



**HAL**  
open science

# COVID-19 Infection among Patients with Autoinflammatory Diseases: A Study on 117 French Patients Compared with 1545 from the French RMD COVID-19 Cohort: COVIMAI –the French Cohort Study of SARS-CoV-2 Infection in Patient with Systemic Autoinflammatory Diseases

Rim Bourguiba, Maeva Kyheng, Isabelle Koné-Paut, Diane Rouzaud, Jerome Avouac, Mathilde Devaux, Nassim Ait Abdallah, Bruno Fautrel, Nicole Ferreira-Maldent, Vincent Langlois, et al.

## ► To cite this version:

Rim Bourguiba, Maeva Kyheng, Isabelle Koné-Paut, Diane Rouzaud, Jerome Avouac, et al.. COVID-19 Infection among Patients with Autoinflammatory Diseases: A Study on 117 French Patients Compared with 1545 from the French RMD COVID-19 Cohort: COVIMAI –the French Cohort Study of SARS-CoV-2 Infection in Patient with Systemic Autoinflammatory Diseases. *RMD Open : Rheumatic & Musculoskeletal Diseases*, 2022, 8 (1), pp.e002063. 10.1136/rmdopen-2021-002063 . hal-04418508

**HAL Id: hal-04418508**

**<https://hal.science/hal-04418508>**






Submitted on 5 Jun 2024

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

## SHORT REPORT

# COVID-19 infection among patients with autoinflammatory diseases: a study on 117 French patients compared with 1545 from the French RMD COVID-19 cohort: COVIMAI – the French cohort study of SARS-CoV-2 infection in patient with systemic autoinflammatory diseases

Rim Bourguiba <sup>1</sup>, Maeva Kyheng,<sup>2</sup> Isabelle Koné-Paut <sup>3</sup>, Diane Rouzaud,<sup>4</sup> Jerome Avouac,<sup>5</sup> Mathilde Devaux,<sup>6</sup> Nassim Ait Abdallah,<sup>7</sup> Bruno Fautrel <sup>8</sup>, Nicole Ferreira-Maldent,<sup>9</sup> Vincent Langlois,<sup>10</sup> Emmanuel Ledoult <sup>11</sup>, Hubert Nielly,<sup>12</sup> Viviane Queyrel,<sup>13</sup> Jérémie Sellam,<sup>14</sup> Nathalie Tieulie,<sup>15</sup> Pascal Chazerain,<sup>16</sup> Philippe Evon,<sup>17</sup> Julien Labreuche,<sup>18</sup> Léa Savey,<sup>1</sup> Veronique Hentgen,<sup>19</sup> Gilles Grateau,<sup>1</sup> Sophie Georgin-lavialle <sup>1</sup>, FAI<sup>2</sup>R/SFR/SNFMI/SOFREMIP/CRI/IMIDIATE consortium and contributors

**To cite:** Bourguiba R, Kyheng M, Koné-Paut I, *et al.* COVID-19 infection among patients with autoinflammatory diseases: a study on 117 French patients compared with 1545 from the French RMD COVID-19 cohort: COVIMAI – the French cohort study of SARS-CoV-2 infection in patient with systemic autoinflammatory diseases. *RMD Open* 2022;**8**:e002063. doi:10.1136/rmdopen-2021-002063

► Additional supplemental material is published online only. To view, please visit the journal online (<http://dx.doi.org/10.1136/rmdopen-2021-002063>).

Received 27 October 2021  
Accepted 4 February 2022



© Author(s) (or their employer(s)) 2022. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

For numbered affiliations see end of article.

### Correspondence to

Dr Sophie Georgin-lavialle; [sophie.georgin-lavialle@aphp.fr](mailto:sophie.georgin-lavialle@aphp.fr)

### ABSTRACT

**Objective** There is little known about SARS-CoV-2 infection in patients with systemic autoinflammatory disease (SAID). This study aimed to describe epidemiological features associated with severe disease form and death. Mortality between patients with and without SAID hospitalised for SARS-CoV-2 infection was compared.

**Methods** A national multicentric prospective cohort study was conducted from the French Rheumatic and Musculoskeletal Diseases (RMD) COVID-19 cohort. Patients with SAID were matched with patients with non-SAID on age±7 years, gender and number of comorbidities to consider important confounding factors. Impact of SAID on severity of SARS-CoV-2 infection was analysed using multinomial logistic regression for severity in three classes (mild, moderate and severe with mild status as reference). Fine-Gray regression model for length of hospital stay and binomial logistic regression model for risk of death at 30 days.

**Results** We identified 117 patients with SAID (sex ratio 0.84, 17 children) and compared them with 1545 patients with non-autoinflammatory immune-mediated inflammatory disorders (non-SAID). 67 patients had a monogenic SAID (64 with familial Mediterranean fever). Other SAIDs were Behçet' disease (n=21), undifferentiated SAID (n=16), adult-onset Still disease (n=9) and systemic-onset juvenile idiopathic arthritis (n=5). Ten adults developed severe form (8.6%). Six patients died. All children had a benign disease. After matching on age±7

### WHAT IS ALREADY KNOWN ABOUT THIS SUBJECT?

⇒ As reported in the French RMD cohort, patients with inflammatory RMD are more likely to develop severe form when they have multiple comorbidities or they were under steroids over 10 mg/day.

### WHAT DOES THIS STUDY ADD?

- ⇒ Children display more likely mild signs of COVID-19 with excellent prognosis.
- ⇒ When comparing patients with systemic autoinflammatory disease (SAID) and non-SAID after matching on age, sex and number of comorbidities, no significant difference in severity of COVID-19 between the two groups was found.
- ⇒ Associated comorbidities are more important than the underlying SAID, for developing a severe form or dying.
- ⇒ Colchicine or biotherapies against Interleukine IL-6 or IL-1 do not seem to be associated with high risk of severe form of COVID-19.

### HOW MIGHT THIS IMPACT ON CLINICAL PRACTICE OR FUTURE DEVELOPMENTS?

⇒ In addition to common risk factors for severe COVID-19, patients with SAID on steroids should be considered of high risk for severe form.

years, sex and number of comorbidities, no significant difference between the two groups in length of stay and the severity of infection was noted.

**Conclusion** As identified in the whole French RMD COVID-19 cohort, patients with SAID on corticosteroids and with multiple comorbidities are prone to develop more severe COVID-19 forms.

