


# Psoriasis and COVID-19 Infection Negatively Impact Each Other: An Analysis of 3581 Cases

Xiaohua Wang\*, Liyan Yuan\*, Xiaoyu Qiu, Bin Yang, Mao-Qiang Man 

Dermatology Hospital, Southern Medical University, Guangzhou, People's Republic of China

\*These authors contributed equally to this work

Correspondence: Mao-Qiang Man; Bin Yang, Dermatology Hospital, Southern Medical University, No. 2 Lujing Road, Guangzhou, 510095, People's Republic of China, Tel +86-20-87255286, Email mqman@hotmail.com; yangbin1@smu.edu.cn

**Objective:** To determine whether COVID-19 infection and psoriasis impact each other.

**Methods:** WeChat app was used to carry out a questionnaire survey in individuals aged 18 years and over.

**Results:** A total of 3581 individuals, including 2515 individuals without psoriasis and 1066 psoriatic patients completed the survey. The rate of COVID-19 infection was significantly higher in psoriatic patients than in those without psoriasis (89.59% vs 77.93%,  $p < 0.0001$ ). Moreover, the rate of relapse and/or worsening of psoriasis was higher in psoriatic patients with COVID-19 infection than in that without COVID-19 infection (75.29% vs 47.75%,  $p < 0.0001$ ).

**Conclusion:** COVID-19 infection and psoriasis negatively impact each other.

**Keywords:** COVID-19, psoriasis, infection

## Introduction

Psoriasis, an immune-mediated inflammatory dermatosis, can be triggered or exacerbated by a variety of factors, including infections and psychological stress.<sup>1,2</sup> COVID-19 infection can dramatically impact mental health, with up to 35% of individuals with COVID-19 infection exhibiting depression and anxiety,<sup>3</sup> whereas psoriasis can also increase the risk of infections.<sup>4</sup> Whether COVID-19 infection and psoriasis impact each other is not clear yet. Here, we compared the incidence and symptoms of COVID-19 infection in individuals with vs without psoriasis.

## Materials and Methods

WeChat app was used to carry out questionnaire survey in individuals aged  $\geq 18$  years old from January 17 to February 4, 2023. COVID-19 infection rates were compared between individuals with and without psoriasis. Moreover, the rates of psoriasis worsening and relapse were compared in psoriatic subjects with vs without COVID-19 infection. Either Chi square or Fisher exact test was applied to assess the significance between the qualitative data, while unpaired student test was used to determine the significance between the quantitative data. The protocol of this survey was reviewed and approved by Institutional Review Board of Dermatology Hospital of Southern Medical University (#2023020). And this work was carried out in accordance with Declaration of Helsinki.

## Results

Out of 5748 individuals who clicked the questionnaire link, 3581 individuals, including 2515 individuals without psoriasis and 1066 psoriatic patients, completed the questionnaire. Overall, the subjects' age was comparable between individuals with or without psoriasis (Table 1). Neither age nor overall BMI differed significantly in psoriatic patients with vs without COVID-19 infection (age:  $48.23 \pm 0.59$  vs  $48.14 \pm 1.67$ ; BMI:  $22.32 \pm 0.12$  vs  $21.97 \pm 0.36$ ). The rates of COVID-19 infection were similar between males and females in individuals with or without psoriasis. However, the

**Table 1** Demographic Characteristics of Subjects

|                   |         | Subjects without Psoriasis<br>(N=2515) | Subjects with Psoriasis<br>(N=1066) | P value |
|-------------------|---------|--|-------------------------------------|---------|
| Age (yr)          | Females | 1237, 49.04 ± 0.52, 32                 | 516, 48.82 ± 0.80, 31               | NS      |
|                   | Males   | 1278, 48.52 ± 0.52, 32                 | 550, 47.66 ± 0.77, 31               | NS      |
| BMI               | Females | 1237, 21.84 ± 0.12, 7.84               | 516, 20.07 ± 0.12, 3.95             | <0.0001 |
|                   | Males   | 1278, 21.98 ± 0.12, 7.76               | 550, 24.35 ± 0.15, 5.11             | <0.0001 |
| COVID Infection   | Females | 970/1237, 78.42%                       | 464/516, 89.92%                     | <0.0001 |
|                   | Males   | 990/1278, 77.46%                       | 491/551, 89.11%                     | <0.0001 |
| COVID Vaccination | Females | 1079/1237, 87.23%                      | 444/516, 86.05%*                    | NS      |
|                   | Males   | 1102/1278, 86.23%                      | 495/550, 90.00%                     | =0.026  |
|                   | Overall | 2181/2515, 86.72%                      | 939/1066, 88.09%                    | NS      |

