



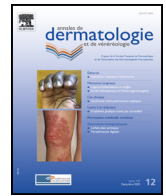
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Original article

## Impact of the COVID-19 pandemic on children with psoriasis

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### ABSTRACT

**Background:** Children with psoriasis may have been directly impacted by the COVID-19 pandemic and their illness may also have affected their ability to follow preventive measures.

**Objective:** To investigate the impact of the COVID-19 pandemic on children with psoriasis.

**Methods:** A survey of children (< 18 years) with psoriasis, conducted from June 10 to June 29, 2020.

**Results:** In total, 92 children were included: 71.7% had psoriasis lesions at the time of home lockdown while 45.2% were receiving systemic treatments, and two contracted COVID-19. During lockdown, psoriasis worsened in 47.3% of the children and 18.8% stopped their systemic treatments, mainly for reasons linked to the pandemic. A total of 41.3% had a consultation for psoriasis during lockdown (71.1% by teleconsultation): 39.5% due to worsening of their psoriasis and 21.1% for pandemic-related issues. Among patients not having a consultation during lockdown, 27.5% had a cancellation by the doctor and 9.3% had concerns over going to see the doctor. Finally, 22.8% of patients reported finding it difficult to respect hygiene measures because of their psoriasis, e.g., application of alcohol-based hand sanitizers (47.6%), handwashing routines (42.9%), and wearing a mask (28.6%).

**Conclusions:** This study demonstrates the major clinical impact of the COVID-19 pandemic on children with psoriasis. Teleconsultations played a key role in patient management as regards patient monitoring, provision of information, and renewal of treatments. It is vital that we learn from these data to improve and adapt the monitoring of chronic dermatoses in both children and adults in the event of a future health crisis.

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## 1. Introduction

In December 2019, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) began spreading around the world, resulting in the coronavirus disease-19 (COVID-19) pandemic [1]. By June 10, 2020, 155,000 subjects had tested positive for COVID-19, with nearly 30,000 deaths being reported in France [2]. A number of risk factors for developing severe COVID-19 symptoms have been

identified: age, coronary heart disease, diabetes, obesity, and high blood pressure [3,4]. However, none of the specific data indicate that there is an increased risk of severe COVID-19 among patients on immunosuppressive treatments [5–8]. Due to the rapid spread of the pandemic and concerns over the number of deaths, health measures were rapidly implemented: staying home, hygiene protocols, maintaining social distancing of at least 1 meter, etc. Many countries were quick to impose total lockdown, closing schools and stopping sporting, cultural and nonessential commercial activities [9]. Alerts were also issued concerning the potentially harmful effects of immunosuppressive drugs used for chronic diseases. The first concerned the risk of a severe form of COVID-19 associated

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with the use of immunosuppressive drugs. The second warned of the impact on worsening of chronic skin diseases of the measures taken to limit severe forms of COVID-19 – e.g., discontinuing or failing to initiate systemic treatments. Other harmful cutaneous effects have also been reported, such as the direct effects of COVID-19 on skin [5,10–12]. Psoriasis affects 0.5% to 1% of children in Europe, with 10 to 20% of them presenting moderate-to-severe forms [13–15]. These children may require general immunosuppressive treatments or biotherapies [16]. A limited amount of data has been published about adults with psoriasis during the COVID-19 pandemic, but none that are specific to children [5–7,10,17]. However, the COVID-19 pandemic and the resulting preventive health measures are likely to have affected children with psoriasis in many ways: flare-ups in case of infection, stress, or discontinuation of treatment, problems with medical follow-up, and more severe forms of COVID-19 infection in children treated with immunosuppressive agents. We conducted a survey study to evaluate the impact of the COVID-19 pandemic on children with psoriasis in France and the impact of psoriasis on the ability of these patients to adhere to preventative health and social measures.

## 2. Methods

### 2.1. Study design

This study in children (aged < 18 years) with psoriasis was conducted using data collected via an anonymous 30-question survey (comprising a questionnaire requiring 10 minutes to complete) conducted from June 10 to June 29, 2020. The survey was carried out using Google Forms and was accessible via two websites: the website of the patient association “Association France Psoriasis” (francepsoriasis.org) and the patient-dedicated website of the French Society of Dermatology (dermato-info.fr). Members of the “Association France Psoriasis” (about 30 children) were invited to participate in the survey by email. Dermatologists belonging to the Research Group on Psoriasis of the French Society of Dermatology and to the French Society of Pediatric Dermatology were also invited by email to propose participation in the study to children with psoriasis. Finally, on June 8, 2020 the French Society of Dermatology sent a newsletter to all its members requesting them to propose the study to eligible patients.