## INTRODUCTION

The pandemic related to SARS-CoV-2 infection has emerged since late 2019; Europe was affected in March 2020.<sup>1</sup> The virus caused many deaths in all countries. Patients with immune disorders were a concern of developing a severe form of COVID-19 especially those with systemic autoinflammatory diseases (SAIDs) in which, the innate immune system is improperly activated. The most frequent SAID worldwide is familial Mediterranean fever (FMF); three other monogenic diseases are also classified in the historical hereditary recurrent fevers: cryopyrin-associated periodic syndrome (CAPS), TNF receptor-associated periodic syndrome (TRAPS) and mevalonate kinase deficiency (MKD). Others are polygenic such as Behçet's disease and Still disease. It was initially difficult to predict if patients with SAID might develop an excessive inflammatory response when they contracted the virus.

To our knowledge, except few studies on FMF<sup>2</sup> and one on Behçet's disease,<sup>3-7</sup> little is known about both the risk factors and the diseases at risk of contracting a severe form of COVID-19.

We took the opportunity of the French national prospective registry collecting cases of COVID-19 in patients with immune diseases including SAIDs.<sup>8</sup> Our main question was to determine whether patients with SAIDs had an over-risk of severe form and death. Our secondary objectives were to assess whether the risk correlated to either the disease itself, the existence of comorbidities or the exposure to anti-inflammatory and immunosuppressive medications. In addition, we compared risk factors of patients with SAIDs with those with other inflammatory disorders included in the French RMD COVID-19 cohort.<sup>8</sup>

## PATIENTS AND METHODS

### Study design and patients

This multicentre, national cohort study (COVIMAI) analysed data from the French RMD COVID-19 cohort, which has been previously described.<sup>8</sup> Briefly, the French RMD COVID-19 cohort included paediatric and adult patients with confirmed inflammatory rheumatic and musculoskeletal diseases and highly suspected or a confirmed diagnosis of COVID-19. SAIDs were defined by the international criteria and included the four historical monogenic SAIDs (FMF, TRAPS, CAPS, MKD), undifferentiated SAIDs,<sup>9</sup> adult onset Still diseases (AOSDs) and Behçet's disease. We assessed and classified the severity of COVID-19 according to the level of care needed for each patient. Mild COVID-19 required ambulatory care;

moderate COVID-19 required non-intensive hospital treatment and severe COVID-19 required admission to an intensive care unit or led to death. The study started on March 2020 and was done in compliance with the research methodology MR-004 (research not involving humans connected to studies and evaluations in the field of health), received legal approval from Lille University Hospital ULR 2694-METRICS (Lille, France) and was declared to the Commission Nationale de l'Informatique et des Libertés (reference DEC20-107).

### Data collection

Cases of patients with inflammatory rheumatic and musculoskeletal diseases and highly suspected or confirmed COVID-19 were reported retrospectively. The individual data regarding diagnosis and specific ongoing treatments for inflammatory rheumatic and musculoskeletal diseases were captured from physicians via an electronic Case Report Form available online through a secured access. Data collected from patients' medical records have previously been described elsewhere.<sup>8</sup> All participants were followed until the worst COVID-19 outcome at the time of dataset lock. The present study was conducted on the database locked in 15 April 2021.

### Outcomes

The primary outcome was to compare the severity of COVID-19 in patients with SAID with patients with non-SAID included in the French RMD COVID-19 cohort. The secondary outcomes were to compare frequency of deaths and duration of hospital stay in patients with or without SAID.

### Statistical analysis

Quantitative variables were expressed as means (SD) in the case of normal distribution or medians (IQR) otherwise. Categorical variables were expressed as numbers (%). Normality of distributions was assessed using histograms and the Shapiro-Wilk test.

To consider important confounding factors, patients with SAIDs were matched with patients with non-SAID from the French RMD COVID-19 cohort on age $\pm$ 7 years, gender and number of comorbidities.

Impact of SAID on severity of SARS-CoV-2 infection was analysed, before and after matching, using multinomial logistic regression for severity in three classes (mild, moderate and severe with mild status as reference), Fine-Gray regression model for length of hospital stay (with death as competing event) and binomial logistic regression model (with link logit) for risk of death at 30 days.

All statistical tests were done at the two-tailed  $\alpha$  level of 0.05. Data were analysed using SAS V.9.4 (SAS Institute).

This study is registered with ClinicalTrials.gov, NCT04353609.

## RESULTS

We included 117 patients with SAID and compared them with 1545 patients with non-SAID. The disease

**Table 1**

	Non-Autoinflammatory diseases(n=1545)	Autoinflammatory diseases (n=117)
<b>Age (years)</b>		
Mean±SD	54.7±17.5	38.7±20.5
<18	41/1545 (2.7)	17/117 (14.5)
18–54	700/1545 (45.3)	74/117 (63.2)
55–64	328/1545 (21.2)	8/117 (6.8)
65–74	260/1545 (16.8)	9/117 (7.7)
≥75	216/1545 (14.0)	9/117 (7.7)
Female gender	1038/1545 (67.2)	64/117 (54.7)
<b>Comorbidities</b>		
Respiratory disease	204/1543 (13.2)	6/117 (5.1)
Interstitial lung disease	60/1543 (3.9)	0/117 (0.0)
COPD	61/1543 (4.0)	2/117 (1.7)
Asthma	95/1543 (6.2)	4/117 (3.4)
Cardiovascular disease	177/1543 (11.5)	11/117 (9.4)
Coronary heart diseases	146/1543 (9.5)	9/117 (7.7)
Stroke	42/1543 (2.7)	5/117 (4.3)
Diabetes	156/1543 (10.1)	8/117 (6.8)
BMI (kg/m <sup>2</sup> )	26.0 (22.0 ; 29.0)	23.0 (21.0 ; 26.0)
<30	1054/1388 (75.9)	98/111 (88.3)
30–39.9	297/1388 (21.4)	10/111 (9.0)
≥40	37/1388 (2.7)	3/111 (2.7)
Hypertension	361/1543 (23.4)	12/117 (10.3)
Cancer	57/1543 (3.7)	3/117 (2.6)
Smoking	139/1543 (9.0)	8/117 (6.8)
Chronic renal failure	80/1543 (5.2)	5/117 (4.3)
<b>Number comorbidities</b>		
0	674/1543 (43.7)	76/117 (65.0)
1	466/1543 (30.2)	26/117 (22.2)
2	230/1543 (14.9)	8/117 (6.8)
3	103/1543 (6.7)	4/117 (3.4)
4	58/1543 (3.8)	3/117 (2.6)
>4	12/1543 (0.8)	0/117 (0.0)
<b>Rheumatic or inflammatory Diseases treatments</b>		
Corticosteroid	460/1542 (29.8)	20/117 (17.1)
Systemic corticosteroid doses≥10 mg/day	176/458 (38.4)	6/20 (30.0)
NSSAIDs	147/1542 (9.5)	2/117 (1.7)
Colchicine	10/1542 (0.6)	72/117 (61.5)
Hydroxychloroquine	146/1542 (9.5)	0/117 (0.0)
Methotrexate	553/1542 (35.9)	13/117 (11.1)
Leflunomide	66/1542 (4.3)	0/117 (0.0)
Salazopyrine	17/1542 (1.1)	0/117 (0.0)
Mycophenolate Mofetil /mycophenolic acid	41/1542 (2.7)	0/117 (0.0)
Azathioprine	18/1542 (1.2)	4/117 (3.4)
IgIV	10/1542 (0.6)	0/117 (0.0)
<b>Targeted biologic or synthetic therapies</b>		
anti-TNF	469/1542 (30.4)	18/117 (15.4)
anti-IL6R	56/1542 (3.6)	5/117 (4.3)
anti-IL17A	51/1542 (3.3)	0/117 (0.0)

