SARS-COV-2 Infection in Patients with Atopic Dermatitis: A Cross-Sectional Study

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Background

- SARS-COV-2 disproportionately impacts certain populations with inflammatory conditions who have an elevated risk of respiratory comorbidities [1,2,3].
- In atopic dermatitis (AD), inflammatory cytokines, e.g. interleukin-13, can regulate SARS-COV-2 entry in airway epithelial cells by increasing transmembrane protease serine 2 and decreasing angiotensin-converting enzyme 2 expression [1].

Objective

- To compare the rates of SARS-COV-2 infection, hospitalization, and mortality among AD patients to controls without AD in a California-based population.

Methods

- A retrospective cross-sectional study was conducted using the University of California COVID Research Data Set (UC CORDS), a HIPAA secure medical records dataset for patients tested for SARS-COV-2 across UC medical centers [4].
- Information regarding SARS-COV-2 testing, patient demographics, hospitalization, and mortality were collected up to October 8, 2020.
- Patients were diagnosed with the following: "atopic dermatitis," "acute dermatitis," "atopic neurodermatitis," "nummular eczema," or "flexural eczema"
- Specific systemic treatment subgroups were identified (prednisone, methotrexate, cyclosporine, or dupilumab) for at least 30 days prior to SARS-COV-2 testing.
- Fisher Exact tests were used for statistical analysis when categories had less than five patients, while Chi-Squared tests were use for the rest.

Table I. AD patients within the UC CORDS that tested positive for SARS-COV-2 compared to patients without AD

	SARS-COV-2 positive AD patients			Hospitalized SARS-COV-2 positive AD patients++			SARS-COV-2 positive AD patients that died+++		
Condition (age range, avg age - years)	Atopic Dermatitis, n (%)	Control, n	p-value+	Atopic Dermatitis, n (%)	Control, n	p-value+	Atopic Dermatitis, n (%)	Control, n	p-value+
Total (0-89, 42)	159 (2.95%)	9649	0.0063	22 (13.8%)	1858	0.3315	3 (1.9%)	200	0.7502
Male	75 (3.3%)	4701	0.1433	12 (16.0%)	1040	0.7810	0 (0.0%)	125	0
Female	84 (2.7%)	4948	0.0220	10 (11.9%)	818	0.3461	3 (3.6%)	75	0

Table II. AD patients within the UC CORDS who tested positive for SARS-COV-2 and had been on medication for AD for at least 30 days prior to SARS-COV-2 test compared to SARS-COV-2-positive AD patients not on medications

SARS-COV-2-positive AD patients		
Medication (age range, avg age – years)	**On Medication**	**Control**
Prednisone (5-89, 54)	N = 12 (2.6%)	N = 147
	p = 0.6210	
Methotrexate (4-89, 41)	N = 2 (2.7%)	N = 157
	p = 1.0	
Cyclosporine (7-76, 46)	N = 0 (0%)	N = 159
Dupilumab (14-88, 45)	N = 0 (0%)	N=159

Legend:
+Statistical analysis of those with AD to those without AD using Chi-squared for >5 or Fisher Exact for <5 patients; significant if <0.05
++Hospitalization within two weeks (+/- 1 week) of COVID test
+++Death any time after SARS-COV-2 test

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References
1. Kimura H, Francisco D, Conway M, et al. Type 2 inflammation modulates ACE2 and TMPRSS2 in airway epithelial cells. *J Allergy Clin Immunol.* 2020;146(1):80-88.e8. doi:10.1016/j.jaci.2020.05.004.
2. Patruno C, Stingeni L, Fabbrocini G, Hansel K, Napolitano M. Dupilumab and COVID-19: What should we expect? [published online ahead of print, 2020 May 2]. *Dermatol Ther.* 2020;e13502. doi:10.1111/dth.13502
3. Wollenberg A, Flohr C, Simon D et al. European Task Force on Atopic Dermatitis (ETFAD) statement on severe acute respiratory syndrome coronavirus 2 (SARS-Cov-2)-infection and atopic dermatitis. J Eur Acad Dermatolog Venereol 2020. https://doi.org/10.1111/jdv.16411
4. University of California. 2020. *University Of California Health Creates Centralized Data Set To Accelerate COVID-19 Research.* [online] Available at: <https://www.universityofcalifornia.edu/press-room/university-california-health-creates-centralized-data-set-accelerate-covid-19-research> [Accessed 20 October 2020]

Results

- There was a 3.64% (n=9808, 4% men, average age 42) positive SARS-COV-2 infection rate among the 269,299 total patients who were tested (Table I)
  - Of these, 5,387 AD patients were tested with a 2.95% (n=159, 47% men, average age 34) infection rate, which was lower than those without AD (p<0.0063).
  - This observation was significant in women with AD compared to those without (p=0.0220)
- For AD patients receiving systemic medications, SARS-COV-2 rates were not significantly different than those without (Table II).
- Hospitalization rates of SARS-COV-2-positive AD patients was not significantly different from those without AD (p=0.9429).
- The mortality rate of SARS-COV-2 positive patients in UC CORDS was 2.1% (n=203), while that of SARS-COV-2-positive AD patients was 1.9% (n=3), and was not significantly different from those without AD (p=0.7502).

Discussion

- **AD patients did not have increased risk for SARS-COV-2 infection, including AD patients on the immunomodulatory medications prednisone, methotrexate, cyclosporine, and dupilumab.**
- **The overall lower age of AD patients may account for the observed lack of significant difference.**
- **Limitations include use of tertiary center data, de-identified data with lack of clinical details, or follow-up.**