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Original article

COVID-19 in French patients with chronic inflammatory rheumatic diseases: Clinical features, risk factors and treatment adherence

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ABSTRACT

Objective: To explore how patients with chronic inflammatory rheumatic diseases (CIRDs) coped with their disease during the COVID-19 pandemic and to identify possible predictive factors of SARS-CoV-2 infection in this population.

Methods: Patients followed in a single rheumatology department in France or registered on the Spondy+ platform, a secure e-health platform for spondyloarthritis patients, were invited to complete a questionnaire focused on their experiences around COVID-19 symptoms, testing and medications access during the lockdown period. Descriptive statistics were used to report questionnaire's results. Factors associated with COVID-19 or with treatment discontinuation were assessed by logistic regression.

Results: We obtained 655 answers from the 2,081 contacted patients: 474 with spondyloarthritis, 129 with rheumatoid arthritis and 52 with psoriatic arthritis. The population was predominantly female (61.8%) with a mean age of 51.0 ± 13.4 years. Incidence of COVID-19 was 6.9% (95%CI: 5.1–9.2%), including 12 confirmed and 33 highly suspicious cases. No death was observed and five patients needed to be hospitalized. Factors independently associated with an increased risk of infection were SARS-CoV-2 exposure, younger age and non-smoking. More than 30% of the patients suspended or decreased the dosage of one of their drugs during the lockdown period. This was followed in 63.4% of them by increased disease activity. Modifications were mostly motivated by fear of contagion (79.3%).

Conclusion: We did not observe any increase of incidence or severity of COVID-19 in patients suffering of the 3 most common CIRDs. This survey also adds evidence of the safety of anti-rheumatic drugs use regarding COVID-19.

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1. Introduction

Since the beginning of the current COVID-19 pandemic, concerns have arisen about patients with immune mediated inflammatory diseases, in particular chronic inflammatory rheumatic diseases (CIRDs) [1,2]. Indeed, patients with CIRDs are known to have an increased risk of infection, in particular viral infections, because of immune dysregulation caused by the disease itself and also linked to their comorbidities and immune-modulating treatments [3].

With the growing knowledge on the COVID-19, several risk factors have been identified including male sex, age over 65, severe obesity, hypertension, diabetes, cardiovascular diseases, chronic kidney disease, liver disease and chronic respiratory diseases [4], which may cause increased incidence of SARS-CoV-2 infection or worse outcomes in case of COVID-19. These risk factors are frequently increased in CIRDs, in particular cardiovascular comorbidities. Uncertainties on the possibility of an increased risk of COVID-19 due to the rheumatic disease in itself with associated comorbidities still exist. However, last reports have shown that patients with CIRDs do not seem to present an increased incidence of COVID-19, neither a worse outcome, in case of infection, as compared to the general population [5–7].

Management of CIRDs patients in pandemic periods may vary according to countries guidelines, severity of the disease, presence of comorbidities and lastly according to patients' fears, making

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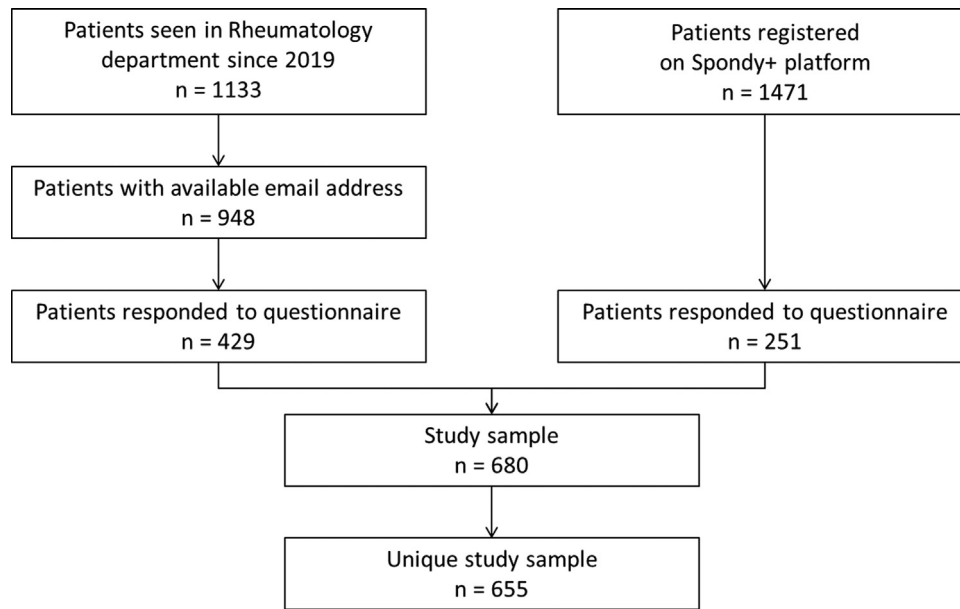