Continued

**Table 1** Continued

	Non-Autoinflammatory diseases(n=1545)	Autoinflammatory diseases (n=117)
anti-IL1	2/1542 (0.1)	12/117 (10.3)
abatacept	34/1542 (2.2)	1/117 (0.9)
JAK inhibitor	56/1542 (3.6)	1/117 (0.9)
Rituximab	83/1542 (5.4)	0/117 (0.0)
Other biologics	33/1542 (2.1)	1/117 (0.9)

Values are presented as no./total no. (%) unless otherwise indicated  
COPD, Chronic obstructive pneumopathy disease; IgIV, Intravenous immunoglobulins.

distribution of the 117 patients with SAID was respectively: monogenic SAID (n=67; 57.3%) including FMF (n=64) and CAPS (n=3), Behçet's disease (n=21; 17.9%), undifferentiated SAID (n=15; 12.8%), AOSD (n=9; 7.7%) and Systemic Juvenile Idiopathic Arthritis (sJIA) (n=5; 4.3%) (online supplemental table 1). Seventeen children had COVID-19 at a median age of 12 years ranging from 3 to 16 years. Ten cases occurred during the first wave (March, April 2020) and seven cases from the second wave (September 2020 onwards). The diseases were FMF (n=7; 41%), PFAPA (n=2), CAPS (n=2), sJIA (n=3), unclassified SAID (n=2) and DADA2 (n=1). Symptoms of COVID-19 were benign in children; none had risk factors for severe COVID-19; seven patients were on colchicine; others were receiving biotherapies (anti-IL-1: n=4; anti-IL-6: n=1; anti TNF: n=2) (online supplemental table 2).

The mean age in each group was 38.7±20.5 for SAID versus 54.7±17.5 for non-SAID. Among the SAIDs, there was a clear predominance of adults (85.5%) with most patients aged between 18 and 54 years (63.2%). The proportion of women was 54.7% in the SAID cohort and 67.2% in the non-SAID cohort. The proportion of patients with SAID with at least one known comorbidity of severe SARS-CoV-2 infection was 35%. Most patients were on colchicine (61.5%) in line with the high proportion of FMF among patients with SAID (table 1). In the SAID group, at least one comorbidity was noted in 35% versus 57% in the non-SAID group. Colchicine and anti-IL-1 biotherapy were, respectively, 61.5% and 10.3%

in the monogenic SAID group, whereas in the non-SAID group, systemic corticosteroids under 10mg/day (38.4%), methotrexate (35, 9%), anti-TNF (30.4%) and anti-IL-6R (3, 6%) were taken (table 1).

In the SAID group, 90 patients (76.9%) displayed mild form, 17 patients (14.5%) with moderate form and 10 patients (8.6%) with severe form. When comparing the severity between the two groups, the difference was closed to the significant level (with mild form as reference p=0.064), patients with SAID displayed a significantly lower proportion of moderate forms (14.5% vs 22.5%, OR 0.56, 95% CI 0.33 to 0.95). Severe forms were not different between the two groups (8.6% vs 11.2%, OR 0.66, 95% CI 0.34 to 1.29). The days of hospitalisation were similar between the two groups (HR 0.83, 95% CI 0.51 to 1.36) and there were no differences on the death rate (OR 1.00 (95% CI 0.43 to 2.35)). After matching on age±7 years, sex and number of comorbidities, we could not find any significant difference between the two groups (table 2).

Concerning the patients who died in the SAID group: two had severe FMF on colchicine and anakinra, one of them had AA amyloidosis; two had Behçet's disease, including a 35-year-old patient; one elderly patient had Still's disease and one had unclassified SAID. Half were on corticosteroids >10mg/day. All had numerous comorbidities and 2/3 were over 65 years old (tables 3 and 4).

**Table 2**

	Before matching			P-value	After matching			P-value
	Autoinflammatory diseases (n=117)	non-Autoinflammatory diseases (n=1545)	Effect size (95% CI)		Autoinflammatory diseases (n=116)	non-Autoinflammatory diseases (n=116)	Effect size (95% CI)	
Severity of COVID-19 Infection								
Mild	90 (76.9)	1025 (66.3)	1.00 (ref)	0.064	89 (76.7)	92 (79.3)	1.00 (ref)	0.86
Moderate	17 (14.5)	347 (22.5)	0.56 (0.33 to 0.95)		17 (14.7)	16 (13.8)	1.10 (0.52 to 2.31)	
Severe	10 (8.6)	173 (11.2)	0.66 (0.34 to 1.29)		10 (8.6)	8 (6.9)	1.29 (0.49 to 3.42)	
Length of hospital stay (days),								
median (IQR)	8 (4 to NA)	10 (5 to 22)	0.83 (0.51 to 1.36)	0.45	8 (4 to NA)	11 (4 to NA)	0.99 (0.52 to 1.88)	0.96
Death	6 (5.1)	79 (5.1)	1.00 (0.43 to 2.35)	0.99	6 (5.2)	5 (4.3)	1.21 (0.36 to 4.08)	0.76

Values are presented as no./total no. (percentage) unless otherwise indicated.

