


RESEARCH ARTICLE

Fears about COVID-19 and perceived risk among people with rheumatoid arthritis or ankylosing spondylitis following the initial lockdown in Aotearoa New Zealand

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Abstract

Background: The COVID-19 pandemic has disrupted all aspects of life and may raise particular fears for people with rheumatic disease. There is a need for research on fears and perceived risk of SARS-CoV-2 so as to understand the impact on wellbeing and inform service provision.

Objectives: The aim of this study was to examine the correlates of COVID-19 fears and perceived risk of SARS-CoV-2 among people with rheumatoid arthritis or ankylosing spondylitis.

Design: A cross-sectional survey design was applied in Aotearoa New Zealand in the period after initial nationwide lockdowns.

Method: An online survey was completed from July to September 2020 by 126 individuals with rheumatoid arthritis ($n = 96$) or ankylosing spondylitis ($n = 30$) who had previously been recruited to the Patient Opinion Real-Time Anonymous Liaison (PORTAL) study in 2015 or 2018. The survey included demographics and health information as well as measures of COVID-19 fears and experiences, functional disability and fatigue-related disability.

Results: Fears about COVID-19 were higher among younger participants, those who had been tested for SARS-CoV-2, and those who experienced more flares over the initial lockdown. Perceived risk of SARS-CoV-2 infection was also higher among individual who had been tested for SARS-CoV-2 and those taking biologic medications.

Conclusion: Fears about COVID-19 and perceived risk of infection are related to age, health and medications among individuals with rheumatoid arthritis or ankylosing spondylitis. These findings inform how health professionals can help address the concerns of particular groups of people with rheumatic disease by providing relevant information about the ongoing effects of the pandemic.

KEYWORDS

inflammatory condition, psychological and social impact, survey

1 | INTRODUCTION

In response to the global COVID-19 pandemic, the government of Aotearoa New Zealand instituted a nationwide response called Unite Against COVID-19, which involved a public health campaign based on four alert levels (Baker, Wilson, & Anglemeyer, 2020). The highest level was called Alert Level 4 and relied on public goodwill and cooperation to isolate at home with minimal travel. A global pandemic with such restrictions on movement is unprecedented in living memory (Baker, Kvalsvig, et al., 2020), and the news cycle has thus placed COVID-19 at the centre of its coverage since (El-Awaisi et al., 2020; Leigh et al., 2020). The level of daily information is informative but also creates anxiety about the spread of infection and mortality rates in some countries (Lai et al., 2020). Ultimately, this information could be more impactful for people with rheumatic disease due to the increased risk of SARS-CoV-2 infection and mortality, particularly when taking biologic and synthetic disease-modifying anti-rheumatic drugs (DMARDs) known to link to respiratory infections (Kourbeti et al., 2014).

Early elimination of COVID-19 community transmission in Aotearoa New Zealand helped reduce the medical burden on the country as evidenced by the low mortality rate of four people per million (Baker, Wilson, & Anglemeyer, 2020). The government's prompt and intense response is credited for reducing the negative effects for individuals with rheumatic disease, who have been disproportionately affected in other countries (Jefferies et al., 2020). Hence, the pandemic has created a need to understand the experiences, views and concerns of people with rheumatic disease about COVID-19 in both the local and international context. The unique situation in Aotearoa New Zealand provides an important aspect of the growing understanding of the global psychological impact of COVID-19 for people with rheumatic disease.

Fears of COVID-19 and perceived risk of SARS-CoV-2 infection are likely to be greater among people with rheumatic disease. Research is therefore needed to ascertain the correlates of fear and perceived risk among patients in order to help healthcare professionals provide appropriate reassurance when making treatment recommendations based on evidence of the risks and benefits of DMARDs and other treatments. We applied a model of fears and perceived risk based on the distinction between risk of negative outcomes and risk of infection that has been recommended when discussing COVID-19 (Finnikin & Spiegelhalter, 2021).

The Patient Opinion Real-Time Anonymous Liaison (PORTAL) system established in 2015 recruited a representative cohort of people with rheumatoid arthritis in Aotearoa New Zealand and regularly interacts with them via online surveys (Benham et al., 2019; Hegarty et al., 2021; Johnstone et al., 2021). Online surveys with existing cohorts provide a mechanism for gathering views and experiences of patient populations whilst minimising response bias (Mazor et al., 2002), which is particularly useful when conducting research during a pandemic that means recruitment in person from clinic is difficult and may bias the sample towards those willing or able to attend. The present study sought input from the PORTAL

cohort providing a unique opportunity to understand the effects of the COVID-19 Alert Level 4 lockdown on a group of engaged participants with rheumatic disease.