**Notes:** Data are expressed as N, mean ± sem, Interquartile Range (IQR) or N/total, %; Either Fisher's exact test or unpaired Student's t-test was used to determine significances. \*p=0.0476 vs males.

incidence of COVID-19 infection was significantly higher in individuals with psoriasis than in those without psoriasis (89.59% vs 77.93%,  $p<0.0001$ ) although the rate of COVID-19 vaccination did not differ between psoriatic patients and non-psoriatic individuals (88.09% vs 86.72%). Proportions of individuals with lower fever, coughing and headache were lower in psoriatic patients than in non-psoriatic individuals after COVID-19 infection. In contrast, more psoriatic patients had high fever and shortness of breath than non-psoriatic individuals did (Table 2). Moreover, 47.75% (53/111) of psoriatic patients without COVID-19 infection experienced relapse and/or worsening of psoriasis, while 75.29% (719/955) of psoriatic patients with COVID-19 infection claimed relapse and/or worsening of psoriasis, with relative risk of 1.577 (95% CI 1.136–1.952) ( $p<0.0001$ ) (Table 3). The overall rates of receiving biologics were comparable in psoriatic patients with vs without COVID-19 infection (74.97% vs 75.68%). The proportion of subjects receiving anti-IL-23 antibody was slightly higher in psoriatic patients without COVID-19 infection than those with COVID-19 infection (3.60% vs 1.05%,  $p=0.0490$ ). Collectively, these results demonstrate that psoriasis predisposes the risk for COVID-19 infection while COVID-19 infection exacerbates psoriasis.

## Discussion

Previous study suggested a risk of psoriasis for COVID-19 infection.<sup>4</sup> Correspondingly, we showed here that the incidence of COVID-19 infection was higher in psoriatic patients than in non-psoriatic individuals, consistent with previous finding that psoriasis increases risk for infections.<sup>5</sup> Although anti-IL-17 antibody can possibly lower the risk for

**Table 2** Characterization of COVID Infection in Subjects with vs without Psoriasis

| Clinical Symptoms                       | Non-Psoriasis (N=2515) | Psoriasis (N=1066) | P value |
|---|------------------------|--------------------|---------|
| Low Fever ( $\leq 38^{\circ}\text{C}$ ) | 978/1959, 49.92%       | 439/955, 45.97%    | =0.0484 |
| High Fever ( $>38^{\circ}\text{C}$ )    | 820/1959, 41.86%       | 450/955, 47.12%    | =0.0077 |
| Sore Throat                             | 848/1959, 43.29%       | 418/955, 43.77%    | =0.8113 |
| Coughing                                | 1178/1959, 60.13%      | 497/955, 52.04%    | <0.0001 |
| Fatigue                                 | 760/1959, 38.85%       | 357/955, 37.38%    | =0.4650 |
| Headache                                | 836/1959, 42.67%       | 359/955, 37.59%    | =0.0091 |
| Joint and Muscle Pain                   | 708/1959, 36.14%       | 312/955, 32.67%    | =0.0687 |
| Loss of Taste                           | 392/1959, 20.01%       | 218/955, 22.83%    | =0.0810 |
| Diarrhea                                | 185/1959, 9.44%        | 101/955, 10.58%    | =0.3531 |
| Chest Tightness                         | 214/1959, 10.92%       | 111/955, 11.62%    | =0.5731 |
| Chest Pain                              | 150/1959, 5.36%        | 66/955, 6.91%      | =0.1103 |
| Palpitation                             | 221/1959, 11.28%       | 86/955, 9.01%      | =0.0624 |
| Shortness of Breath                     | 150/1959, 7.66%        | 116/955, 12.15%    | =0.0001 |