Matching on age±7 years, sex and number of comorbidities. A 5-year-old male patient with asthma in autoinflammatory disease could not be matched with a control

**Table 3**

	Monogenic recurrent fever	
	Non monogenic SAID (n=50)	Monogenic SAID (n=67)
Patient's characteristics		
Age (years)		
Median (IQR)	44.0 (34.0 ; 59.0)	29.0 (19.0 ; 43.0)
<18	4/50 (8.0)	13/67 (19.4)
18–64	37/50 (74.0)	45/67 (67.2)
≥65	9/50 (18.0)	9/67 (13.4)
Female gender	29/50 (45.3)	35/67 (54.7)
Comorbidities		
Respiratory disease	3/50 (6.0)	3/67 (4.5)
Interstitial lung disease	0	0
COPD	1/50 (2.0)	1/67 (1.5)
Asthma	2/50 (4.0)	2/67 (3.0)
Cardiovascular disease	6/50 (12.0)	5/67 (7.5)
Coronary heart diseases	4/50 (8.0)	5/67 (7.5)
Stroke	4/50 (8.0)	1/67 (1.5)
Diabetes	5/50 (10.0)	3/67 (4.5)
BMI (kg/m <sup>2</sup> )	25.0 (21.0 ; 28.0)	22.0 (20.0 ; 25.5)
<30	38/47 (80.9)	60/64 (93.8)
30–39.9	6/47 (12.8)	4/64 (6.3)
≥40	3/47 (6.4)	0/64 (0.0)
Hypertension	6/50 (12.0)	6/67 (9.0)
Cancer	2/50 (4.0)	1/67 (1.5)
Smoking	6/50 (12.0)	2/67 (3.0)
Chronic renal failure	2/50 (4.0)	3/67 (4.5)
Number comorbidities, median (IQR)		
0	25/50 (50.0)	51/67 (76.1)
1	16/50 (32.0)	10/67 (14.9)
2	5/50 (10.0)	3/67 (4.5)
3	3/50 (6.0)	1/67 (1.5)
4	1/50 (2.0)	2/67 (3.0)
>4	0	0
Rheumatic or inflammatory Diseases treatments		
Corticosteroid	19/50 (38.0)	1/67 (1.5)
Systemic corticosteroid doses ≥10 mg	6/19 (31.6)	0/1 (0.0)
NSSAIDs	1/50 (2.0)	1/67 (1.5)
Colchicine	15/50 (30.0)	57/67 (85.1)
Hydroxychloroquine	0	0
Methotrexate	13/50 (26.0)	0/67 (0.0)
Leflunomide	0	0
Salazopyrine	0	0

Continued

**Table 3** Continued

	Monogenic recurrent fever	
	Non monogenic SAID (n=50)	Monogenic SAID (n=67)
Mycophenolate Mofetil / mycophenolic acid	0	0
Azathioprine	4/50 (8.0)	0/67 (0.0)
IgIV	0	0
Targeted biologic or synthetic therapies		
anti-TNF	14/50 (28.0)	4/67 (6.0)
anti-IL6	5/50 (10.0)	0/67 (0.0)
anti-IL17A	0	0
anti-IL1	4/50 (8.0)	8/67 (11.9)
abatacept	1/50 (2.0)	0/67 (0.0)
JAK inhibitor	1/50 (2.0)	0/67 (0.0)
Other biologics	1/50 (2.0)	0/67 (0.0)
<b>Severity of COVID-19 Infection</b>		
Mild	35/50 (70.0)	55/67 (82.1)
Moderate	9/50 (18.0)	8/67 (11.9)
Severe	6/50 (12.0)	4/67 (6.0)
<b>Length of hospital stay (days), median (IQR)</b>	12 (6 to NA)	5 (2 to NA)
<b>Death</b>	4/50 (8.0)	2/67 (3.0)

## DISCUSSION

Patients of all ages with SAID can contract COVID-19 and without surprise, more frequently those with FMF, because it is the most frequent monogenic SAID worldwide and those with Behçet's disease, the most frequent polygenic SAID. Interestingly, neither patients with TRAPS nor MKD developed COVID-19 in this series, but some cases might be unreported.

Patients with SAID were younger compared with patients with non-SAID, and all children with SAID displayed a benign form of COVID-19 with excellent prognosis. Therefore, after matching with sex and age, there is no difference in the infection outcome: severe forms and deaths, between the two groups. Thus, the weight of comorbidities appeared more important than the underlying disease; indeed 41/117 (35%) patients with COVID-19+SAID displayed one or more comorbidities.

Colchicine, taken as a daily treatment by 72/117 patients with SAID (61.5%), was not associated with the severity of infection. Even though the number of patients is relatively low, there was no signal on a higher sensitivity to COVID-19 of patients receiving biotherapies targeting either TNF (n=4) or IL-1 (n=8). Interestingly, three patients receiving daily steroids >10 mg/day died including two patients with Behçet's disease. Chronic oral steroid intake has previously been reported to be associated with more severe COVID-19<sup>7</sup>.

Table 4

	Age at time of the survey	Sex	Body mass index (kg/m <sup>2</sup> )	Comorbidities* number type	Autoinflammatory disease	AA amyloidosis	Treatment	Biologics
1	75	W	20	2 COPD	Behçet disease	No	Steroids >10mg	No
2	34	H	43	3 Obesity Diabetes HT	Unclassified autoinflammatory disease	No	Colchicine	No
3	84	M	20	4 CVD CKD AVC	Still disease	No	Steroids > 10 mg	No
4	74	W	27	3 Diabetes HT	Behçet disease	No	Steroids >10 mg	No
5	58	M	21.8	2 HT CKD**	FMF	Yes	Colchicine	IL1-inhibitor (Anakinra)
6	81	M	22.9	5 CVD CKD** COPD HT	FMF	No	Colchicine	IL1-inhibitor (Anakinra)

## CONCLUSION

In conclusion, COVID-19 affected more likely patients with FMF in our cohort. Severe forms occurred more frequently among patients with multiple comorbidities, and chronic intake of oral steroids.