Fig. 1. Flow chart.

sometimes challenging and conflicting priorities for these patients: should they interrupt immunomodulatory drugs to decrease the risk of viral infection, with the risk of disease flare? Should they attend health care visits with the risk of being infected?

We therefore aimed at exploring how patients with CIRDs coped with their disease during the lockdown period, and to identify possible predictive factors of SARS-CoV-2-infection and the global burden of COVID-19 on these patients.

2. Methods

2.1. Study population

We focused on the three more frequently seen CIRDs: spondyloarthritis (SpA), rheumatoid arthritis (RA) and psoriatic arthritis (PsA). The study population came from two recruitment procedures. On one hand, all adult (> 18 years-old) patients seen since 2019 in the rheumatology department of Ambroise Paré Hospital in Paris close suburb (either in outpatient or inpatient clinics) with a diagnosis of SpA, RA or PsA were asked to complete a questionnaire focused on their experiences around COVID-19 symptoms, testing and medication access during the lockdown period. The questionnaire was sent via an e-mail on April 18, 2020 and responses were collected until May 21, 2020. On the other hand, the same questionnaire was proposed during the same period to all patients registered on the Spondy+® platform, a secure e-health platform for SpA patients developed to give them update information on their disease, to allow them to self-monitor disease activity and possibility to participate to research studies. The Spondy+® patients participating to our survey have previously provided a medical certificate from their rheumatologist or general practitioner confirming the SpA diagnosis.

The study was conducted according to the current regulations of the International Conference on Harmonization guidelines and the principles of the Declaration of Helsinki.

2.2. Study variables–COVID-19 survey

Participants were asked to fill a questionnaire of 39 questions divided in several sections: sociodemographic characteristics, disease characteristics and treatments, comorbidities, presence of

symptoms suggesting viral infection, eventual confirmed diagnosis of COVID-19 (nasopharyngeal swab or CT-scan), patient's contacts with subjects diagnosed with COVID-19, adherence to the ongoing rheumatological therapy and any changes in their rheumatology treatment plan since the beginning of the COVID-19 pandemic, as well as reported changes on their disease activity or on the management of their follow up visits.

2.3. Statistical analyses

Statistical analysis was performed using R version 3.6.1 (<http://www.r-project.org/>).

Differences between COVID-19 questionnaire respondents and non-respondents were assessed with Student's *t* test for continuous variables and χ^2 tests for categorical variables. Descriptive statistics were used to report questionnaire's results: mean and standard deviation for continuous variables, frequency for categorical variables. Factors associated with COVID-19 or with treatment discontinuation were assessed by univariate and multivariate logistic regression models. All the variables, which obtained a *P*-value of less than 0.1, were entered in multivariate models. *P*-values equal to or less than 0.05 were considered statistically significant. Performances of clinical symptoms as diagnostic tests for COVID-19 were assessed using epiR package.

3. Results

3.1. Study population

We were able to contact by email 948 (83.7%) of the 1133 RA, SpA and PsA patients seen in 2019 in our Rheumatology department, of whom 429 (45.3%) responded to the questionnaire. We also obtained 251 (17.1%) answers from the 1471 Spondy+® patients. As 25 patients from the Hospital have also answered to the questionnaire on Spondy+®, we finally obtained 655 unique answers (Fig. 1). Factors independently associated with the non-response to the questionnaire were age (younger), SpA diagnosis and recruitment through Spondy+® platform (Table S1).