**Note:** Fisher's exact test was used to determine significances between psoriasis and non-psoriasis.

**Table 3** Comparison of Psoriatic Individuals with vs without COVID Infection

|                              | Subjects without COVID<br>(N=111) | Subjects with COVID<br>(N=955) | P values |
|------------------------------|-----------------------------------|--------------------------------|----------|
| Age                          |                                   |                                |          |
| Females                      | 52, 48.67 ± 2.38, 33.25           | 464, 48.84 ± 0.85, 31          | NS       |
| Males                        | 59, 47.66 ± 2.35, 33              | 491, 47.66 ± 0.82, 31          | NS       |
| Overall                      | 111, 48.14 ± 1.67, 32             | 955, 48.23 ± 0.59, 31          | NS       |
| BMI                          |                                   |                                |          |
| Females                      | 52, 19.50 ± 0.33, 3.22            | 464, 20.13 ± 0.13, 4.05        | NS       |
| Males                        | 59, 24.14 ± 0.45, 5.93            | 491, 24.38 ± 0.15, 5.05        | NS       |
| Overall                      | 111, 21.97 ± 0.36, 6.29           | 955, 22.32 ± 0.12, 5.14        | NS       |
| COVID Vaccination            | 79/111, 71.17%                    | 860/955, 90.05%                | <0.0001  |
| Psoriasis Relapse/Worsening  | 53/111, 47.75%                    | 719/955, 75.29%                | <0.0001  |
| <b>Biologics</b>             |                                   |                                |          |
| TNFα                         | 29, 26.13%                        | 223, 24.44%                    | NS       |
| IL-17α                       | 28, 25.23%                        | 219, 22.93%                    | NS       |
| IL-23                        | 4, 3.60%                          | 10, 1.05%                      | =0.0490  |
| IL-22/23p40                  | 3, 2.70%                          | 28, 2.93%                      | NS       |
| TNFα + IL-17α                | 15, 13.51%                        | 159, 16.65%                    | NS       |
| TNFα + IL-23                 | 1, 0.9%                           | 7, 0.73%                       | NS       |
| TNFα + IL-22/23p40           | 1, 0.9%                           | 18, 1.88%                      | NS       |
| IL-17α + IL-23               | 1, 0.9%                           | 6, 0.63%                       | NS       |
| IL-17α + IL-22/23p40         | 1, 0.9%                           | 7, 0.73%                       | NS       |
| IL-17α + IL-23 + IL-22/23p40 | 1, 0.9%                           | 0                              | NS       |
| TNFα + IL-17α + IL-23        | 0                                 | 18, 1.88%                      | NS       |
| TNFα + IL-23 + IL-22/23p40   | 0                                 | 2, 0.20%                       | NS       |
| Other Combination            | 0                                 | 19, 1.99%                      | NS       |
| Total                        | 84, 75.68%                        | 716, 74.97%                    | NS       |

**Note:** Except data of biologics, all other data are expressed as N, mean, Interquartile Range (IQR, or ratio, percentage).

COVID-19 infection,<sup>6</sup> the rates of COVID-19 infection were similar between psoriatic patients with vs without IL-17a treatment, consistent with findings by the others.<sup>7</sup> The higher incidence of COVID-19 infection in psoriatic patients is unlikely due to the use of anti-TNFα antibody, a risk factor for infections,<sup>8</sup> because proportion of patients who used anti-TNFα antibody did not differ between individuals with and without COVID-19 infection (24.44% vs 26.13%). These results are consistent with previous studies.<sup>9</sup> Although a study showed that COVID-infection is not a risk factor for exacerbation of psoriasis,<sup>10</sup> other studies revealed that either COVID-infection or COVID-19 vaccination induces new-onset or flares of psoriasis in both adults and children.<sup>11–13</sup> Likewise, the present study demonstrates exacerbation of psoriasis by COVID-19 infection. The exacerbation of psoriasis can be attributable to COVID-19 induced production of IL-17 and IL-23,<sup>4,14</sup> key cytokines in the pathogenesis of psoriasis. Moreover, COVID-19 infection increases the number of circulating neutrophils, and cytokines and chemokines,<sup>15</sup> leading to relapse or exacerbation of psoriasis. Furthermore, COVID-19 infection can induce psychological stress, which is a known trigger factor for psoriasis. Especially, the COVID-zero policy isolated individuals infected with COVID-19 and those contacted with COVID-positive individuals, making them subject to extra psychological stress. Thus, COVID-19 infection-induced inflammation and psychological stress can contribute to relapse and exacerbation of psoriasis. Collectively, the present study clearly demonstrated that psoriasis and COVID-19 infection negatively impact each other. Biologics do not increase risk for COVID-19 infection. In contrast, biologics are effective for psoriatic patients with COVID-19 infection.<sup>10,12,16</sup>

In summary, psoriasis and COVID-19 infection affect each other. Successful management of one condition could possibly benefit the other one. The underlying mechanisms by which psoriasis and COVID-19 infection negatively impact each other remain to be determined.

## Data Sharing Statement

All data are available from the Xiaohua Wang (wxh\_21773@163.com) upon reasonable request, with privacy restriction.

## Ethics Statement

This work was reviewed and approved by ethics committee of Dermatology Hospital, Southern Medical University (#2023020).

## Informed Consent

Written informed consent was obtained from all participants.

## Funding

There is no funding to report.

## Disclosure

The authors have no conflicts of interest.

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