Another important issue within the COVID-19 pandemic is adherence to behaviours that help prevent the spread of SARS-CoV-2 such as hand-washing, social distancing, wearing of face masks, restrictions to travelling and altered shopping arrangements (Bish & Michie, 2010). Engaging in these behaviours may be associated with higher fear of COVID-19 leading to appropriate adherence but resulting in residual fears. Healthcare services for those with rheumatic disease also changed because of the pandemic, with hospital attendances limited to emergencies and consultations conducted via telephone (Antony et al., 2020; Mehta et al., 2020). It is vital to understand how these changes affected perceptions of risk and fear regarding SARS-CoV-2 infection for those with rheumatic disease (Seale et al., 2009).

Many patients with rheumatic disease have a high burden of disability (Michaud et al., 2020). The restrictions during the Alert Level 4 lockdown in Aotearoa New Zealand meant everyone apart from essential workers was required to stay home. These constraints may have exacerbated fatigue or disability, both of which associate with limits to physical activity (Michaud et al., 2020). Lockdown also forced changes to everyone's daily lifestyle and caused some elective services to be suspended with the supply of medications, such as the DMARD hydroxychloroquine, interrupted or threatened (Michaud et al., 2020). Hydroxychloroquine has been of particular interest due to media reports suggesting it could be an effective preventative measure against COVID-19, despite the FDA explaining it was not a sufficient prophylactic or treatment (Mahase, 2020). Regardless, many countries imposed strict restrictions on who could have access to hydroxychloroquine (Mendel et al., 2020). For example, in Canada 60% of rheumatologists report being contacted by worried patients struggling to obtain their hydroxychloroquine medication (Mendel et al., 2020). Fears about potential shortages of hydroxychloroquine are particularly likely because of its important place in the treatment of some people with rheumatic diseases, particularly rheumatoid arthritis (Mendel et al., 2020; Peschken, 2020).

Research has demonstrated that individuals with rheumatic disease have been concerned their immunosuppressing medications increase their risk of contracting SARS-CoV-2 (Peschken, 2020). Specifically, this has been informed by research finding individuals with rheumatoid arthritis have an increased susceptibility to all infections (Kourbeti et al., 2014). In terms of the risks associated with medications, biologics have been of main concern (Lahiri & Dixon, 2015). Past research has demonstrated that biologics can increase one's likelihood of contracting a serious infection by three times (Listing et al., 2005). A statistically significant increase in the rate of serious infections was also associated with corticosteroid use (Lacaille et al., 2008). Ultimately, out of fear that continuing their anti-rheumatic medication would negatively affect SARS-CoV-2 symptom severity some individuals changed or stopped these medications over lockdown without seeking advice from clinicians (Hassen et al., 2020; Michaud et al., 2020). The implications of this on disease progression is unknown

but may have adverse effects including more frequent and severe flares, or progressive joint damage (Emery et al., 2014).

Rheumatic diseases like rheumatoid arthritis and ankylosing spondylitis necessitate regular consultations with clinicians to monitor disease progression (Khilnani et al., 2020; Knitza et al., 2020). Therefore, during lockdown many healthcare services switched to eHealth/telehealth whereby video or telephone appointments were conducted (Huckle, 2019; Khilnani et al., 2020; Knitza et al., 2020). Prior to the pandemic, telehealth was slowly building support with 4.1% of rheumatic disease individuals actively using telehealth services and 68.4% agreeing it would be beneficial (Knitza et al., 2020). Research conducted during the pandemic has demonstrated that patients are taking up telehealth services to reduce their risk of contracting SARS-CoV-2 infection (Holtz, 2020), and therefore those people with rheumatic disease whose medical appointments are disrupted by lockdowns may be more likely to experience fears about COVID-19.

1.1 | Aim

Whilst community transmission of SARS-CoV-2 is currently under control in Aotearoa New Zealand, most of the rest of the world is still battling recurring peaks in infection rates. Any breaches of quarantine or border control protocols in Aotearoa New Zealand could lead to a new community outbreak, with any breach making headline news (Baker, Wilson, & Anglemeyer, 2020). To optimise ongoing care for individuals with rheumatic disease there is a need to understand the impact of lockdown restrictions, changes to health delivery such as telehealth and perceived risk of SARS-CoV-2 infection on patients with rheumatic disease. The aim of this study was to test whether fears about COVID-19 and perceived risk of SARS-CoV-2 are associated with (1) demographics, (2) disruptions to consultations, (3) current types of medications and (4) current aspects of health and disability for people with rheumatoid arthritis or ankylosing spondylitis.

