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Association between atopic dermatitis and dermatophytosis: A TriNetX retrospective cohort study

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Atopy is characterized by immediate hypersensitivity, driven by Th2 immune response and high IgE levels. The dysfunctional epidermal barrier and altered immune pathways in atopic dermatitis (AD) may contribute to increased susceptibility to fungal infections and hypersensitivity reactions,¹ due to dermatophytes and *Malassezia* species, respectively.² In addition, immediate hypersensitivity triggered by dermatophyte antigen stimulation causes IgE class-switching and eosinophilic recruitment, which may exacerbate atopic disease.³ Furthermore, patients with AD and dermatophytosis have had resolution of AD following systemic antifungal treatment.³ Therefore, we evaluated for potential associations between AD and dermatophytosis in a retrospective database cohort study to inform screening and intervention strategies.

TriNetX, a research network with patient data from 30 countries, was searched on June 30, 2025, for patients with vs without AD, 2005–2025. Cohorts were propensity score

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DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

AI was not used in the preparation of this work.

Conflicts of interest

Dr Lipner has served as a consultant for Moberg Pharmaceuticals and BelleTorus Corporation. Ms Zhou, Drs Gold, and Hay have no conflicts of interest to declare.

Patient consent: This retrospective study is exempt from informed consent.

IRB approval status: The data reviewed are a secondary analysis of existing data, do not involve intervention or interaction with human subjects, and are deidentified per the deidentification standard defined in Section §164.514 (a) of the HIPAA Privacy Rule. The process by which the data are deidentified is attested through a formal determination by a qualified expert as defined in Section §164.514(b) (1) of the HIPAA Privacy Rule. This formal determination by a qualified expert was refreshed in December 2020. This activity was reviewed by CDC, deemed research not involving human subjects, and was conducted consistent with applicable federal law and CDC policy (see eg, 45 C.F.R. part 46; 21 C.F.R. part 56; 42 U.S.C. §241(d), 5 U.S.C. §552a, 44 U.S.C. §3501 et seq.).

matched by age, sex, race, ethnicity, HIV infection status, organ transplant status, long-term corticosteroid use, immunodeficiency, diabetes mellitus, and obesity (Supplementary Appendix, available via Mendeley at <https://data.mendeley.com/datasets/nk6zmcdnyx/1>). Odds ratios and 95% CIs of dermatophytosis occurrence ≥ 1 -day following AD diagnosis were calculated. Bonferroni correction for multiple hypothesis testing (8 independent queries) was applied.

Overall, 1,062,994 patients with AD (mean followup 4.32 years) and 1,062,994 matched controls (mean follow-up 3.98 years) were included. After matching, demographics were similar between cohorts, with all standardized mean differences < 0.06 (Table I). Patients with vs without AD had increased odds of dermatophytosis (odds ratio [95% CI] = 1.95 [1.911-1.99], $P < .001$), with the highest odds for tinea manuum (5.32 [4.12-6.87], $P < .001$), followed by tinea imbricata (2.98 [2.72-3.26], $P < .001$), tinea pedis (2.37 [2.28-2.47], $P < .001$), tinea corporis (2.27 [2.18-2.37], $P < .001$), tinea cruris (2.14 [2.01-2.28], $P < .001$), tinea barbae/capitis (2.09 [1.95-2.23], $P < .001$), and tinea unguium (1.62 [1.56-1.68], $P < .001$) (Table II).

