National Eczema Association Research Grant Final Report
Mental Health Comorbidity in Atopic Dermatitis
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Background. Atopic dermatitis (AD) exerts a significant psychosocial burden on both children and families. Recent data, primarily from Europe, suggest children with AD may be at increased risk of developing attention-deficit disorder and autism.

Objective. We aimed to quantify the mental health burden associated with pediatric atopic dermatitis using a population-based survey from the United States.

Design. A cross-sectional study design was used analyzing data from the 2007 National Survey of Children's Health (NSCH).

Participants. The 2007 NSCH was sponsored by the Maternal and Child Health Bureau and the U.S. Department of Health and Human Services and gathered data on 92,642 non-institutionalized children ages 0-17 regarding multiple aspects of childrens' health.

Main Outcome Measures. The lifetime prevalence of provider-diagnosed attention-deficit hyperactivity disorder, anxiety, depression, conduct disorder, and autism were calculated for those with and without a history of atopic dermatitis.

Results. The odds of having ADHD was significantly increased in children with AD compared to non-AD controls, OR 1.87 (95% CI 1.54, 2.27) even after controlling for known confounders including sleep loss. The adjusted odds ratios for depression, anxiety, conduct disorder, and autism were 1.81 (95% CI 1.33,2.46) , 1.77 (95% CI 1.36, 2.29), 1.87 (1.46, 2.39), and 3.04 (95% CI 2.13, 4.34), respectively, and these estimates were all statistically significant. A clear dose-dependent relationship was observed between the prevalence of a mental health disorder and the reported severity of the skin disease.

Conclusions. Our data reveal a striking association between mental health disorders and AD in the U.S. pediatric population. The severity of the skin disease alters the strength of the association. Prospective cohort studies are needed to verify these associations and to explore underlying mechanisms. Chronic sleep disruption and systemic inflammation, both commonly found in AD, have been associated with several mental health disorders. Strategies to prevent AD or to aggressively treat early skin inflammation may modify the risk of developing mental health disorders in at-risk children.

Data Tables

Table 1. Prevalence of AD stratified by age, household income, gender, and race

Variable	Strata	Prevalence of AD	Chi square p-value
Age	0-3	15.62	<0.0001
	4-8	13.88	
	9-12	12.47	
	13-18	10.15	
Gender	Female	13.33	0.2537
	Male	12.68	
Ethnicity/Race	White	12.09	<0.0001
	Black	19.69	
	Hispanic	10.29	
	Multiracial	16.11	
	Other	11.82	
Household income	0-99% FPL	12.54	0.4719
	100% FPL and above	13.08	

Table 2. Prevalence of mental health care utilization and mental health concern according to eczema status in the 2007 National Survey of Children Health (NSCH).

Variable	Group Without Eczema (%)	Group With Eczema (%)	Chi-square p-value
Seen a mental health care provider	7.89	12.12	<.0001
Received treatment for behavior	6.61	11.31	<.0001
Parent concerned about child's behavior			
None	79.93	75.42	
A little	13.82	16.59	
A lot	6.25	7.99	0.0470

Table 3. Prevalence of mental health disorders in children according to eczema status in the 2007 National Survey of Children Health (NSCH).

	Group Without Eczema (%)	Group With Eczema (%)	Odds Ratio	95% CI of OR	Chi-square p-value
ADHD					
Ever	8.19	12.60	1.62	(1.35, 1.93)	<.0001
Current	6.37	9.57	1.55	(1.29, 1.87)	<.0001
Medicated	4.31	6.27	1.49	(1.17, 1.88)	0.0009
Depression					
Ever	3.37	6.52	2.00	(1.49, 2.69)	<.0001
Current	1.76	3.93	2.28	(1.55, 3.35)	<.0001
Anxiety					
Ever	4.13	7.25	1.81	(1.43, 2.29)	<.0001

Current	2.59	5.09	2.02	(1.59, 2.56)	<.0001
Conduct Disorder					
Ever	3.97	7.74	2.03	(1.63, 2.52)	<.0001
Current	2.85	6.51	2.37	(1.86, 3.02)	<.0001
Autism					
Ever	1.49	3.97	2.73	(1.94, 3.84)	<.0001
Current	0.89	2.19	2.51	(1.67, 3.77)	<.0001

Table 4. Prevalence of mental health disorders in children with eczema according to parental report of eczema severity

Outcome	Eczema Severity	Prevalence of Mental Health Outcome	Chi-square p-value
ADHD	Mild	10.68	<.0001
	Moderate	13.21	
	Severe	27.70	
Depression	Mild	5.40	0.0101
	Moderate	7.20	
	Severe	14.11	
Anxiety	Mild	5.47	0.0002
	Moderate	9.11	
	Severe	16.26	
Conduct Disorder	Mild	5.91	<.0001
	Moderate	8.07	
	Severe	22.89	
Autism	Mild	2.55	<.0001
	Moderate	5.00	
	Severe	12.85	

Table 5. Parental report of number of nights of adequate sleep stratified by eczema status. Values are the percent of parents reporting the average number of nights of adequate sleep.