### Author affiliations

<sup>1</sup>Sorbonne Université, AP-HP, Tenon Hospital, Internal Medicine Department, 4 rue de la Chine, 75020, Paris, France; national Reference center for autoinflammatory diseases and AA amyloidosis (CEREMAIA), Tenon Hospital, Paris, France

<sup>2</sup>Univ. Lille, CHU Lille, ULR 2694 - METRICS : évaluation des technologies de santé et des pratiques médicales, F-59000 Lille, France, CHU Lille, Département de Biostatistiques, F-59000 Lille, France, Université de Lille, Lille, France

<sup>3</sup>Service de Rhumatologie Pédiatrique, Centre de Référence des Maladies Auto-Inflammatoires de l'enfant, Hôpital Bicêtre, AP HP, Université Paris Sud, Bicêtre, France

<sup>4</sup>Department of internal medicine, Bichat hospital, Paris, France, Bichat Hospital, Paris, France

<sup>5</sup>Université de Paris, Service de Rhumatologie, Hôpital Cochin, AP-HP, Paris, France, Hôpital Cochin, Paris, France

<sup>6</sup>CHI Poissy-Saint-Germain-en-Laye, Saint-Germain-en-Laye, France

<sup>7</sup>Unité de Médecine Interne: Maladies Auto-immunes et Pathologie Vasculaire (UF 04), Centre de Référence des Maladies autoimmunes systémiques Rares d'Île-de-France MATHEC, AP-HP, Hôpital Saint-Louis, Paris, France, Université de Paris, IRSL, Recherche clinique appliquée à l'hématologie, EA, Paris, France, Hôpital Saint-Louis, Paris, France

<sup>8</sup>Sorbonne Université – Assistance Publique Hôpitaux de Paris, Pitié Salpêtrière University Hospital, Dept of Rheumatology, Reference Center for Rare Diseases CEREMAIA (ERN RITA), Paris, France. ii) Pierre Louis Institute of Epidemiology and Public Health, INSERM UMRS 1136, PEPITES team, Assistance Publique-Hôpitaux de Paris, Paris, France

<sup>9</sup>Internal Medicine, CHU Tours, Tours, France

<sup>10</sup>GH du Havre-Hôpital Jacques Monod, Le Havre, France

<sup>11</sup>Service de Médecine Interne, Centre de Référence des Maladies Auto-immunes et Systémiques Rares du Nord et Nord-Ouest de France (CeRAINO), CHU Lille, F-59000 Lille, France 2- Inserm, U1286, F-59000 Lille, France, CHRU de Lille, Lille, France

<sup>12</sup>Hôpital d'Instructions des Armées Bégin, Saint Mandé, France

<sup>13</sup>Rheumatology department, CHU de Nice, Nice, France

<sup>14</sup>Rheumatology, INSERM UMRS\_938, Sorbonnes Université UPMC Univ Paris 06, St-Antoine Hospital, DHU i2B, Paris, France

<sup>15</sup>Service de Rhumatologie, Hôpital Pasteur, Centre Hospitalier Universitaire, Université de Nice Sophia Antipolis, Nice, France

<sup>16</sup>Internal Medicine and Rheumatology, Groupe Hospitalier Diaconesses Croix Saint Simon, Paris, France

<sup>17</sup>Internal Medicine department, CH de Bar-Le-Duc, Bar-le-Duc, France

<sup>18</sup>Univ Lille, Lille, France

<sup>19</sup>CeReMAI-Department of Pediatrics Department of general pediatrics, Andre Mignot hospital, Versailles, CEREMAIA, France, Hôpital Mignot, Le Chesnay, France

**Collaborators** FAI<sup>2</sup>R /SFR/SNFMI/SOFREMIP/CR/IMIDIATE Consortium And Contributors: Florence Aeschlimann, Paris; Christian Agard, Nantes; Nassim, Ait-Abdallah Paris; Jean-David Albert, Rennes; Didier Alcaix, Le Havre; Jean-Sébastien Allain, Rennes; Yannick Allanore, Paris; Zahir Amoura, Paris; Adamah Amouzougan, Aint-Priest-En-Jarez; Emma Andre, Paris; Anais Arbault, Dijon; Jean-Benoît Arlet Paris; Laurent Arnaud, Strasbourg; Denis Arniaud, Marseille; Herliette Arty-Hue, Gap; Lucie Atlan, Amboise; Alexandra Audemard-Verger Tours; Christine Audoin-Pajot, Toulouse; Victor Audren, Paris; Gilles Avenel, Rouen; Jérôme Avouac, Paris; Maxime Bach-Bunner, Colmar; Hélène Bacquet-Deschryver, Dieppe; Brigitte Bader-Meunier, Paris; Nathalie Balandraud, Marseille; Jean-Charles Balblanc, Trevenans; Claire Ballot-Schmit, Besancon; Stéphane Bally, Chambéry; Frédéric Banal, Saint-Mandé; Béatrice Banneville, Paris; Pierre Barbery, Lisieux; Audrey Barrelet, Jossigny; Géraldine Bart, Rennes; André Basch, Caluire-Et-Cuire; Vincent Baumier, Clermont-Ferrand; Guillaume Bayer, Quincy-Sous-Senart; Sophie Bayle, Avignon; Catherine Beauvais, Paris; Rudie Beinat, Bordeaux; Véronique Belin, Thonon-Les-Bains; Rakiba Belkhir, Kremlin-Bicetre; Alexandre Belot, Bron; Aurélie Beltai, Narbonne; Ruben Benainous, Bobigny; Mohammed Benammar, Saint-Quentin; Chahinez Bendahmane, Pontoise; Mathilde Benhamou, Versailles; Ygal Benhamou, Rouen; Ahmed Benmansour, Chateauroux; Pascal Bennet, Bois-Guillaume; Brigitte Bernoux-Manat, Rennes; Elise Berthet, Clermont-Ferrand; Sabine Berthier, Dijon; Olivia Berthoud, Rennes; Emilie Berthou, Lyon; Ewa Bertolini, annecy; Adrien Bigot, Tours; Aurélie Bisson-Vaivre, Castres, Gilles Blaison, Colmar; Gilles Bolla, Cannes; Olivier Bonidan, Agen; Christine Bonnet, Limoges; Raphaël Borie, Paris; Charlotte Borocco, Paris; Marie Bossert, Trevenans; Laurence Boudou, Saint-Chamond; Françoise Bouhour, Bron; Kévin Bouillier, Besancon; Laurence Bouillet, Grenoble; Bastien Bouldoires, Colmar; Thomas Bourree, Cholet; Ines Boussem, Paris; Karima Boussoulaim, Saint-Priest-En-Jarez; Eric Bouvard, Paris; Brondino Regine, Pennes-Mirabeau; Pierre Buchlin, Mulhouse; Laurence Cabantous, Merignac; Patrice Cacoub, Paris; Simon Cadiou, Rennes; Alaine Cantagrel, Toulouse; Didier Caplanne, Bayonne; Aurélie Carbasse, Montpellier; Maurizio Carteni, Saint-Pierre-De-Coutances; Brice Castel, Tarbes; Pascal Cathebras, Saint-Priest-En-Jarez; Hervé Caumont, Troyes; Audrey Cayot-Bouillet, Dijon; Annalisa Celant, Metz; Aurélie Chaffin, Avranches; Benjamin Chaigne, Paris; Benoît Chaillous, Herbiers; Romuald Champy, Ecuelles; Agnès Charcot, Paris; Pierre Charles, Paris; Isabelle Charlot-Lambrecht, Reims; Caroline Charpin, Marseille; Emmanuel Chatelus, Strasbourg; Bernard Chaudier, Marseille; Pascal Chazerain, Paris; Pascale Chertok, Argenteuil; Xavier Chevalier, Creteil; Maxime Chevreau, Aix-Les-Bains; Emilie Chotard, Paris; Delphine Chu Miow Lin, Tours; Pascal Claudepierre, Creteil; Gaëlle Clavel, Paris; Cyril Clavel-Osorio, Saint-Martin; Marine Clay, Grenoble; Johanna Clet, Bordeaux; Fleur Cohen, Paris; Gregory Cohen, Avignon; Marie-Eve Colette-Cedoz, Bourgoin-Jallieu; Nived Collercandy, Tours; Antoine Colombey; Saint-Nazaire; Chloé Comarmond, Paris; Bernard Combe, Montpellier; Céline Comparon, Bobigny; Elodie Constant, Valence; Arnaud Constantin, Toulouse; Pascal Coquerelle, Beuvry; Justine Corli, Douai; Clémence Corre, Vannes; Nathalie Costedoat-Chalumeau, Paris; Marion Couderc, Lermont-Ferrand; Marie Couret, Bourg-En-Bresse, Natacha Courvoisier, Nogent-Sur-Marne; Fabienne Coury-Lucas, Pierre-Benite; Cécile Coutarel, Clermont-Ferrand; Fabrice Coutier, Vesoul; Richard Damade, Chartres; Laurence Daver-Malaterre, Marseille; Claire De Moreuil, Brest; Marijke Decrock, Perpignan; Michel Delahousse, Suresnes; Emilie Delattre Barrois, Quincey; Christophe Deligny, Fort-De-France; Delphine Denarie, Roanne; Amélie Denis, Le Mans; Camille Deprouw, Courbevoie; Emanuelle Derris, Le Mans; Alban Deroux, Grenoble; Renaud Desbarbieux, Boulogne-Sur-Mer; Elise Descamps, Paris; Alexandra Desdoits, Caen; Chantal Deslandre, Paris; Marie Desmurs, Mulhouse; Jacques Despau, Montelimar; Marie Desplats, Lambersart; Frédéric Detree, Reims; Valérie Devauchelle-Pensec, Brest; Mathilde Devaux, Poissy; Robin Dhote,