Demographic and clinical characteristics of the included patients are detailed in Table 1. The population was predominantly female (61.8%) with a mean (\pm standard deviation) age

Table 1
Characteristics of the study population.

Characteristic	All (n = 655)	Spondyloarthritis (n = 474)	Rheumatoid arthritis (n = 129)	Psoriatic arthritis (n = 52)
Sociodemographic characteristics				
Gender, n (%) of men	250 (38.2)	206 (43.5)	22 (17.1)	22 (42.3)
Age, mean \pm sd	51.0 \pm 13.4	48.1 \pm 12.2	60.5 \pm 12.8	54.1 \pm 13.8
Health professionals, n (%)	94 (14.3)	76 (16.0)	11 (8.5)	7 (13.5)
Profession with public contact, n (%)	271 (41.4)	208 (43.9)	40 (31.0)	23 (44.2)
Medical history				
Rheumatic disease duration, mean \pm sd	12.5 \pm 10.2	13.0 \pm 10.2	12.0 \pm 10.6	8.4 \pm 8.4
Smokers, n (%)	103 (15.7)	75 (15.8)	20 (15.5)	8 (15.4)
BMI > 25, n (%)	307 (46.9)	218 (46.0)	59 (45.7)	30 (52.7)
At least one comorbidity ^a , n (%)	233 (35.6)	150 (31.3)	65 (50.4)	18 (34.6)
Number of comorbidities ^a , mean \pm sd	0.5 \pm 0.8	0.4 \pm 0.7	0.7 \pm 1.0	0.5 \pm 0.8
Treatment				
NSAIDs, n (%)	300 (45.8)	249 (52.5)	26 (20.2)	25 (48.1)
Corticosteroids, n (%)	107 (16.4)	28 (5.9)	74 (57.4)	5 (9.6)
Daily dose \geq 10 mg/day	21 (3.2)	10 (2.1)	9 (7.0)	2 (3.8)
cDMARDs, n (%)	158 (24.1)	58 (12.2)	83 (64.3)	17 (32.7)
Methotrexate, n (%)	132 (20.1)	42 (8.9)	75 (58.1)	15 (28.9)
bDMARDs, n (%)	404 (61.7)	299 (63.1)	74 (57.4)	31 (59.6)
TNF blockers, n (%)	306 (46.7)	255 (53.8)	33 (25.6)	18 (34.6)
IL-17 blockers, n (%)	55 (8.4)	43 (9.07)	0 (0)	12 (23.1)
IL-6 blockers, n (%)	18 (2.7)	0 (0)	17 (13.2)	1 (1.92)
tsDMARDs, n (%)	10 (1.5)	4 (0.8)	4 (3.1)	2 (3.8)

sd: standard deviation; BMI: body mass index; NSAIDs: non-steroidal anti-inflammatory drugs; cDMARDs: conventional disease modifying anti-rheumatic drugs; bDMARDs: biological conventional disease modifying anti-rheumatic drugs; tsDMARDs: targeted synthetic conventional disease modifying anti-rheumatic drugs.

^a Among the following comorbidities (past or present): cardiovascular disease (stroke, heart failure), hypertension, diabetes, asthma, renal failure, respiratory insufficiency, cancer, hematologic malignancy, HIV, HBV or HCV infection, cirrhosis, sickle cell anemia, splenectomy, organ transplant.

Table 2
SARS-CoV-2 exposure and symptoms.

