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**COVID-19: Important Updates and Developments**  
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## COVID-19 and Dermatology in Iran

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**Abstract** COVID-19 infection may affect the individuals with many underlying conditions including skin diseases. This cross-sectional study was conducted to provide an overview regarding the prevalence of COVID-19 disease in the patients with several skin diseases. Overall, 703 patients with several skin diseases participated in the study and completed our online-designed questionnaire. Among the total participants, only 32(4.6%) subjects reported the COVID-19 infection. The prevalence rate was equal to 0.04%. In the patients with psoriasis, 14 out of 322 people (4.3%) developed the COVID-19. Three out of 159 patients (1.9%) with alopecia areata had been affected with the COVID-19 and 4 (5.2%) patients with vitiligo had caught the disease. Only one subject (2%) with the lichen planus, and 6 (6.8%) patients with other skin diseases had developed the COVID-19 but in the patients with GVHD (Graft Versus Host Disease), 4 (80%) out of 5 patients had caught the COVID-19 disease. The frequency of COVID-19 infection was low in the studied population however; more studies with larger sample size are needed to determine the exact prevalence of the infection in the patients with skin diseases undergoing the treatment with several systemic medications.

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In some patients with coronavirus disease 2019 (COVID-19), pre-existing skin diseases, such as atopic dermatitis, psoriasis, and rosacea, have been exacerbated.<sup>1</sup> It is not known whether the patients receiving immunotherapy for skin diseases are more susceptible to severe acute respiratory syndrome coronavirus 2.<sup>2,3</sup>

### Cross-sectional study

Participants who had dermatologic diseases and who completed our questionnaire took part in this cross-sectional

study. Some patients were being treated with various immunosuppressive or immunomodulatory and biologic agents. The data were collected by a web-based designed questionnaire. Statistical analyses were performed using the SPSS v 24 (IBM Corp., Chicago, IL, USA) and R statistics. A *P* value of  $\leq .05$  was considered statistically significant. Descriptive statistics were reported using the frequencies and percentages. The quantitative data were summarized as mean  $\pm$  standard deviation.

The Pearson chi-square test was used to evaluate the association between two categoric responses, as well as the Spearman rank-order correlation, to measure and test the as-

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**Table 1** Distribution of the disease types in the population studied

Disease	n	%
Psoriasis	322	45.8
Lichen planus	50	7.1
Vitiligo	77	11
Alopecia areata	159	22.6
Hidradenitis suppurativa	3	0.4
Pemphigus	2	0.3
GVHD	5	0.7
Other diseases	85	12.1
Total	703	100
<b>COVID-19</b>		
Positive	32	4.6
Negative	671	95.4
Total	703	100
<b>Underlying diseases</b>		
Hypertension	61	8.7
Cardiovascular disease	34	4.8
Diabetes mellitus	29	4.1
Obesity	126	17.9
Fatty liver	124	17.6
Hypothyroidism	92	13.1
Hyperthyroidism	5	0.7
Hyperlipidemia	84	11.9
Psychosocial disease	51	7.3
No underlying disease	370	52.6

COVID-19, coronavirus disease 2019; GVHD, graft versus host disease.

sociation between two continuous or ordered categorical responses if the data met the assumptions using the chi-square test. The Fisher exact test was used to determine the associations between two categorical variables.

A total of 703 patients participated in this study and completed our questionnaire. The majority of the participants (322) had psoriasis. Table 1 presents the frequency of other dermatologic diseases. Of the 703 patients, seven had both psoriasis and lichen planus, seven had both psoriasis and alopecia areata, three had both lichen planus and alopecia areata, and seven had both psoriasis and vitiligo.

Among the participants, only 32 (4.6%) reported COVID-19. This included those who did not have signs and symptoms of COVID-19, only two participants (6.3%) tested positive for COVID-19, but 30 (93.8%) of those with signs and symptoms of COVID-19 also became positive. All patients positive for COVID-19 reported in this study received a positive result from a polymerase chain reaction test. A statistically significant difference was detected between these groups (Fisher exact test,  $P = .0001$ ).

Of patients with psoriasis, 14 of 322 (4.3%) developed COVID-19. Of patients with alopecia areata, 3 of 159 contracted COVID-19. Of patients with vitiligo, four (5.2%) developed the disease. Only one patient (2%) with lichen

planus and six (6.8%) patients with other skin diseases developed COVID-19, but of patients with graft versus host disease (GVHD), four (80%) of five contracted COVID-19. There were no positive cases of COVID-19 among the patients with pemphigus and hidradenitis suppurativa. There were also no reports of positive cases of COVID-19 in patients with concomitant conditions, such as psoriasis and alopecia areata or psoriasis and vitiligo.

The mean age of the subjects was  $35.45 \pm 12.67$  years. The highest number and percentage belonged to the group between 30 and 40 years of age, which was equivalent to 277 (39.4%) participants. Among the patients, 497 (70.7%) individuals were overweight, 137 (19.5%) were obese, and 48 (6.8%) had normal body mass index. A total of 21 (3%) patients were underweight. No positive significant correlation was observed between high body mass index and COVID-19 development ( $X^2$ ,  $P=0.9$ ).

Table 2 presents the frequency of COVID-19 disease according to the skin diseases and the type of received medications.