Bobigny; Harmonie Diaz, Narbonne; Philippe Dieude, Paris; Yannick Dieudonne, Strasbourg; Elisabeth Diot, Tours; Guillaume Direz, Le Mans; Djamel-Dine Djeddi, Amiens; Fanny Domont, Paris; Sarah Douvier, Aix-Les-Bains; Béatrice Drouet, Pau; Jean-Jacques Dubost, Clermont-Ferrand; Catherine Duc, Romans-Sur-Isere; Angélique Ducornet, Saint-Brieuc; Carine Dufauret-Lombard, Limoges; Cécile Dumaine, Paris; Anne-Elisabeth Dumel, Cernay; Chantal, Dumoulin-Richez Merignac; Agnès Duquesne, Bron; Géraldine Durand, Poitiers; Mariane Durandin-Truffinet, Paris; Pierre-Marie Duret, Colmar; Stéphanie Durieux-Mehlman, Saint-Cloud; Perrine Dusser-Benesty, Paris; Maïka Duval, Antibes; Mikaël Ebbo, Marseille; Esther Ebstein, Paris; Andra Economu-Dubosc, Sucy-En-Brie; Soumaya El Mahou, Tourcoing; Stéphanie Emilie, Villeneuve-Saint-Georges; Romain Euvrard, Bourg-En-Bresse; Philippe Evon, Bar-Le-Duc; Claire Eymard-Gibert, Lyon; Sylvie Fabre, Montpellier; Dorothée Fagedet, Gap; Dominique Farge-Bancel, Paris; Meryem Farhat, Lille; Marion Faucouner, Reims; Bruno Fautrel, Paris; Jacques Echtenbaum, Pantin; Renaud Felten, Strasbourg; Nicole Ferreira-Maldent, Tours; Elodie Feurer, Lyon; Amandine Fichet, Trevenans; Françoise Flaisler, Nimes; René-Marc Flipo, Lille; Nans Florens, Lyon; Violaine Foltz, Paris; Elisabeth Fontanges, Lyon; Jennifer Foret, Dax; Anne-Claire Fougousse, Saint-Mande; Anne Fouque-Aubert, Lyon; Catherine Foutrier-Morello, Ecully; Baptiste Glace, Vichy; Camille Glanowski, Saint-Mande; Bertrand Godeau, Creteil; Bruno Gombert, La Rochelle; Camille Gonnet-Gracia, La Rochelle; Tiphaine Goulenok, Paris; Philippe Goupille, Tours; Olivier Gourmelen, Aix-Les-Bains; Sophie Govindaraju-Audouard, Vesoul; Franck Grados, Amiens; Martine Grall-Lerosey, Rouen; Bruno Gardel, Arras; Anne Grasland, Colombes; Gilles Grateau, Paris; Monica Groza, Colmar; Pascal Guggenbuhl, Rennes; Isabelle Guichard, Saint-Priest-En-Jarez; Constance Guillaud, Creteil; Séverine Guillaume-Czitrom, Kremlin-Bicetre; Caroline Guillibert, Marseille; Xavier Guillot, Saint-Denis; Philippe Guilpain, Montpellier; Aline Gury, Angers; Pauline Guyader, Ploemeur; Marie-Hélène Guyot, Roubaix; Eric, Hachulla Lille; Cécile Hacquard-Bouder, Yvetot; Marie-Noelle Havard, Argenteuil; Jean-Pierre Hellier, Arles; Pascal Hennequin, Epinal; Basile Henriot, Dinan; Julien Henry, Kremlin-Bicetre; Véronique Hentgen, Le Chesnay; Marion Hermet, Vichy; Julie Hernandez, Montauban; Miguel Hie, Paris; Pascal Hilliquin, Corbeil-Essonnes; Olivier Hirschberger, Mulhouse; Ambre Hittinger-Roux, Reims; Jan Holubar, Montpellier; Elsa How Shing Koy, Saint-Priest-En-Jarez; Charlotte Hua, Nimes; Christophe Hudry, Paris; Serge Huguénel, Sarrebourg; Clara Jaccard, Clermont-Ferrand; Jean-Michel Jacquemier, Cornebarrieu; Bénédicte Jamard, Toulouse; Catherine Jan, Bar-Le-Duc; Sylvie Jean, Rennes; Laurie Joffres, Saint-Benoît; Sandrine Jousse-Joulin, Brest; Mathieu Jouvray, Arras; Pierre-Antoine Juge, Paris; Laurent Juillard, Lyon; Denis Jullien, Lyon; Abdelkrim Kabchou, Vichy; Ludovic Karkowski, Lyon; Françoise Karman, Pontault-Combault; Farid Kemiche, Pontoise; Jérémy Keraen, Quimper; Pierre Kieffer, Mulhouse; Isabelle Kone-Paut, Kremlin-Bicetre; Abdeldjalil Koreichi, Lorient; Marie Kostine, Bordeaux; Stéphanie Krebs, Ploemeur; Sylvain La Batide Alanore, Paris; Valentin Lacombe, Angers; Pierre Lafforgue, Marseille; Sophie Lahalle, PARIS; Marc Lambert, Lille; Isabelle Lambrecht, Reims; François Lamer, Rennes; Vincent Langlois, Le Havre; Sylvain Lanot, Alençon; Aurélie Lanteri, Antibes; Jean-Paul Larbre, Ierre-Benite; Augustin Latourte, Paris; Christian Lavigne, Angers; Noémie Le Gouellec, Valenciennes; Sophie Le Guen Guegan, Contamine-Sur-Arve; Guillaume Le Guenno, Clermont-Ferrand; Agnès Lebrun, Paris; Emmanuel Ledoult, Tourcoing / Lille; Nathalie Legoupil, Paris; Erick Legrand, Angers; Diane Leguy, Roubaix; Olivier Leloir, Ronchin; Christophe Leroux, Dreux; Rémi Leroy, Dunkerque; Marie Leroy-Gouix, Vannes; Charles Leske, Cholet; Tifenn Leturcq, Paris; Amélie Leurs, Dunkerque; Céline Leveque Michaud, Valence; François-Xavier Limbach, Saverne; Frédéric Liote, Paris; Anne, Lohse Trevenans; Pierre Lozac'h, Le Mans; Charlotte Lucas, Rennes; Etienne Mabrut, Pierre-Benite; Aurélie Madelon, Grenoble; Nadine Magy-Bertrand, Besançon; Matthieu Mahevas, Creteil; Hélène Maillard, Lille; Thibault Maillet, Macon; François Maillot, Tours; Sandrine Malochet-Guinamand, Clermont-Ferrand; Quentin Mangon, Aurillac; Julie Mankikian, Tours; Sylvie Marchou\_Lopez, Crolles; Nathalie Margarit, Portet-Sur-Garonne; Thierry Marhadour, Brest; Alexandre Maria, Montpellier; Xavier Mariette, Kremlin-Bicetre; Hubert Marotte; Saint-Priest-En-Jarez; Claire Martin, A Rochelle; Thierry Martin, Strasbourg; Alexis Mathian, Paris; François Maurier, Metz; Frédéric Maury, Beury; Betty Mazet-Guillaume, Angers; Arnaud Mazouyez, Contamine-Sur-Arve; Hassan Mazyad, Poissy; Nadia Mehzen-Cetre, Bordeaux; Arsène Mekinian, Paris; Isabelle Melki, Paris; Jean-Camille Meric, Ales; Laurent Messer, Colmar; Martin Michaud, Toulouse; Catherine Michel, Mulhouse; Matthias Michel, Sangatte; Mathilde