The survey consisted of a two-part questionnaire. The first contained questions on the demographic characteristics of the children and on their psoriasis. The second contained questions to evaluate

the impact of the pandemic and lockdown on the child's psoriasis, as well as to assess the impact of psoriasis on the patient's ability to adapt to preventive measures and return to school. The questionnaire could be completed by the child, either alone or with help from their parent(s), or else on behalf of the child by their parent(s).

### 2.2. Definitions

Severe psoriasis was defined as skin psoriasis requiring systemic therapy (conventional treatment or biotherapies). Mild-to-moderate psoriasis consisted of psoriasis without systemic treatment. The French regions considered as having a high COVID-19 prevalence during the study period were the Île-de-France, Hauts-de-France and Grand Est regions [18].

### 2.3. Statistics

Analyses were conducted on data stratified into the following subgroups: age (adolescents  $\geq 13$  years vs. children and infants), COVID-19 risk in the region of residence (high risk vs. low risk), and severity of psoriasis (severe vs. mild). These parameters were selected as they were likely to have an impact on disease management, infectious risk and patient response. Quantitative data were expressed as mean  $\pm$  standard deviation (SD), and qualitative data were expressed as the number and percentage of patients,  $n$  (%). Means were compared using the  $t$ -test and frequencies using the  $\chi^2$  test or Fisher's exact test, as appropriate. A  $P$ -value < 0.05 was considered statistically significant. Statistical analyses were performed using BiostaTGV (<http://biostatgv.sentiweb.fr/?module=tests>).

## 3. Results

### 3.1. Patient demographics and characteristics of psoriasis

Ninety-two patients completed the survey. The questionnaire was completed by the child alone in 32 cases (34.8%) and with parents in other cases. The characteristics of the children and their psoriasis are detailed in Tables 1 and 2. Their mean age was 11.4 years. Psoriasis lesions were present in 71.7% of patients. Severe psoriasis affected 45.2% of them, while 70.7% came from high-risk regions for COVID-19. Forty-three children (47.3%) reported worsening of their psoriasis during lockdown. The most common patient-identified causes of these flares were stress (48.8%) and stopping treatment (18.6%).

**Table 1**  
Patient demographics and clinical characteristics.

|  | All<br>$n = 92$ | Age                          |                                      | Severity of psoriasis |                       | COVID-19 risk in patients' region <sup>a</sup> |                       |
|--|-----------------|------------------------------|--------------------------------------|-----------------------|-----------------------|--|-----------------------|
|  |                 | Infants/children<br>$n = 59$ | Adolescents<br>$n = 33$              | Mild<br>$n = 59$      | Severe<br>$n = 33$    | Low risk<br>$n = 25$                           | High risk<br>$n = 65$ |
| Gender, male/female                                    | 37/55           | 23/36                        | 14/19                                | 19/40                 | 18/15 <sup>0.04</sup> | 7/18   | 29/36                 |
| Age (y), mean $\pm$ SD                                 | 11.4 $\pm$ 3.5  | 9.3 $\pm$ 2.1                | 15.2 $\pm$ 1.5 <sup>&lt;0.0001</sup> | 11.3 $\pm$ 3.5        | 11.5 $\pm$ 3.4        | 12.5 $\pm$ 3.2                                 | 11.0 $\pm$ 3.5        |
| Region with a high COVID-19 risk, $n$ (%) <sup>a</sup> | 65 (70.7)       | 43 (72.9)                    | 22 (66.7)                            | 40 (67.8)             | 25 (75.8)             | –  | 65 (100)              |
| Comorbidities  | 16 (17.4)       | 10 (17.2)                    | 5 (15.2)                             | 12 (20.3)             | 4 (12.5)              | 4 (16.7)                                       | 12 (18.5)             |
| Asthma   | 5 (5.4)         | 2 (3.4)                      | 3 (9.1)                              | 2 (3.4)               | 3 (9.1)               | 2 (8.0)  | 3 (4.6)               |
| Diabetes   | 1 (1.1)         | 1 (1.7)                      | 0                                    | 1 (1.7)               | 0                     | 1 (4.0)  | 0                     |
| Cardiac disease <sup>b</sup>                           | 1 (1.1)         | 1 (1.7)                      | 0                                    | 0                     | 1 (3.0)               | 1 (4.0)  | 0                     |
| Depression   | 1 (1.1)         | 0                            | 1 (3.0)                              | 0                     | 1 (3.0)               | 0  | 1 (1.5)               |
| Miscellaneous <sup>c</sup>                             | 7 (7.6)         | 5 (8.5)                      | 2 (6.1)                              | 5 (8.5)               | 2 (6.1)               | 0  | 3 (10.8)              |
| COVID-19 in the family, $n$ (%)                        | 7 (7.6)         | 4 (6.8)                      | 3 (9.1)                              | 6 (10.2)              | 1 (3.0)               | 1 (4.0)  | 6 (9.2)               |
| COVID-19 in the child, $n$ (%)                         | 2 (2.2)         | 2 (3.4)                      | 0                                    | 2 (3.4)               | 0                     | 0  | 2 (3.1)               |

