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## Risk of COVID-19 in Dermatologic Patients on Long-term Immunomodulatory Therapy

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# Journal Pre-proof

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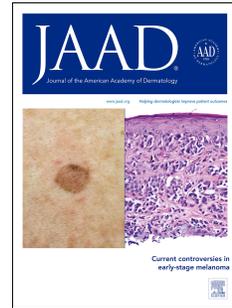
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**Conflicts of interests:**

Dr. Rosales Santillan has received fellowship funding from AbbVie and Janssen that went directly to her institution.

Dr. Alexa B. Kimball Consultant and Investigator for Abbvie, Bristol Meyers Squibb, Janssen, Eli Lilly, Novartis, Pfizer, and UCB; Consultant for Kymera, AmiraInvestigator ChemoCentryx; Receives Fellowship funding from Janssen and Abbvie; and served as previous Board Of Directors and Past President of the International Psoriasis Council and Board Of Directors of the HS Foundation.

Dr. Martina L. Porter is a consultant and investigator for UCB, Pfizer, Eli Lilly, and Novartis and an investigator for Abbvie, Janssen, and Bristol Meyers Squibb.

Min Ji Her's spouse works for Abbvie.

Peyton Morss, Prerna Salian, Nicole Giannotti, and Dr. Zachary Holcomb do not have any conflicts of interest to disclose.

Journal Pre-proof

As the COVID-19 pandemic has rapidly spread around the globe, concern has been raised regarding susceptibility of patients on immunomodulatory therapies to severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) infection. While general guidance has been put forth, data regarding infection rate and outcomes in immunosuppressed patients is still rare.<sup>1</sup> Recent articles, including the work by Gisondi, *et al*, suggest that outcomes of patients on systemic immunomodulatory therapies infected with SARS-CoV-2 are similar to the general population.<sup>2</sup> These findings may relate to the aberrant cytokine and inflammatory responses in severe COVID-19, which may be treated or partially blunted by cytokine-targeted therapy.<sup>3</sup> Given the substantial outbreak of COVID-19 in our community, we tested whether, in addition to similar outcomes, patients on systemic immunomodulatory therapy had similar infection rates compared to the general population.

We performed a retrospective cross-sectional analysis of patients seen across all providers at Beth Israel Deaconess Department of Dermatology. Our clinical practice has 412 patients on systemic immunomodulatory medications, including biologics and traditional immunosuppressives, prescribed within the past year. Patients were surveyed by either a clinic phone call, telemedicine visit, or through an outreach wellness check-in call from March 15 to May 8, 2020, corresponding to the “peak” incidence of new cases of COVID-19 in Massachusetts.

Of our 412 patients, 327 were successfully contacted, with approximately 80% contacted after April 19, 2020. We were not able to identify any hospitalizations in Boston-area hospitals in the other 85 patients. Results are shown in Table 1, with age distributions and conditions requiring immunomodulatory therapy displayed in Figure 1. There were no statistical differences between age, gender, or medications between the patients who were reached and those who were not.

As one of the “hotspots” of viral spread in the United States, Boston and the surrounding areas are ideal locations for studying effects of viral transmission. At the time of data collection, slightly over 1% of Massachusetts residents had been diagnosed with COVID-19, and slightly fewer than 10% of cases required hospitalization.<sup>4</sup> These numbers were similar in our patient population, with only five infections and one hospitalization, suggesting that the risk of both COVID-19 and poor outcomes are

minimally impacted by dermatologic immunomodulatory medications. However, it is worth noting that many patients were successfully isolating to a large degree, and the low infectious rates appear to be due, at least in part, to enhanced “social distancing” efforts. As has been proposed previously<sup>5</sup>, our findings suggest that when combined with patient education and encouragement to minimize exposure risks, systemic immunomodulatory therapies for dermatologic indications can be safely continued during the COVID-19 pandemic.

Limitations include the unknown number of possible asymptomatic infections, lack of available confirmatory COVID-19 testing in some cases, and the impact of social distancing as a confounding factor on infection rates. Also, our practice consists of only adult patients. Despite these limitations, we did not see evidence of increased infectious risk and we hope that these data will inform treatment decisions for patients who need these medications despite the ongoing COVID-19 pandemic.