Characteristic	All (n = 655)	Spondyloarthritis (n = 474)	Rheumatoid arthritis (n = 129)	Psoriatic arthritis (n = 52)
Exposure, at least one, n (%)				
Contact with a traveler in high incidence country ^a , n (%)	83 (12.7)	70 (14.8)	9 (7.0)	4 (7.7)
Contact with a confirmed case, n (%)	58 (8.9)	49 (10.4)	6 (4.7)	3 (5.8)
Contact with a suspected case, n (%)	153 (23.4)	125 (26.4)	20 (15.5)	8 (15.4)
Travel in a high incidence country ^a , n (%)	35 (5.3)	28 (5.9)	6 (4.7)	1 (1.9)
Symptoms, at least one, n (%)				
Headache, n (%)	388 (59.2)	290 (61.2)	67 (51.9)	31 (59.6)
Rhinorrhea, n (%)	201 (30.7)	157 (33.1)	25 (19.4)	19 (36.5)
Dry cough, n (%)	147 (22.5)	106 (22.4)	25 (19.4)	16 (30.8)
Fever, n (%)	123 (18.8)	101 (21.3)	16 (12.4)	6 (11.5)
Myalgia, n (%)	117 (17.9)	89 (18.8)	17 (13.2)	11 (21.1)
Diarrhea, n (%)	115 (17.6)	91 (19.3)	15 (11.6)	9 (17.3)
Chills, n (%)	106 (16.2)	87 (18.3)	12 (9.3)	7 (13.5)
Thoracic pain, n (%)	104 (15.9)	77 (16.2)	13 (10.1)	14 (26.9)
Dyspnea, n (%)	90 (13.8)	76 (16.0)	9 (7.0)	5 (9.6)
Abdominal pain, n (%)	87 (13.3)	66 (14.0)	15 (11.6)	6 (11.5)
Wet cough, n (%)	84 (12.8)	70 (14.8)	8 (6.2)	6 (11.5)
Nausea, vomiting, n (%)	77 (11.8)	54 (11.4)	17 (13.2)	6 (11.5)
Skin lesions, n (%)	52 (8.0)	37 (7.8)	9 (7.0)	6 (11.5)
Confusion, n (%)	30 (4.6)	26 (5.5)	3 (2.3)	1 (1.9)
Agueusia, n (%)	27 (4.1)	22 (4.7)	5 (3.9)	0 (0)
Anosmia, n (%)	14 (2.1)	7 (1.5)	5 (3.9)	2 (3.9)
	11 (1.7)	6 (1.3)	4 (3.1)	1 (1.9)

^a High incidence countries: China, Hong-Kong, Italy, Spain.

of 51.0 \pm 13.4 years. Most of the patients were from European ancestry (87.3%) and lived in Paris or in its suburban area (64.6%). Geographical distribution of the responders is shown in Fig. S1. Frequency of SpA (72.3%) was higher than that of RA (19.7%) or PsA (8.0%) and the mean disease duration was 12.5 \pm 10.2 years. Anti-inflammatory drugs were taken by 62% of the patients (non-steroidal anti-inflammatory drugs (NSAIDs): 45.8%, corticosteroids: 16.3%). The vast majority of them (72.8%) were treated with disease modifying anti-rheumatic drug (DMARDs): conventional DMARDs (cDMARDs): 24.12%, biological DMARDs (bDMARDs): 61.7%, targeted synthetic DMARDs: 1.5%. Only a minority presented some comorbidity (35.6%), high blood pressure being the most frequent (18.6%).

3.2. SARS-CoV-2 exposure, symptoms and diagnoses

Approximately one third of the patients reported a possible or confirmed exposure to SARS-CoV-2. The most frequently reported circumstance was the contact with a confirmed or suspected case. More than half of the responders experienced at least one symptom potentially associated with COVID-19 since January 2020. The most frequently reported symptoms were headache (30.7%), rhinorrhea (22.5%) and dry cough (18.8%). Details of exposure and symptoms are given in Table 2. Twelve cases of COVID-19 were confirmed (1.8%, 95%CI: 1.0–3.2%) by nasopharyngeal polymerase chain reaction (PCR) testing, and/or by CT-scan (with typical COVID-19 abnormalities): 4 patients have both positive PCR test and CT-scan, 3 PCR

Table 3
Factors associated with SARS-CoV-2 infection (confirmed or suspected) in the multivariate regression analysis.