SD: standard deviation; y: years. In superscript:  $P$ -value if  $P < 0.05$ . For all the other comparisons,  $P$ -value was  $\geq 0.05$ .

<sup>a</sup> French regions with a high prevalence of COVID-19 were the Île-de-France, Hauts-de-France and Grand Est regions. Two children did not know in which region they were living.

<sup>b</sup> The cardiac disease in question was tetralogy of Fallot, which was operated in the first months of life.

<sup>c</sup> Included: atopic dermatitis ( $n = 2$ ; 2.2%), vitiligo ( $n = 1$ ; 1.1%), chronic knee pain ( $n = 1$ ; 1.1%), auto-inflammatory disease ( $n = 1$ ; 1.1%), allergic rhinitis, and attention deficit hyperactivity disorder ( $n = 1$ ; 1.1%). No details of comorbidity were provided for one child.

**Table 2**  
Characteristics of psoriasis.

|  | All n=92  | Age                   |                                 | Severity of psoriasis |                            | COVID-19 risk in patients' region |                |
|--|-----------|-----------------------|---------------------------------|-----------------------|----------------------------|-----------------------------------|----------------|
|  |           | Infants/children n=59 | Adolescents n=33                | Mild n=59             | Severe n=33                | Low risk n=25                     | High risk n=65 |
| Age of onset (y), mean ± SD                        | 6.5 ± 3.6 | 5.3 ± 2.3             | 8.9 ± 4.3 <sup>&lt;0.0001</sup> | 6.7 ± 3.9             | 6.2 ± 3.1                  | 7.4 ± 3.5                         | 6.3 ± 3.6      |
| Familial psoriasis, n (%)                          | 35 (38.0) | 20 (33.9)             | 15 (45.5)                       | 23 (39.0)             | 12 (36.4)                  | 10 (40.0)                         | 24 (36.9)      |
| Psoriasis lesions during lockdown, n (%)           | 66 (71.7) | 44 (75.9)             | 22 (66.7)                       | 48 (81.4)             | 18 (54.5) <sup>0.006</sup> | 19 (76.0)                         | 46 (70.8)      |
| Areas affected by psoriasis during lockdown, n (%) |           |                       |                                 |                       |                            |                                   |                |
| Scalp  | 42 (63.6) | 31 (70.5)             | 11 (50.0)                       | 30 (62.5)             | 12 (66.7)                  | 14 (73.7)                         | 28 (60.9)      |
| Face and ears                                      | 32 (48.5) | 23 (52.3)             | 9 (40.9)                        | 25 (52.1)             | 7 (38.9)                   | 11 (57.9)                         | 21 (45.7)      |
| Neck   | 10 (15.2) | 4 (9.1)               | 6 (27.36)                       | 8 (16.7)              | 2 (11.1)                   | 4 (21.1)                          | 6 (13.0)       |
| Trunk  | 27 (40.9) | 17 (38.6)             | 10 (45.5)                       | 18 (37.5)             | 9 (50.0)                   | 11 (57.9)                         | 16 (34.8)      |
| Perineum   | 17 (25.8) | 13 (29.5)             | 4 (18.2)                        | 15 (31.3)             | 2 (11.1)                   | 5 (26.3)                          | 12 (26.1)      |
| Upper limbs  | 29 (43.9) | 18 (40.9)             | 11 (50.0)                       | 20 (41.7)             | 9 (50.0)                   | 9 (47.4)                          | 20 (43.5)      |