We found that patients with AD were more likely to develop dermatophytosis, including all analyzed subtypes, compared to controls. Similarly, in a crosssectional study of 180 randomly selected patients, with 19% (35/180) having chronic dermatophytosis, chronic dermatophytosis was ~ 3 -fold more common in patients with vs without atopic disease (41% vs 14%, P value not reported), and 79% (11/14) of chronically infected, atopic patients had immediate hypersensitivity to dermatophyte antigen.⁴ In addition, in a retrospective study of 198,102,435 emergency department visits, including 3,070,678 (primary) and 1,848,130 (secondary) AD diagnoses, AD was associated with increased odds of any skin infection (1.93 [1.89-1.97]), including dermatophytosis (6.32 [6.08-6.56]).⁵

Limitations include potential miscoding, a single International Classification of Diseases code for tinea barbae/capitis, and lack of information on diagnostic method, if any. While tinea manuum/imbricata are uncommon, small cohorts for these subtypes limit the strength of conclusions. Large, prospective studies involving dermatologist evaluations and mycologic confirmation might help corroborate our findings. We could not assess dermatophytosis chronicity, AD disease severity, and all possible potential confounders.

In conclusion, AD diagnosis was associated with increased odds of subsequent dermatophyte infection. Our findings suggest a need for heightened physician awareness and patient education regarding dermatophytosis in patients with AD to ensure prompt testing and treatment. Prospective studies with mycologic confirmation are needed to corroborate these results. Further research is needed to better understand the immunological mechanism of the atopy-dermatophytosis relationship and assess the response of atopic disease to dermatophytosis treatment.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the CDC.

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Demographic characteristics and comorbidities in patients with vs without atopic dermatitis after matching

Table 1.

Characteristics	Atopic dermatitis (n = 1,062,994)	Controls (n = 1,062,994)	SMD
Sex*			
Female	588,107 (55.3%)	570,622 (53.7%)	0.033
Male	450,469 (42.4%)	469,534 (44.2%)	0.036
Mean (SD) age at diagnosis, y	28.8 (25.6)	29.2 (25.2)	0.017
Mean (SD) current age, y	35.1 (25.4)	35.4 (25.4)	0.011
Race*			
White	616,963 (58.0%)	599,273 (56.4%)	0.034
Black	187,010 (17.6%)	174,377 (16.4%)	0.032
Asian	60,560 (5.7%)	70,415 (6.6%)	0.039
Ethnicity*			
Hispanic	145,301 (13.7%)	138,088 (13.0%)	0.020
Not Hispanic	666,963 (62.7%)	681,472 (64.1%)	0.028
Comorbidities			
HIV infection	3270 (0.3%)	2193 (0.2%)	0.020
Organ transplant	3809 (0.4%)	7710 (0.7%)	0.050
Long-term corticosteroid use	16,013 (1.5%)	20,054 (1.9%)	0.029
Immunodeficiency	7233 (0.7%)	9351 (0.9%)	0.023
Diabetes mellitus	69,722 (6.6%)	71,590 (6.7%)	0.007
Obesity	10,779 (1.0%)	8010 (0.8%)	0.028

SMD, Standard mean difference.

* Unknown values for sex, race, and ethnicity were excluded from matching and represent the missing data percentages.

Table II.
Incidence and odds ratios of dermatophytosis in patients with vs without atopic dermatitis^{*}

Dermatophytosis subtype	Atopic dermatitis (n = 1,062,994)	Controls (n = 1,062,994)	P value [†]	OR (95% CI) [‡]
All dermatophytosis	5.56%	2.94%	<.001	1.95 (1.91-1.99)
Tinea barbae and tinea capitis	0.52%	0.25%	<.001	2.09 (1.95-2.23)
Tinea unguium	2.33%	1.46%	<.001	1.62 (1.56-1.68)
Tinea manuum	0.07%	0.01%	<.001	5.32 (4.12-6.87)
Tinea pedis	1.38%	0.59%	<.001	2.37 (2.28-2.47)
Tinea corporis	1.48%	0.66%	<.001	2.27 (2.18-2.37)
Tinea imbricata	0.34%	0.12%	<.001	2.98 (2.72-3.26)
Tinea cruris	0.56%	0.26%	<.001	2.14 (2.01-2.28)

Bold values indicate statistical significance ($P < .05$).
OR, Odds ratio.

^{*} Mean follow-up for the atopic dermatitis cohort and controls was 4.32 years and 3.98 years, respectively.

[†] Bonferroni correction for multiple hypothesis testing applied.