Characteristic	No infection (n = 610)	Infection (n = 45)		Univariate analysis OR (95%CI)	Multivariate analysis OR (95%CI)
		Suspected (n = 33)	Confirmed (n = 12)		
Gender					
Female, n (%)	372 (91.6)	24 (6.2)	9 (2.2)	–	
Male, n (%)	238 (95.2)	9 (3.6)	3 (1.2)	0.57 (0.28–1.09)	
Age, mean ± sd	51.5 ± 13.3	44.8 ± 13.0	46.4 ± 14.6	0.96 (0.94–0.99)**	0.97 (0.94–0.99)**
Disease					
Rheumatoid arthritis, n (%)	122 (94.6)	3 (2.3)	4 (3.1)	–	
Psoriatic arthritis, n (%)	47 (90.4)	4 (7.7)	1 (1.9)	1.85 (0.53–6.10)	
Spondyloarthritis, n (%)	441 (92.8)	26 (5.7)	7 (1.5)	1.30 (0.60–3.28)	
Health professionals					
No, n (%)	529 (94.1)	23 (4.3)	9 (1.6)	–	
Yes, n (%)	81 (86.2)	10 (10.6)	3 (3.2)	2.65 (1.30–5.16)**	1.71 (0.78–3.61)
Profession with public contact					
No, n (%)	367 (95.3)	12 (3.4)	5 (1.3)	–	
Yes, n (%)	243 (89.7)	21 (7.7)	7 (2.6)	2.49 (1.35–4.73)**	1.73 (0.87–3.48)
Smokers					
No, n (%)	509 (92.0)	31 (5.8)	12 (2.2)	–	
Yes, n (%)	101 (98.1)	2 (1.9)	0 (0)	0.23 (0.04–0.78)*	0.18 (0.03–0.61)*
BMI, mean ± sd	25.6 ± 5.3	25.0 ± 4.7	25.0 ± 5.0	0.98 (0.91–1.03)	
At least one comorbidity^a, n (%)					
No, n (%)	389 (92.2)	26 (6.2)	7 (1.6)	–	
Yes, n (%)	221 (94.8)	7 (3.0)	5 (2.1)	0.64 (0.31–1.23)	
Number of comorbidities ^a , mean ± sd	0.5 ± 0.8	0.3 ± 0.7	0.6 ± 0.8	–	0.81 (0.49–1.23)
NSAIDs					
No, n (%)	313 (92.9)	17 (5.0)	7 (2.1)	–	
Yes, n (%)	297 (93.4)	16 (5.0)	5 (1.6)	0.92 (0.50–1.69)	
Corticosteroids					
No, n (%)	511 (93.4)	26 (4.8)	10 (1.8)	–	
Yes, n (%)	99 (91.7)	7 (6.5)	2 (1.9)	1.29 (0.57–2.65)	
cDMARDs					
No, n (%)	465 (93.6)	26 (5.2)	6 (1.2)	–	
Yes, n (%)	145 (91.8)	7 (4.4)	6 (3.8)	1.30 (0.64–2.49)	
bDMARDs					
No, n (%)	233 (93.2)	13 (5.2)	4 (1.6)	–	
Yes, n (%)	377 (93.1)	20 (4.9)	8 (2.0)	1.02 (0.55–1.94)	
At least one SARS-CoV-2 exposure					
No, n (%)	423 (95.1)	15 (3.4)	7 (1.5)	–	
Yes, n (%)	187 (89.0)	18 (8.6)	5 (2.4)	2.36 (1.28–4.37)**	1.92 (1.01–3.62)*

sd: standard deviation; BMI: body mass index; NSAIDs: non-steroidal anti-inflammatory drugs; cDMARDs: conventional disease modifying anti-rheumatic drugs; bDMARDs: biological conventional disease modifying anti-rheumatic drugs; tsDMARDs: targeted synthetic conventional disease modifying anti-rheumatic drugs.