| Hand   | 17 (25.8) | 13 (29.5)             | 4 (18.2)                        | 12 (25.0)             | 5 (27.8)                   | 6 (31.6)                          | 10 (21.7)      |
| Lower limbs  | 35 (53.0) | 23 (52.3)             | 12 (54.5)                       | 22 (45.8)             | 13 (72.2)                  | 12 (63.2)                         | 23 (50.0)      |
| Feet   | 19 (28.8) | 13 (29.5)             | 6 (27.3)                        | 14 (29.2)             | 5 (27.8)                   | 5 (26.3)                          | 14 (30.4)      |
| Nails  | 11 (16.7) | 7 (15.9)              | 4 (18.2)                        | 8 (16.7)              | 3 (16.7)                   | 3 (15.8)                          | 8 (17.4)       |
| Joints   | 8 (12.1)  | 4 (9.1)               | 4 (18.2)                        | 6 (12.5)              | 2 (11.1)                   | 1 (5.3)                           | 7 (15.2)       |
| Worsening of psoriasis during lockdown, n (%)      | 43 (47.3) | 28 (48.3)             | 15 (45.5)                       | 30 (50.8)             | 13 (40.6)                  | 13 (54.2)                         | 28 (43.1)      |
| Causes of worsening <sup>a</sup> , n (%)           |           |                       |                                 |                       |                            |                                   |                |
| Stress   | 21 (48.8) | 14 (50.0)             | 7 (46.7)                        | 14 (46.7)             | 7 (53.8)                   | 7 (53.8)                          | 13 (46.4)      |
| Stopping treatment                                 | 8 (18.6)  | 3 (10.7)              | 5 (33.3)                        | 3 (10.0)              | 5 (38.5)                   | 3 (23.1)                          | 5 (17.9)       |
| Other causes <sup>b</sup>                          | 2 (4.7)   | 2 (7.1)               | 0                               | 2 (6.7)               | 0                          | 0                                 | 2 (7.1)        |
| No known reason                                    | 16 (37.2) | 12 (42.9)             | 4 (26.7)                        | 13 (43.3)             | 3 (23.1)                   | 5 (38.5)                          | 10 (35.7)      |

SD: standard deviation; y: years. In superscript: *P*-value where *P* < 0.05. For all other comparisons, the *P*-value was ≥ 0.05.

<sup>a</sup> There was no definition of "stress". We suggested these responses.

<sup>b</sup> Included: start of puberty (*n* = 1; 2.3%) and exposure to sun (*n* = 1; 2.3%).

### 3.2. Psoriasis treatments

Seventy-three patients were receiving treatment for their psoriasis at the beginning of lockdown. Of these, 33 (45.2%) were receiving systemic treatments, 24 of which were methotrexate or biotherapies. Ten patients (13.8%) stopped their treatment during lockdown: 6 (18.2%) of those on systemic therapies and 4 (10.0%) of those using topical treatment alone. Explanations given for stopping treatment are detailed in Table 3.

### 3.3. Consultations

During lockdown, 41.3% of patients had a consultation for their psoriasis, 71.1% of them by teleconsultation (Table 4), which was more frequent in high-risk regions (*P* = 0.003). The 3 main reasons for consultation were: keeping a scheduled appointment (60.5%); worsening of psoriasis (39.5%), and questions about COVID-19 (21.1%). The three main reasons for not consulting were: no consultation needed (55.6%), cancelation of consultations by the doctor

