	1.00	—	1.00	—
	Several days	1,585	35.47 (33.69, 37.25)	119	40.59 (34.08, 47.10)	1.50 (1.11, 2.04)	0.009	1.38 (1.00, 1.89)	0.048
	More than half the days	331	7.07 (6.13, 8.00)	39	11.57 (7.39, 15.74)	2.13 (1.35, 3.37)	0.001	1.93 (1.18, 3.14)	0.009
Feeling bad about yourself	Nearly every day	299	6.03 (5.20, 6.87)	27	8.53 (4.82, 12.25)	1.86 (1.10, 3.13)	0.02	1.89 (1.09, 3.27)	0.02
	None	3,582	80.53 (79.08, 91.98)	227	75.55 (66.67, 78.43)	1.00	—	1.00	—
	Several days	640	13.65 (12.38, 14.92)	51	14.24 (9.85, 18.63)	1.16 (0.79, 1.69)	0.46	1.16 (0.78, 1.72)	0.46
Trouble concentrating	More than half the days	143	3.24 (2.58, 3.90)	17	5.56 (2.31, 8.80)	1.89 (0.98, 3.63)	0.06	1.72 (0.90, 3.31)	0.10
	Nearly every day	149	2.58 (2.06, 3.11)	19	7.65 (4.01, 11.29)	3.28 (1.88, 5.73)	<0.0001	3.61 (1.96, 6.65)	<0.0001
	None	3,887	86.60 (85.35, 87.84)	244	77.84 (72.45, 83.27)	1.00	—	1.00	—
Moving or speaking slowly or too fast	Several days	467	10.41 (9.29, 11.54)	45	15.03 (10.31, 19.76)	1.63 (1.10, 2.40)	0.02	1.49 (0.98, 2.27)	0.06
	More than half the days	81	1.57 (1.12, 2.02)	14	4.30 (1.69, 6.92)	3.08 (1.53, 6.18)	0.002	3.07 (1.48, 6.38)	0.003
	Nearly every day	79	1.42 (1.00, 1.83)	10	2.83 (0.82, 4.83)	2.22 (1.01, 4.88)	0.048	2.73 (1.20, 6.22)	0.02
Feeling down depressed, or hopeless	None	3,831	85.58 (84.30, 86.86)	237	77.11 (71.58, 82.64)	1.00	—	1.00	—
	Several days	497	10.58 (9.45, 11.70)	46	15.16 (10.29, 20.03)	1.60 (1.08, 2.39)	0.02	1.51 (0.99, 2.30)	0.05
	More than half the days	98	2.14 (1.60, 2.68)	20	5.13 (2.39, 7.86)	2.69 (1.44, 5.03)	0.002	2.84 (1.42, 5.67)	0.003
Feeling tired or little energy	Nearly every day	88	1.70 (1.26, 2.14)	11	2.60 (0.75, 4.45)	1.69 (0.78, 3.65)	0.19	1.88 (0.85, 4.18)	0.12
	None	4,092	91.93 (90.96, 92.90)	267	85.57 (81.00, 90.15)	1.00	—	1.00	—
	Several days	302	5.83 (4.99, 6.66)	39	11.87 (7.67, 16.07)	2.19 (1.42, 3.36)	0.0004	2.21 (1.43, 3.43)	0.0004
Feeling bad about yourself	More than half the days	74	1.59 (1.15, 2.04)	5	1.64 (0.00, 3.42)	1.16 (0.36, 3.69)	0.81	1.30 (0.39, 4.40)	0.67
	Nearly every day	42	0.65 (0.39, 0.91)	3	0.92 (0.00, 2.00)	1.52 (0.43, 5.42)	0.52	2.06 (0.55, 7.71)	0.28

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