^a Among the following comorbidities (past or present): cardiovascular disease (stroke, heart failure), hypertension, diabetes, asthma, renal failure, respiratory insufficiency, cancer, hematologic malignancy, HIV, HBV or HCV infection, cirrhosis, sickle cell anemia, splenectomy, organ transplant.

* $P \leq 0.05$.

** $P \leq 0.01$.

test positive only and 5 positive CT-scan only. None of them died. Five patients required hospitalisation, including one admission in intensive care unit. Four required low-flow oxygen supplementation. In addition to these confirmed cases, 33 patients had a strong suspicion of COVID-19 (5.0%, 95% confidence interval (CI): 3.6–7.1%) but without PCR test confirmation (negative PCR test ($n = 7$) or no PCR test performed ($n = 26$). Characteristics of confirmed and suspected cases as compared to non-infected patients are summarized in Table 3 and their symptoms are detailed in Table S2.

Factors independently associated with an infection (confirmed or suspected) were age (odds ratio (OR) (95%CI): 0.96 (0.93–0.99), P -value = 0.01), current smoking (OR (95%CI): 0.17 (0.03–0.59), P -value = 0.02) and potential exposure to SARS-CoV-2 (OR (95%CI): 2.25 (1.15–4.44), P -value = 0.02). Among the collected symptoms reported by patients with at least one of suspicious symptom of infection, anosmia and ageusia presented the highest positive predictive value for COVID-19 diagnosis (55% and 62% respectively, Table S3).

3.3. Consequences on COVID-19 pandemic on rheumatic disease management

Overall, more than 30% of patients suspended or decreased the dosage of one of their drugs. Details on modifications are given

in Table 4. NSAIDs were the most frequently modified (41.6%), followed by bDMARDs (17.4%), cDMARDs (12.0%) and then corticosteroids (11.2%). Modifications were mostly due to fear of contagion (79.3%) or symptoms suggestive of infection (17.8%). Discontinuation for drug shortage or prescription problems was rare (2.9%). The only factor significantly associated with treatment modification for fear of contagion was NSAIDs use (Table 5). Almost two third of the patients who modified their treatment reported a flare of disease activity.

Other consequences of COVID-19 pandemic on rheumatic disease management were delayed or cancelled appointments, which occurred for 47% of patients (Table 4).

4. Discussion

To date, the impact on inflammatory rheumatic conditions and their associated treatment on incidence and severity of COVID-19 remain uncertain. In our survey performed in France during the lockdown period, frequency of COVID-19 was 1.8% (95%CI: 1.0–3.2%) if we considered only confirmed cases and 6.9% (95%CI: 5.1–9.2%) when high suspicious cases were added. This frequency is higher than that estimated in French general population (4.4%, range: 2.8–7.2) but similar to the estimated frequency of Paris

Table 4
Consequences of COVID-19 pandemic on rheumatic disease daily management.