**Table 3**  
Psoriasis management.

|   | All n=92  | Age                   |                  | Severity of psoriasis |             | COVID-19 risk in patients' region |                |
|---|-----------|-----------------------|------------------|-----------------------|-------------|-----------------------------------|----------------|
|   |           | Infants/children n=59 | Adolescents n=33 | Mild n=59             | Severe n=33 | Low risk n=25                     | High risk n=65 |
| Therapies at start of lockdown, n (%)             | 73 (79.3) | 48 (81.4)             | 25 (75.8)        | 40 (67.8)             | 33 (100)    | 20 (80.0)                         | 52 (80.0)      |
| Topical therapies                                 | 57 (78.1) | 39 (81.3)             | 18 (72.0)        | 40 (100)              | 17 (51.5)   | 13 (65.0)                         | 43 (82.7)      |
| Systemic therapies <sup>a</sup>                   | 33 (45.2) | 19 (39.6)             | 14 (56.0)        | –                     | 33 (100)    | 8 (40.0)                          | 25 (48.1)      |
| Acitretin   | 11 (15.1) | 10 (20.8)             | 1 (4.0)          | –                     | 11 (33.3)   | 1 (5.0)                           | 10 (19.2)      |
| Methotrexate                                      | 8 (11.0)  | 4 (8.3)               | 4 (16.0)         | –                     | 8 (24.2)    | 1 (5.0)                           | 7 (13.5)       |
| Adalimumab  | 9 (12.3)  | 3 (6.3)               | 6 (24.0)         | –                     | 9 (27.3)    | 5 (25.0)                          | 4 (7.7)        |
| Etanercept  | 1 (1.4)   | 1 (2.1)               | 0                | –                     | 1 (3.0)     | 1 (5.0)                           | 0              |
| Ustekinumab                                       | 5 (6.8)   | 2 (4.2)               | 3 (12.0)         | –                     | 5 (15.2)    | 0                                 | 5 (9.6)        |
| Secukinumab                                       | 1 (1.4)   | 0                     | 0                | –                     | 1 (3.0)     | 0                                 | 1 (1.9)        |
| Treatment stopped during lockdown, n (%)          | 10 (13.9) | 5 (10.4)              | 5 (20.0)         | 4 (10.0)              | 6 (18.8)    | 4 (21.1)                          | 6 (11.5)       |
| Reasons for stopping, n (%)                       |           |                       |                  |                       |             |                                   |                |
| No prescription renewal                           | 2 (20.0)  | 1 (20.0)              | 1 (20.0)         | 1 (25.0)              | 1 (16.7)    | 1 (25.0)                          | 1 (16.7)       |
| Medical advice                                    | 2 (20.0)  | 2 (40.0)              | 0                | 1 (25.0)              | 1 (16.7)    | 0                                 | 2 (33.3)       |
| Own decision (supported by parents)               | 2 (20.0)  | 1 (20.0)              | 1 (20.0)         | 0                     | 2 (33.3)    | 1 (25.0)                          | 1 (16.7)       |
| Concerns over developing severe COVID-19 symptoms | 1 (10.0%) | 0                     | 1 (20.0)         | 0                     | 1 (16.7)    | 0                                 | 1 (16.7)       |
| Lower impact of psoriasis on social life          | 2 (20.0)  | 1 (20.0)              | 1 (20.0)         | 1 (25.0)              | 1 (16.7)    | 1 (25.0)                          | 1 (16.7)       |
| Child tried a therapeutic window                  | 1 (10.0%) | 0                     | 1 (20.0)         | 1 (25.0)              | 0           | 1 (25.0)                          | 0              |

In superscript: *P*-value where *P* < 0.05 (none in this table). For all other comparisons, the *P*-value was ≥ 0.05.

<sup>a</sup> Two children received acitretin associated with a biotherapy (adalimumab or secukinumab). None received cyclosporine or fumaric acid ester.