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Table 1. Baseline characteristics of patients on immunosuppressive therapy.

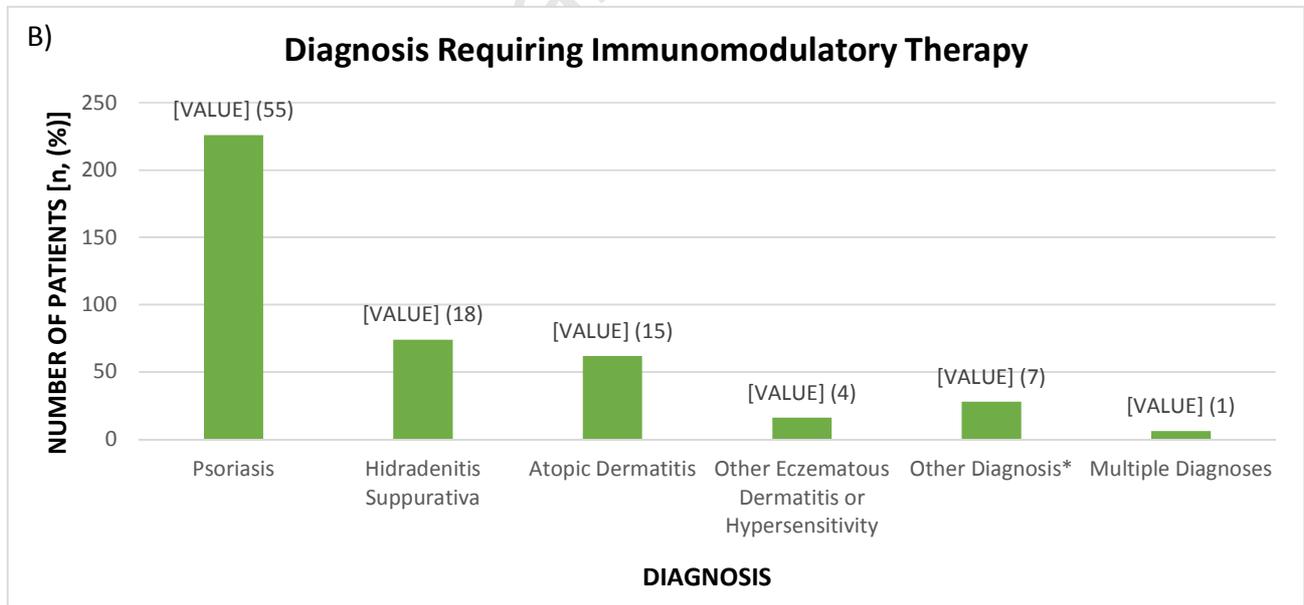
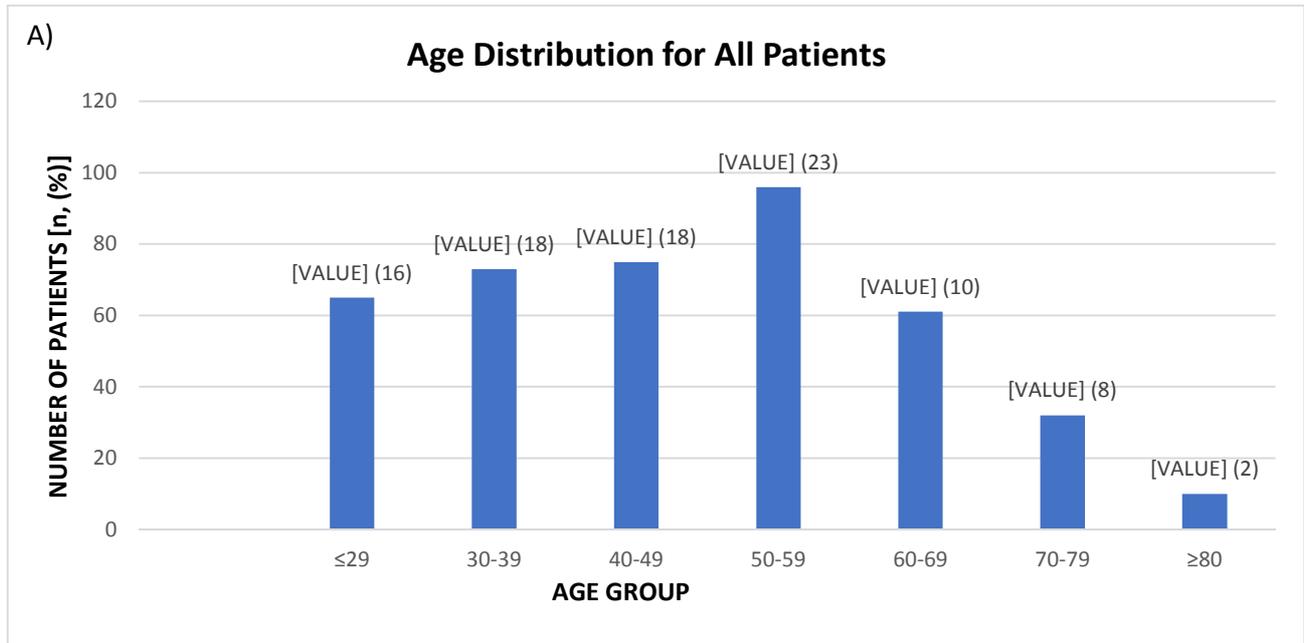
Characteristic	All Patients (n=412)	Positive and Presumed Positive Patients (n=5)
<b>Demographics</b>		
Mean Age (years) + SD	48.2 + 15.9	48.4
Male – number (%)	196 (48)	2 (40)
Female – number (%)	216 (52)	3 (60)
Live in Massachusetts – number (%)	382 (93)	5 (100)
<b>Medications</b>		
<b>Biologics</b>		
TNF $\alpha$ Inhibitor	117 (28.4%)	2 (40%)
IL-17 Inhibitor	29 (7%)	0
IL-23 Inhibitor	30 (7.3%)	0
IL-12/23 Inhibitor	54 (13.2%)	1 (20%)
JAK Inhibitor	12 (2.9%)	0
<b>Traditional Immunosuppressives</b>		
Methotrexate	48 (11.7%)	1 (20%)
Cyclosporine	5 (1.2%)	0
Mycophenolate mofetil	8 (1.9%)	0
<b>Other Immunomodulatory Therapies</b>		
IL-4R $\alpha$ Inhibitor	65 (15.8%)	0
Apremilast	26 (6.3%)	1 (20%)
<b>Multiple Medications</b> (combination of multiple biologics, traditional immunosuppressives and/or other immunomodulatory therapies)	18 (4.4%)	0
<b>COVID-19 Outcomes</b>		
COVID-related Hospitalization	1 (0.2%)	1 (20%)
Any Cause of Death	0	0
<b>Degree of Contact with Others</b>		
	<b>All Patients (n=260)</b>	<b>Positive and Presumed Positive Patients (n=5)</b>
None (patient generally not leaving home)	158 (60.8%)	1 (33%)
Patient with minimal degree of contact at work	31 (11.9%)	0
Patient with minimal degree of contact at home	31 (11.9%)	1 (33%)
Patient with minimal degree of contact both at work and home	9 (3.5%)	0
Patient with high degree of contact at work and home	22 (8.5%)	1 (33%)
Household member with high degree	9 (3.5%)	0