Modifications	All (n = 655)	Spondyloarthritis (n = 474)	Rheumatoid arthritis (n = 129)	Psoriatic arthritis (n = 52)
Treatment modification, n/n treated (%)				
At least one modification	224/655 (34.2)	179/474 (37.8)	29/129 (22.5)	16/52 (30.8)
NSAIDs discontinuation	107/318 (33.7)	97/266 (36.5)	1/26 (3.8)	9/26 (34.6)
NSAIDs dose diminution	36/318 (11.3)	29/266 (10.9)	3/26 (11.5)	4/26 (15.4)
Corticosteroids discontinuation	7/108 (6.5)	4/29 (13.8)	3/74 (4.0)	0/5 (0)
Corticosteroids dose diminution	5/108 (4.6)	2/29 (6.9)	3/74 (4.0)	0/5 (0)
cDMARDs discontinuation	16/158 (10.1)	4/58 (6.9)	10/83 (12.0)	2/17 (11.8)
cDMARDs dose diminution	3/158 (1.9)	1/58 (1.7)	0/83 (0)	2/17 (11.8)
bDMARDs discontinuation	54/404 (13.4)	44/299 (14.7)	8/74 (10.8)	2/31 (6.5)
bDMARDs dose diminution	16/404 (4.0)	15/299 (5.0)	1/74 (1.4)	0/31 (0)
Other modifications ^a	20/655 (3.0)	12/474 (2.5)	7/129 (5.4)	1/52 (1.92)
Reasons for modification, n (%)				
Fear of contagion	165 (79.3)	134 (78.4)	18 (78.2)	13 (92.9)
COVID-19 symptoms or diagnosis	37 (17.8)	32 (18.7)	4 (17.4)	1 (7.1)
Drug shortage	6 (2.9)	5 (2.9)	1 (4.3)	0 (0)
Consequences of modification on disease activity, n (%)				
Increased disease activity	137 (63.4)	117 (65.4)	13 (50)	7 (63.6)
Stable disease activity	79 (36.6)	62 (34.6)	13 (50)	4 (36.4)
Other changes in rheumatology care, n (%)				
Delayed consultation	172 (26.2)	109 (23.0)	52 (40.3)	11 (21.1)
Delayed blood tests	101 (15.8)	65 (14.0)	25 (19.5)	11 (21.1)
Delayed imaging exams	63 (9.8)	38 (8.2)	21 (16.4)	4 (8.0)
Delay of other medical exam	93 (14.5)	64 (13.8)	22 (17.3)	7 (14.3)

NSAIDs: non-steroidal anti-inflammatory drugs; cDMARDs: conventional disease modifying anti-rheumatic drugs; bDMARDs: biological conventional disease modifying anti-rheumatic drugs.

^a Other modifications: intravenous to subcutaneous switch (abatacept, tocilizumab), increased delay between infliximab infusions.

Table 5
Factors associated with treatment modification for fear of contagion in the multivariate analysis.

Characteristic	No treatment modification(n = 431)	Treatment modification(n = 224)	Univariate analysis	Multivariate analysis
			OR (95%CI)	OR (95%CI)
Gender				
Female	305 (75.3)	100 (24.7)	–	–
Male	185 (74.0)	65 (26.0)	1.07 (0.74–1.54)	–
Age, mean ± SD	52.1 (13.5)	47.8 (12.5)	0.98 (0.96–0.99)***	0.99 (0.98–1.01)
Disease				
Rheumatoid arthritis	111 (86.0)	18 (14.0)	–	–
Psoriatic arthritis	39 (75.0)	13 (25.0)	2.06 (0.91–4.57)	1.26 (0.52–2.98)
Spondyloarthritis	340 (71.7)	134 (28.3)	2.43 (1.45–4.28)***	1.19 (0.63–2.33)
Health professionals				
No, n (%)	417 (74.3)	144 (25.7)	–	–
Yes, n (%)	73 (77.7)	21 (22.3)	0.83 (0.48–1.38)	–
Profession with public contact				
No, n (%)	296 (77.1)	88 (22.9)	–	–
Yes, n (%)	194 (71.6)	77 (28.4)	1.34 (0.93–1.90)	–
Smokers,				
No, n (%)	270 (76.1)	85 (23.9)	–	–
Yes, n (%)	220 (73.3)	80 (26.7)	1.16 (0.81–1.65)	–
BMI, mean ± SD	25.8 (5.6)	24.8 (4.2)	0.96 (0.92–0.99)*	0.98 (0.93–1.01)
At least one comorbidity ^a , n (%)				
No, n (%)	301 (71.3)	121 (28.7)	–	–
Yes, n (%)	189 (81.1)	44 (18.9)	0.58 (0.39–0.85)**	0.82 (0.52–1.26)
NSAIDs				
No, n (%)	293 (86.9)	44 (13.1)	–	–
Yes, n (%)	197 (61.9)	121 (38.1)	4.09 (2.79–6.09)***	3.49 (2.34–5.29)***
Corticosteroids				
No, n (%)	404 (73.9)	143 (26.1)	–	–
Yes, n (%)	86 (79.6)	22 (20.4)	0.72 (0.43–1.18)	–
cDMARDs				
No, n (%)	358 (72.0)	139 (28.0)	–	–
Yes, n (%)	132 (83.5)	26 (16.5)	0.51 (0.31–0.80)**	0.81 (0.47–1.38)
bDMARDs				
No, n (%)	179 (71.6)	71 (28.4)	–	–
Yes, n (%)	311 (76.8)	94 (23.2)	0.76 (0.53–1.09)	–
At least one SARS-CoV-2 exposure				
No, n (%)	346 (77.8)	99 (22.2)	–	–
Yes, n (%)	144 (68.6)	66 (31.4)	1.60 (1.11–2.31)**	1.28 (0.86–1.90)