**Table 4**  
Consultations during lockdown.

|  | All<br>n = 92 | Age                        |                       | Severity of psoriasis |                  | COVID-19 risk in patients' region |                     |
|--|---------------|----------------------------|-----------------------|-----------------------|------------------|-----------------------------------|---------------------|
|  |               | Infants/children<br>n = 59 | Adolescents<br>n = 33 | Mild<br>n = 59        | Severe<br>n = 33 | Low risk<br>n = 25                | High risk<br>n = 65 |
| Consultation for psoriasis during lockdown, n (%)                    |               |                            |                       |                       |                  |                                   |                     |
| Yes  | 38 (41.3)     | 27 (45.8)                  | 11 (33.3)             | 23 (39.0)             | 15 (45.5)        | 12 (48.0)                         | 25 (38.5)           |
| No   | 54 (58.7)     | 32 (54.2)                  | 22 (66.7)             | 36 (61.0)             | 18 (54.5)        | 13 (52.0)                         | 40 (61.5)           |
| If yes, how did you consult? n (%) <sup>a</sup>                      |               |                            |                       |                       |                  |                                   |                     |
| Face-to-face consultation  | 14 (36.8)     | 9 (33.3)                   | 5 (45.5)              | 9 (39.1)              | 5 (33.3)         | 10 (83.3)                         | 4 (16.0) <0.0001    |
| Teleconsultation   | 27 (71.1)     | 18 (66.7)                  | 9 (81.3)              | 16 (69.6)             | 11 (73.3)        | 4 (33.3)                          | 22 (88.0) 0.003     |
| If yes, why? n (%)   |               |                            |                       |                       |                  |                                   |                     |
| Scheduled consultation   | 23 (60.5)     | 16 (59.3)                  | 7 (63.6)              | 9 (39.1)              | 14 (93.3) 0.0008 | 6 (50.0)                          | 16 (64.0)           |
| Worsening of psoriasis   | 15 (39.5)     | 10 (37.0)                  | 5 (45.5)              | 14 (60.9)             | 1 (6.7) 0.0008   | 6 (50.0)                          | 9 (36.0)            |
| Question about COVID-19  | 8 (21.1)      | 8 (29.6)                   | 0 0.003               | 3 (13.0)              | 5 (33.3)         | 1 (8.3)                           | 7 (28.0)            |
| Prescription renewal   | 1 (2.6)       | 1 (3.7)                    | 0                     | 1 (4.3)               | 0                | 0                                 | 1 (4.0)             |
| If no, why not? n (%)  |               |                            |                       |                       |                  |                                   |                     |
| No consultation needed   | 30 (55.6)     | 20 (62.5)                  | 10 (45.5)             | 23 (63.9)             | 7 (38.9) 0.01    | 5 (38.5)                          | 24 (60.0)           |
| Consultation canceled by the doctor and no new appointment scheduled | 15 (27.5)     | 8 (25.0)                   | 7 (31.8)              | 7 (19.4)              | 8 (44.4)         | 7 (53.8)                          | 8 (20.0) 0.02       |
| Doctor unavailable   | 3 (5.6)       | 1 (3.1)                    | 2 (9.1)               | 2 (5.6)               | 1 (5.6)          | 0                                 | 3 (7.5)             |
| Worried about going to the doctor's office                           | 5 (9.3)       | 3 (9.4)                    | 2 (9.1)               | 4 (11.1)              | 1 (5.6)          | 0                                 | 5 (12.5)            |
| Consultation postponed   | 2 (3.7)       | 0                          | 2 (9.1)               | 1 (2.8)               | 1 (5.6)          | 1 (7.7)                           | 1 (2.5)             |

In superscript: *P*-value if *P* < 0.05. For all other comparisons, the *P*-value was ≥ 0.05.

<sup>a</sup> Two children had both a face-to-face consultation and a teleconsultation during lockdown.

without making a new appointment (27.5%), and worries about visiting the doctor's office (9.3%).

### 3.4. COVID-19 infection

Seven children (7.6%) had family members who had contracted COVID-19. None of these 7 children were receiving immunosuppressive treatment. Only two (2.2%) developed COVID-19 symptoms (Table 1). The first was an 11-year-old boy who was given topical therapy. He developed fever, abdominal pain, urticaria, and severe asthenia. He reported having a psoriasis flare-up. The second was a 3-year-old boy not on treatment and who had no skin involvement. He developed fever, asthenia and myalgia. Neither a rash nor psoriasis flare-ups were reported. Two of the seven patients had a psoriasis flare-up during lockdown, but it is not known whether the timing of these flare-ups coincided with COVID-19 exposure.

### 3.5. Impact of psoriasis and treatments on patients' ability to follow preventive health and social measures

Twenty-one patients (22.8%) reported finding it difficult to follow preventive measures because of their psoriasis: 47.6% had problems using alcohol-based hand sanitizers, 42.9% following handwashing protocols, 28.6% wearing masks, and 9.5% wearing protective gloves (Table 5). Forty-three patients (46.2%) said they did not plan to resume school; this was more common among adolescents (*P* = 0.0002; Table 5). Among the explanations given that were directly linked to psoriasis or the pandemic were the following: 14% of patients justified not returning because of their psoriasis treatments, 9.3% because their psoriasis had worsened, 4.8% because they wanted to reduce their risk of infection, and 2.4% because of difficulties with handwashing protocols. For some children, the decision not to return was based on a need to reduce their risk of infection because of their comorbidities (7.0%), or because their parents had chronic diseases (2.4%).