Michon, Courbevoie; Anne-Marie Milesi-Lecat, Vichy; Anna Molto, Paris; Olivier Moranne, Nimes; Gautier Morel, Valenciennes; Hugo Morel, Dijon; Jacques Morel, Montpellier; Franck Morin, Saint-Pierre-De-Coutances; Laurence Moulinier, Paris; Guillaume Moulis, toulouse; Bertrand Moura, Paris; Claudine Naude, Saint-Jean-De-Maurienne; Minh Nguyen, Paris; Sabine Nicolas-Vullierme, Chatillon; Hubert Nielly, Saint-Mande; Gaétane Nocturne, Kremlin-Bicetre; Aurore Nottez, Dunkerque; Henri-Olivier Ollagnon, Villeurbanne; Eric Ozio, Beziers; Isabelle Pacaud-Vitoux, Guilherand-Granges; Guillaume Padern, Montpellier; Anne Pagnier, Grenoble; Caroline Paris, Marseille; Antoine Parrot, Paris; Tristan Pascart, Lille; Yasmina Pascaud-Mansour, Angers; Lætitia Paulin, Bourgoin-Jallieu; Stephan Pavy, Kremlin-Bicetre; Judith Payet, Saint-Denis; Laurent Perard, Lyon; Céline Pereira-Gillion, Tours; Yves-Marie Pers, Montpellier; Edouard Pertuiset, Pontoise; Micheline Pha, Paris; Thao Pham, Marseille; Maud Pichon, Argenteuil; Audrey Pierreinard, Merignac; Gabrielle Pizana, Fougères; Sylvaine Poignant, Nantes; Elsa Poix, Quint-Fonsegrives; Agnès Portier, Paris; Jacques Pouchot, Paris; Antoine Poullet, Marseille; Nicolas Poursac, Bordeaux; Grégory Pugnet, Toulouse; Déborah Puyraimond-Zemmour, Paris; Pierre Quartier-Dit-Maire, Paris; Quenet Marion, Saint-Brieuc; Viviane Queyrel, Nice; Loïc Raffray, Saint-Denis; Jérôme Razanamahery, Dijon; Philippe Remy, Creteil; Myriam Renard, Aix-Les-Bains; Jessica Rene, Tours; Sabine Revuz, Metz; Bénédicte Rey, Lyon; Gaëlle Richard-Colmant, Lyon; Olivier Richer, Bordeaux; Christophe Richez, Bordeaux; Elodie Riviere, Kremlin-Bicetre; Etienne Riviere, Bordeaux; Sébastien Riviere, Paris; Sophie Robin, Elbeuf; Julien Rohmer, Suresnes; Isabelle Rott, Perpignan; Michel Rolland, Saint-Etienne; Mélanie Roriz, Agen; Carole Rosenberg, Argenteuil; Linda Rossi, Kremlin-Bicetre; Olivier Roth, Marseille; Sid-Ahmed Rouidi, Dreux; Mathilde Roumier, Suresnes; Mickaël Rousiere, Paris; Clémentine Ousselin, Valenciennes; Bénédicte Rouviere, Brest; Christian Roux, Nice; Fabienne Roux, Paris; Marielle Roux, Bourgoin-Jallieu; Nicolas Roux, Metz; Diane Rouzaud, Paris; Sylvie Rozenberg, Paris; Ruysen-Witrand Adeline, Toulouse; Sacco Isabelle, Paris; Sadj Fatiha, Poissy; Laurent Sailler, Toulouse; Carine Salliot, Orleans; Jean-Hugues Salmon, Reims; Charlotte Samaille, Lille; Maxime Samson, Dijon; Alain Saraux, Brest; Léa Savey, Paris; Jean Schmidt, Amiens; Julie Segulier, Marseille; Jérémie Sellam, Paris; Eric Senbel, Marseille; Thomas Sene, Paris; Patricia Senet, Paris; Raphaële Seror, Kremlin-Bicetre; Amélie Servettaz, Reims; Pascal Seve, Lyon; Aurélie Sicaud, Le Pont-De-Beauvoisin; Nadia Sivova, Tourcoing; Smets, Clermont-Ferrand; Vincent Sobans, Lille; Christelle Sordet, Strasbourg; Elisabeth Sornay-Rendu, La Tour-Du-Pin; Martin Soubrier, Clermont-Ferrand; Odile Souchaud-Debouverie, Poitiers; Gaëlle Sourisseau-Diverres, Gujan-Mestras; Lætitia Sparsa, Mulhouse; Lionel Spielmann, Colmar; Chloé Stavris, Marseille; Sarah Steib, Marseille; Catherine Straus, Elancourt; Victor Strotz, Antony; Sylvain Mathieu, Clermont-Ferrand; Séverine Taffignon-Clave, Ecully; Déborah Talmud, Orleans; Chloé Taraud, Niort; Nora Tenenbaum, Paris; Claire Theillac, Benoît Pierre-Benite; Thomachot, Gardanne; Thierry Thomas, Saint-Priest-En-Jarez; Nathalie Tieulie, Nice; Soizic Tiriau, Nantes; Alice Tison, Bordeaux; Anne Tournadre, Clermont-Ferrand; Eric Toussiro, Besançon; Ludovic Trefond, Clermont-Ferrand; Sophie Trijau, Marseille; Sébastien Trouillier, Aurillac; Anne-Priscille Trouvin, Paris; Marie-Elise Truchetet, Bordeaux; Florence Uettwiller, Tours; Florence Ulrich, Valenciennes; Yurdagul Uzunhan, Bobigny; Isabelle Valls-Bellec, Brest; Jacques Vaquier, Limoges; Eric Veillard, Saint-Malo; Laurent Veillon, Orleans; Guillaume Vial, Bordeaux; Jean-François Viillard, Bordeaux; Judith Victor, Bordeaux; Claire Vidon, Aix-Les-Bains; Vidon, Creteil; Camille Vigne, Pierre-Benite; Alexandre Virone, Kremlin-Bicetre; Ursula Warzocha, Bobigny; Daniel Wendling, Besançon; Claude Werle, Haguenau; Cécile Wibaux, Seclin; Michel Wisniewski, Saint-Amand-Les-Eaux; Juliette Woessner, Avignon; Bernadette Xerri-Campano, Saint-Maur-Des-Fosses.