sd: standard deviation; BMI: body mass index; NSAIDs: non-steroidal anti-inflammatory drugs; cDMARDs: conventional disease modifying anti-rheumatic drugs; bDMARDs: biological conventional disease modifying anti-rheumatic drugs.

^a Among the following comorbidities (past or present): cardiovascular disease (stroke, heart failure), hypertension, diabetes, asthma, renal failure, respiratory insufficiency, cancer, hematologic malignancy, HIV, HBV or HCV infection, cirrhosis, sickle cell anemia, splenectomy, organ transplant.

* $P \leq 0.05$.

** $P \leq 0.01$.

*** $P \leq 0.001$

region, the most affected region of the country (9.9%, range: 6.6–15.7) where 87% of our respondents lived [8]. These results are consistent with those reported by Favalli et al. in Lombardy with no increased incidence of COVID-19 in a cohort of rheumatic patients as compared to the general population [5]. In line with them, we also did not observe more severe infections than expected in the general population with no death observed, five hospitalisations, and only one admission in intensive care unit [8].

Non-smoking was associated with a higher risk of infection. Although counter-intuitive, this observation is consistent with several studies reporting a lower proportion of current smokers among hospitalised COVID-19 patients than expected based on population smoking rates [9,10]. The fact that age was negatively associated with risk of infection was also unexpected. One possible explanation is the fact that younger people had more social contact than the elderly ones. Of interest, we did not find any association between anti-rheumatic treatments (NSAIDs, corticosteroids, cDMARD or bDMARD) and risk of infection, which supports the recent recommendations established by scientific societies to maintain the ongoing treatment [11–13].

Almost one third of the respondents reduced or discontinued their ongoing therapy with NSAIDs, corticosteroids, cDMARDs or bDMARDs. This observation is higher to frequencies previously reported [5,6,14]. Discontinuation or reduction of ongoing therapy lead to a subjective disease flare-up in two thirds of the patients. If some of these modifications were secondary to suspicious symptoms of possible SARS-CoV2 infection or to confirmed infection, the majority of them (79.3%) were linked to fear of contagion especially in patients treated with NSAIDs. This high rate of NSAIDs discontinuation might have been encouraged by a warning of the French health authorities published on 14 March and signalling serious side-effects in COVID-19 patients treated with NSAIDs [15], in line with other regulatory agencies [16]. However, there is no scientific data to support an increased risk of SARS-CoV-2 infection or COVID-19 severity with NSAIDs [17].

The cross-sectional survey design may be a limitation. Unfortunately we might have missed infected patients who were not able to respond to the survey because they were hospitalized or died. The high number of suspicion of COVID-19 without diagnosis confirmation is another limitation. However it reflected the situation in France during the lockdown period with a limited availability of PCR-based diagnostic tests.

In conclusion, this survey confirms that the incidence and severity of COVID-19 are not increased in patients with RA, SpA and PsA. It also adds evidence of the safety of anti-rheumatic drugs use (including NSAIDs, corticosteroids, cs- and b-DMARDs) during this period. This observation, together with the high rate of increased disease activity in case of treatment discontinuation, suggests that these drugs should be maintained.

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Disclosure of interest

The authors declare that they have no competing interest.

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Appendix A. Supplementary data

Supplementary data (Tables S1–S3, Figure S1) associated with this article can be found, in the online version, at <https://doi.org/10.1016/j.jbspin.2020.105095>.

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