## 4. Discussion

This survey of 92 children with psoriasis provides important real-world data on how the COVID-19 pandemic and the associated preventive measures affected the lives of these children and the management of their chronic dermatosis. Half of the children presented a psoriasis flare-up during lockdown, 14% stopped their treatment, mainly for reasons linked to the pandemic, 23% found it difficult to comply with preventive health measures because of their disease, and about three-quarters of psoriasis consultations were conducted by teleconsultation. This study had a number of limitations. First, our study population contained an unexpectedly high number of children receiving systemic therapies: 45.2%, compared to 17% and 30% in two French cohorts respectively in private practice and hospitals [14,15]. The recruitment of children via the patient association and through hospital dermatologists may explain why our population had a high number of patients with more severe psoriasis. Another limitation was the short inclusion period, leading to a relatively small number of participants. As a result of the small study size, the subgroup analyses lacked statistical power to show the impact of age, disease severity, or prevalence of COVID-19 on patient responses.

Only two patients developed symptoms of COVID-19 and only one of these patients reported having a psoriasis flare-up during infection. None of these patients were treated by systemic treatment and none developed a severe form of COVID-19. The symptoms of these two COVID-19 patients were similar to those described in pediatric cases in the general population, in which COVID-19 symptoms were most often mild or asymptomatic at this stage of the pandemic [19]. We now know that more severe COVID-19 can develop in children. Five children had been in contact with an infected family member but none of them developed COVID-19 symptoms. Since none of the seven children exposed to or contracting COVID-19 were receiving immunosuppressive treatments, our study does not provide new data on the risk of severe COVID-19 in children being treated with these drugs. Data about the risk of severe COVID-19 in adult patients with psoriasis receiving biologic therapies are quite reassuring [5,6,17] and there is currently no

**Table 5**  
COVID-19 preventive measures.

|   | All<br>n = 92 | Age                        |                            | Severity of psoriasis |                  | COVID-19 risk in patients' region |                     |
|---|---------------|----------------------------|----------------------------|-----------------------|------------------|-----------------------------------|---------------------|
|   |               | Infants/children<br>n = 59 | Adolescents<br>n = 33      | Mild<br>n = 59        | Severe<br>n = 33 | Low risk<br>n = 25                | High risk<br>n = 65 |
| Difficulties adhering to preventive measures due to psoriasis, n (%)                    | 21 (22.8)     | 16 (27.1)                  | 5 (15.2)                   | 12 (20.3)             | 9 (27.3)         | 7 (28.0)                          | 13 (20.0)           |
| If yes, why? n (%)  |               |                            |                            |                       |                  |                                   |                     |
| Handwashing   | 9 (42.9)      | 9 (56.3)                   | 0                          | 7 (58.3)              | 2 (22.2)         | 4 (57.1)                          | 4 (30.8)            |
| Applying alcohol-based hand sanitizer   | 10 (47.6)     | 6 (27.1)                   | 4 (80.0)                   | 6 (50.0)              | 4 (44.4)         | 4 (57.1)                          | 6 (46.2)            |
| Wearing a mask  | 6 (28.6)      | 4 (25.0)                   | 2 (40.0)                   | 2 (16.7)              | 4 (44.4)         | 0                                 | 6 (46.2)            |
| Wearing protective gloves   | 2 (9.5)       | 2 (12.5)                   | 0                          | 1 (8.3)               | 1 (11.1)         | 2 (28.6)                          | 0                   |
| Did you start, or plan to start, school or university before the summer holidays? n (%) |               |                            |                            |                       |                  |                                   |                     |
| Yes   | 49 (53.3)     | 40 (67.8)                  | 9 (27.3) <sup>0.0002</sup> | 33 (55.9)             | 16 (48.5)        | 11 (44.0)                         | 36 (55.4)           |
| No  | 43 (46.2)     | 19 (32.2)                  | 24 (72.7)                  | 26 (44.1)             | 17 (51.5)        | 14 (56.0)                         | 29 (44.6)           |
| If no, why? n (%)   |               |                            |                            |                       |                  |                                   |                     |
| No place at school (or school closed)   | 19 (44.2)     | 4 (21.1)                   | 15 (62.5) <sup>0.007</sup> | 13 (50.0)             | 6 (35.3)         | 6 (42.9)                          | 13 (44.8)           |
| Psoriasis treatments  | 6 (14.0)      | 4 (21.1)                   | 2 (8.3)                    | 0                     | 6 (35.3)         | 1 (7.1)                           | 5 (17.2)            |
| Worsening of psoriasis  | 4 (9.3)       | 3 (15.8)                   | 1 (4.2)                    | 3 (11.5)              | 1 (5.9)          | 3 (21.4)                          | 1 (3.4)             |
| Other disease (asthma...)   | 3 (7.0)       | 2 (10.5)                   | 1 (4.2)                    | 2 (7.7)               | 1 (5.9)          | 1 (7.1)                           | 2 (6.9)             |
| Child didn't want to  | 5 (11.6)      | 3 (15.8)                   | 2 (8.3)                    | 4 (15.4)              | 1 (5.9)          | 4 (28.6)                          | 1 (3.4)             |
| Parents didn't want to  | 17 (39.5)     | 9 (47.4)                   | 8 (33.3)                   | 13 (50.0)             | 4 (23.5)         | 4 (28.6)                          | 13 (44.8)           |
| Miscellaneous <sup>a</sup>  | 5 (11.6)      | 5 (26.3)                   | 0                          | 3 (11.5)              | 2 (11.8)         | 2 (14.3)                          | 3 (10.3)            |