Among the patients, 152 (21.6%) had discontinued their medications after the onset of the COVID-19 pandemic, and only 21 (30.2%) patients had continued their treatment regularly, 102 (14.5%) continued their treatments irregularly, and 237 (33.7%) did not answer this question. Based on the data, the patients were divided into two groups, one group was undergoing biologic treatment and the other group was receiving nonbiologic therapy. Adalimumab, etanercept, infliximab, and tofacitinib as the small molecule Janus kinase inhibitor were classified as the biologic drugs, and other drugs were classified as the nonbiologic. Only four (12.5%) patients treated with biologics drugs had developed COVID-19. No significant statistical correlation was detected between receiving the biologics and nonbiologic therapies and the development of COVID-19 (Fisher exact test,  $P = .7$ ).

None of the patients taking hydroxychloroquine had uncontracted COVID-19 disease, but no statistically significant difference was observed between the use of this drug and other ones and the development of COVID-19 (Fisher exact test,  $P = .6$ ). No findings have been reported on the prevalence of COVID-19 in the patients with various skin diseases as well as the correlation of the disease with the drugs used.

## Additional observations

In this cross-sectional study, the frequency of COVID-19-positive cases in various dermatologic diseases was reported. The overall prevalence of COVID-19 in the studied population was low, about 0.04%; however, applying polymerase chain reaction tests during course of this study was limited just to very few cases. It is assumed that the actual prevalence is to be higher than the reported one.

**Table 2** Frequency of COVID-19–positive cases based on the type of disease and received medications

Drugs	Diseases								Total (COVID+)
	Psoriasis (COVID+)	Lichen planus (COVID+)	Vitiligo (COVID+)	Alopecia areata (COVID+)	Hidradenitis suppurativa (COVID+)	Pemphigus (COVID+)	GVHD (COVID+)	Other diseases (COVID+)	
<b>Methotrexate</b>	33(0)	1(0)	0(0)	11(0)	0(0)	0(0)	1(1)	10(1)	56(2)
<b>Adalimumab</b>	45(3)	0(0)	1(0)	0(0)	0(0)	0(0)	0(0)	0(0)	46(3)
<b>Azathioprine</b>	1(0)	0(0)	1(0)	8(1)	0(0)	1(0)	0(0)	1(0)	12(1)
<b>Prednisolone</b>	15(1)	14(0)	2(0)	15(0)	0(0)	1(0)	1(1)	3(1)	51(3)
<b>Tofacitinib</b>	1(0)	0(0)	1(0)	18(1)	0(0)	0(0)	0(0)	0(0)	20(1)
<b>Etanercept</b>	3(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	3(0)
<b>Cyclosporine</b>	10(0)	0(0)	0(0)	5(0)	0(0)	0(0)	0(0)	3(0)	18(0)
<b>Isotretinoin</b>	1(0)	14(0)	0(0)	0(0)	0(0)	0(0)	0(0)	2(1)	17(1)
<b>Hydroxychloroquine</b>	0(0)	10(0)	0(0)	1(0)	0(0)	0(0)	0(0)	2(0)	13(0)
<b>Acitretin</b>	9(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	2(1)	11(1)
<b>Mycophenolate mofetil</b>	0(0)	3(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	3(0)
<b>Infliximab</b>	2(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	2(0)
<b>Sulfasalazine</b>	1(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	1(0)
<b>Other medications</b>	168(7)	6(1)	72(4)	89(0)	3(0)	0(0)	2(1)	60(2)	400(15)
<b>Combination therapy</b>	33(3)	2(0)	0(0)	12(1)	0(0)	0(0)	1(1)	2(0)	50(5)
<b>Total</b>	322(14)	50(1)	77(4)	159(3)	3(0)	2(0)	5(4)	85(6)	703(32)

COVID+, positive for coronavirus disease 2019; GVHD, graft versus host disease.

Many patients with several skin conditions were being treated with various immunosuppressive drugs. It is important to investigate the correlation between taking these drugs and the development of COVID-19. Currently, no data are available to describe the benefits or risks of stopping immunomodulators/immunosuppressants during the COVID-19 outbreak.<sup>4</sup>

Numerous opinions exist on the use of biologic drugs for treatment of psoriasis during the pandemic.<sup>3</sup>

In the current studies, patients on the systemic immunomodulatory therapy had similar infection rates compared with the general population.<sup>5-8</sup> The mortality rate adjusted by age and sex did not increase in the patients who had received the immunosuppressive therapies.<sup>9</sup>

In a recent study, an evidence-based approach to the risk of infection along with receiving the dermatologic therapeutics was evaluated. Most biologics and conventional immunotherapies, such as methotrexate, cyclosporine, and azathioprine when based on the doses and indications in dermatology, do not appear to increase the risk of viral vulnerability. They are most likely safe to be used during the COVID-19 pandemic.<sup>10</sup>

In our studied population, only 2 of 56 patients treated with the methotrexate, as well as 1 of 12 patients treated with the azathioprine and 3 of 51 patients treated with the prednisolone had developed COVID-19. There were no reports of COVID-19 in the patients treated with the cyclosporine and mycophenolate mofetil.

Although 703 patients completed our questionnaire, the sample size in the subgroup of diseases was small, which is one of the limitations of this study. Perhaps the small sample size in the subgroups and those who had received the biologics may have prevented us from finding a statistically significant correlation between the use of biologics and the development of COVID-19 disease.

The unknown number of possible asymptomatic infections and the lack of available confirmatory COVID-19 tests were also limitations of this study.

## Conclusions

We have presented an overview of the prevalence of COVID-19 in 703 patients with skin diseases undergoing the

treatment with wide range of medications. Despite the addressed limitations, no positive correlation was observed between the development of COVID-19 infection and use of immunosuppressive/immunomodulatory therapies. Prospective studies with larger sample size are needed to prove the benefit and risk of using these agents during the ongoing COVID-19 pandemic.

## Conflict of interest

The authors have no conflict of interest to disclose.

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