Eczema severity category	Nights of adequate sleep per week (% of subjects per eczema severity category)								Chi square p-value
	0	1	2	3	4	5	6	7	
None	2.03	0.70	2.23	2.74	4.98	13.18	9.16	64.98	<0.0001
Mild	3.05	0.87	2.06	4.10	7.51	13.26	10.66	58.49	
Moderate	3.71	1.73	1.79	3.05	7.11	16.69	7.21	58.72	
Severe	8.26	2.52	9.33	2.57	8.68	8.95	3.84	55.85	

Table 6. Prevalence of ADHD in children according to eczema status after adjusting for potential confounders using logistic regression.

Eczema Status	Adjusted OR (excluding sleep variable)	95% CI	p-values FDR-adjusted	Adjusted OR (including sleep variable)	95% CI	p-values FDR-adjusted

No Eczema	1.00	-	-	1.00	-	-
Any Eczema	1.87	(1.54, 2.27)	<.0001	1.76	(1.44, 2.16)	<0.0001
Mild	1.66	(1.28, 2.15)	0.0003	1.61	(1.23, 2.12)	0.0003
Moderate	1.76	(1.30, 2.38)	0.0004	1.58	(1.13, 2.22)	0.0004
Severe	4.35	(2.73, 6.93)	<.0001	3.88	(2.49, 6.04)	<.0001

Table 7. Prevalence of depression in children according to eczema status after adjusting for potential confounders using logistic regression.

Eczema Status	Adjusted OR (excluding sleep variable)	95% CI	p-values FDR-adjusted	Adjusted OR (including sleep variable)	95% CI	p-values FDR-adjusted
No Eczema	1.00	-	-	1.00	-	-
Any Eczema	1.81	(1.33, 2.46)	0.0002	1.56	(1.18, 2.06)	0.002
Mild	1.64	(1.06, 2.53)	0.0750	1.33	(0.94, 1.87)	0.2244
Moderate	2.02	(1.31, 3.14)	0.0097	1.89	(1.18, 3.02)	0.0458
Severe	2.12	(1.00, 4.48)	0.0980	1.86	(0.87, 3.99)	0.2244

Table 8. Prevalence of anxiety in children according to eczema status after adjusting for potential confounders using logistic regression.

Eczema Status	Adjusted OR (excluding sleep variable)	95% CI	p-values FDR-adjusted	Adjusted OR (including sleep variable)	95% CI	p-values FDR-adjusted
No Eczema	1.0	-	-	1.0	-	-
Any Eczema	1.77	(1.36, 2.29)	<.0001	1.41	(1.11, 1.79)	0.0049
Mild	1.44	(1.01, 2.05)	0.0936	1.11	(0.86, 1.44)	0.4984
Moderate	2.18	(1.47, 3.23)	0.0006	1.81	(1.22, 2.68)	0.0199
Severe	2.81	(1.28, 6.17)	0.0301	2.11	(0.93, 4.81)	0.1505

Table 9. Prevalence of conduct disorder in children according to eczema status after adjusting for potential confounders using logistic regression.

Eczema Status	Adjusted OR (excluding sleep variable)	95% CI	p-values FDR-adjusted	Adjusted OR (including sleep variable)	95% CI	p-values FDR-adjusted
No Eczema	1.0	-	-	1.0	-	-
Any Eczema	1.87	(1.46, 2.39)	<0.0001	1.82	(1.39, 2.38)	<.0001
Mild	1.59	(1.17, 2.18)	0.0068	1.59	(1.12, 2.25)	0.0199
Moderate	1.82	(1.22, 2.72)	0.0068	1.74	(1.14, 2.66)	0.0199
Severe	3.90	(1.88, 8.09)	0.0016	3.63	(1.66, 7.93)	0.0073

Table 10. Prevalence of autism in children according to eczema status after adjusting for potential confounders using logistic regression.

Eczema Status	Adjusted OR (excluding sleep variable)	95% CI	p-values FDR-adjusted	Adjusted OR (including sleep variable)	95% CI	p-values FDR-adjusted
No Eczema	1.0	-	-	1.0	-	-
Any Eczema	3.04	(2.13, 4.34)	<.0001	2.90	(1.94, 4.33)	<.0001
Mild	1.99	(1.25, 3.16)	0.0052	1.98	(1.12, 3.52)	0.0292
Moderate	3.59	(1.97, 6.54)	<.0001	3.06	(1.57, 5.96)	0.0020
Severe	11.26	(5.49, 23.07)	<.0001	9.42	(4.37, 20.27)	<.0001