In superscript: *P*-value if *P* < 0.05. For all the other comparisons, *P*-value was ≥ 0.05.

<sup>a</sup> Included: difficulties with handwashing protocols (*n* = 1; 2.4%), home schooling preferred (*n* = 1; 2.4%), to reduce the risk of coronavirus contamination (independently of my psoriasis or my treatments) (*n* = 2; 4.8%), my parents have health problems (*n* = 1; 2.4%).

reason to stop these treatments in children during the pandemic, as proposed in both the international and French recommendations [11,12]. Nevertheless, nearly 20% of the children stopped their systemic treatment.

About half of the patients in our study reported worsening of their psoriasis during lockdown. This exacerbation of psoriasis may have been caused by discontinuation of treatment or stress, but it could also be a direct result of COVID-19 infection. The preliminary results of the PsoProtect project indicate that 29% of patients developing COVID-19 experienced worsening of their psoriasis after infection [20]. The reasons given for discontinuations were related to fear of developing a severe form of COVID-19 and to restrictions on patient movement. In France, the recommendations for treatment follow-up were widely disseminated on websites for professionals and patients and they have generally been well accepted. Studies have shown that providing easy access to consultations or teleconsultations during lockdown may reduce the number of patients discontinuing their treatment [21,22]. Our study highlighted the trend towards preference for teleconsultations. However, our personal experience indicated that one of the major drawbacks of the emergency initiatives in place during the lockdown period was the lack of standardization in monitoring of psoriasis. Standardized measuring tools (skin severity scores, self-questionnaires, etc.) must be developed that have been specially adapted for telemonitoring of diseases such as psoriasis in children and adults.

The gradual re-opening of schools took place during the study, making it difficult to analyze our patients' responses about returning to school. However, almost a quarter of patients reported experiencing difficulty in complying with preventive measures because of their psoriasis, making mandatory return to school problematic. Moreover, some children and parents were anxious about a return to school because of concerns over the risk associated with treatments as well as the potential risk of contracting COVID-19.

This study highlights the major impact of the COVID-19 health crisis on children with psoriasis. It is essential that we learn from these data in order to improve and adapt the monitoring of chronic dermatoses in children and in adults in the event of a future health crisis.

#### Disclosure of interest

M. Beylot-Barry has undertaken paid activities as a consultant, advisor or speaker for AbbVie, Amgen, Celgene, Janssen Cilag, Leo Pharma, Lilly, MSD, Novartis, and Pfizer; D. Jullien has done the same for MEDAC UCB Fresenius Kabi, Biogen, AbbVie, Celgene, Novartis, Lilly, Janssen Cilag, Pfizer, and Merck Sharpe & Dohme, as has E. Mahé for AbbVie, Leo Pharma, Sanofi, Lilly, Amgen, Janssen Cilag, Novartis, and Celgene.

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