of contact at work		
<b>COVID-19 Symptoms/Testing</b>		
	<b>Patients Self-Reporting Symptoms (n=25)<sup>†</sup></b>	<b>Positive and Presumed Positive Patients (n=5)</b>
<b>Patients with symptoms and positive COVID-19 PCR test</b>	2 (8%)	2 (40%)
<b>Patients with symptoms and negative COVID-19 PCR test</b>	9 (36%)	1 (20%) <sup>‡</sup>
<b>Patients with symptoms who were not tested for COVID-19</b>	14 (56%)	2 (40%) <sup>‡</sup>

<sup>†</sup>Symptoms include any patient-reported symptom of cough, fever, diarrhea, body aches, loss of smell, or dyspnea. These patients would meet COVID-19 testing criteria at our institution while on immunosuppression.

<sup>‡</sup>Patient was evaluated by a primary care physician who believed that the patient had presumed COVID-19.

**Figure 1. (A) Age distributions of all patients taking immunomodulatory therapy and (B) underlying diagnoses being treated.**

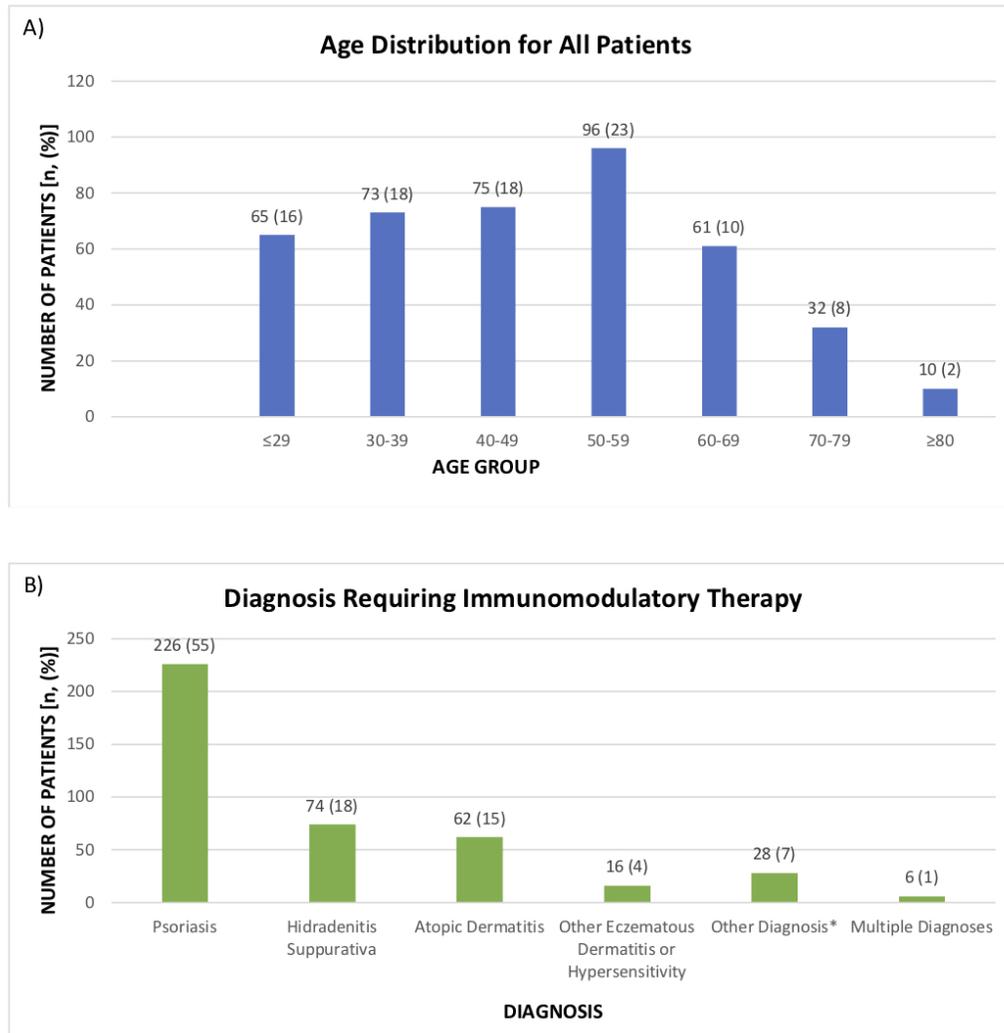


\*Other diagnoses included bullous pemphigoid (6), pyoderma gangrenosum (4), alopecia areata (2), lichen planopilaris (2), unspecified pruritus (2), vasculitis (2), acne keloidalis nuchae (1), discoid lupus erythematosus (1), granuloma annulare (1), lichen planus (1), lichen simplex chronicus (1), morphea (1), pemphigus vulgaris (1), pityriasis lichenoides (1), pityriasis rubra pilaris (1), and systemic lupus erythematosus (1).

Table 1. Baseline characteristics of patients on immunosuppressive therapy.

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<b>Demographics</b>		
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<b>Degree of Contact with Others</b>		
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