**Funding** The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

**Competing interests** None declared.

**Patient consent for publication** Not applicable.

**Ethics approval** This study involves human participants and was approved by CNIL DEC20-107. Participants gave informed consent to participate in the study before taking part.

**Provenance and peer review** Not commissioned; externally peer reviewed.

**Open access** This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

#### ORCID iDs

Rim Bourguiba <http://orcid.org/0000-0002-7352-9074>  
 Isabelle Koné-Paut <http://orcid.org/0000-0001-8939-5763>  
 Bruno Fautrel <http://orcid.org/0000-0001-8845-4274>  
 Emmanuel Ledoult <http://orcid.org/0000-0002-3925-9541>



Sophie Georjin-lavialle <http://orcid.org/0000-0001-6668-8854>

## REFERENCES

- 1 Chen G, Wu D, Guo W, *et al.* Clinical and immunological features of severe and moderate coronavirus disease 2019. *J Clin Invest* 2020;130:2620–9.
- 2 Kharouf F, Ishay Y, Kenig A, *et al.* Incidence and course of COVID-19 hospitalizations among patients with familial Mediterranean fever. *Rheumatology* 2021;60:keab577.
- 3 Bourguiba R, Delplanque M, Vinit C, *et al.* Clinical course of COVID-19 in a cohort of 342 familial Mediterranean fever patients with a long-term treatment by colchicine in a French endemic area. *Ann Rheum Dis* 2020. doi:10.1136/annrheumdis-2020-218707. [Epub ahead of print: 02 Nov 2020].
- 4 Güven SC, Erden A, Karakaş Özlem, *et al.* COVID-19 outcomes in patients with familial Mediterranean fever: a retrospective cohort study. *Rheumatol Int* 2021;41:715–9.
- 5 Nas K, Eryilmaz N, Geyik MF, *et al.* COVID-19 in patients with familial Mediterranean fever treated with colchicine: case based review. *Rheumatol Int* 2021;41:811–7.
- 6 Stella A, Lamkanfi M, Portincasa P. Familial Mediterranean fever and COVID-19: friends or Foes? *Front Immunol* 2020;11:574593.
- 7 Zouboulis CC, van Laar JAM, Schirmer M, *et al.* Adamantiades-Behçet's disease (Behçet's disease) and COVID-19. *J Eur Acad Dermatol Venereol* 2021;35:e541–3.
- 8 FAI2R /SFR/SNFMI/SOFREMIP/CRI/IMIDIATE consortium and contributors. Severity of COVID-19 and survival in patients with rheumatic and inflammatory diseases: data from the French RMD COVID-19 cohort of 694 patients. *Ann Rheum Dis* 2021;80:527–38.
- 9 Papa R, Penco F, Volpi S, *et al.* Syndrome of undifferentiated recurrent fever (surf): an emerging group of autoinflammatory recurrent fevers. *J Clin Med* 2021;10:10.