2 | METHODS

2.1 | Participants and procedures

Participants from the PORTAL project were invited to participate in this study. PORTAL is an existing database of volunteers who had agreed to give their opinions on their experiences living with a rheumatic disease (Benham et al., 2019; Hegarty et al., 2021; Johnstone et al., 2021). Participants were enrolled in PORTAL through their rheumatologist in 2015 at clinics in Auckland, Wellington, Dunedin, or Hamilton in Aotearoa New Zealand. Additional participants were recruited in 2018 through the Dunedin Hospital Rheumatology Outpatients Clinic and from a database of patients who participated in the Spondyloarthritis Genetics and the Environment study. Participants were eligible if they were 18 years old or older and had a physician-confirmed rheumatic disease diagnosis. This

phase of the overall study was approved by the Southern Health and Disability Ethics committee (15/STH/95/AM04) of New Zealand.

Participants were sent an invitation via email to complete the survey, which was distributed through the Qualtrics survey platform. The email contained a link to an online information sheet and consent form followed by the survey itself for those who consented. Additionally, for participants who did not have Internet access, surveys were offered via a phone interview ($n = 1$; conducted by BDF) or a paper survey was delivered by mail ($n = 2$). Surveys were completed between July and September 2020.

2.2 | Measures

Participants self-reported their age, gender (male, female or gender diverse), ethnicity (based on New Zealand census categories), disease duration, medication types/dosages, education, employment, benefits, living arrangements, relationship status, the number of people in their household during lockdown (including those either above or below the ages of 18) and comorbid medical conditions.

Participants also self-reported whether they had received a test for SARS-CoV-2, the outcome of any SARS-CoV-2 test, whether someone close to them had been diagnosed with COVID-19, their level of concern about COVID-19, perceived risk of being infected, opinion on the governments and healthcare systems response to COVID-19, changes and access to medical care and medication due to COVID-19, financial impact of COVID-19 and the fear of COVID-19 Questionnaire. The fear of COVID-19 Questionnaire for Chronic Medical Conditions is a 15-item measure that assesses possible fears associated with the consequences of COVID-19. Items are rated on a five-point Likert-type scale from 1 (not at all) to 5 (extremely), with higher scores indicating greater fears relating to COVID-19 (Thombs et al., 2020) (Cronbach's $\alpha = 0.927$ in this sample).

Functional disability was self-reported on the British version of the Health Assessment Questionnaire (HAQ) (Kirwan & Reeback, 1986). The HAQ is a self-reported measure of functional status (disability) based on eight categories; dressing and grooming, arising, eating, walking, hygiene, reach, grip and activities. Each category is assessed by two or three questions on a four-point Likert-type scale ranging from 0 (without any difficulty) to 3 (unable to do). Additional questions determine if the individual uses any aids, devices (e.g., cane, wheelchair, etc.) or receives help to complete any activities. A composite score is calculated based on self-reported abilities and their need for assistance of any kind to complete activities. All categories are then summed together and divided by eight to give a reliable overall disability index score, which ranges from 0 to 3, with higher scores indicating greater disability (Kirwan & Reeback, 1986) (Cronbach's $\alpha = 0.943$ in this sample). Participants also rated their level of fatigue-related disability on a numerical rating scale ranging from 0 (no fatigue/interference) to 10 (severe fatigue/interference) over the past seven days on a scale adapted from the Bristol Rheumatoid Arthritis Fatigue Numerical Rating Scales (BRAFF NRS) (Nicklin et al., 2010). Participants were asked to report the number of

flares of their rheumatic disease they had experienced during the lockdown, and this variable was split into three groups (none, one, more than one) to avoid the impact of skewness.

2.3 | Statistical analysis

Data were analysed using SPSS (version 25). All participants who responded to the survey were included in the analyses ($n = 126$). All continuous outcomes were evaluated for normality by confirming the absence of extreme outliers, skewness and kurtosis. Continuous variables are reported as means and standard deviations (SDs). Categorical variables are reported as frequencies, including the number and percentage of participants. Hierarchical multiple regressions were carried out for the COVID-19 fear and perceived risk of SARS-CoV-2 infection variables using forwards entry in four steps: age, medical characteristics, medication type and wellbeing characteristics. Assumptions of linearity, homoscedasticity, multicollinearity and independence were assessed and met.

3 | RESULTS

3.1 | Characteristics of the sample

Demographics of the 126 participants are summarised in Table 1. The majority of the sample identified as New Zealand European. The

TABLE 1 Demographic characteristics ($n = 126$)

Demographics	Mean (SD)
Age (years)	57.13 (12.56)
Duration of primary rheumatic disease (years)	19.10 (11.76)
	<i>n</i> (%)
Gender	
Female	91 (72.2%)
Male	35 (27.8%)
Ethnicity	
New Zealand European	115 (91.3%)
Māori	5 (4.0%)
Other	6 (4.8%)
Living status	
Alone	22 (17.5%)
With partner only	63 (50.0%)
With children and partner	29 (23.0%)
With children only	3 (2.4%)
With other family members	3 (2.4%)
With friends or flatmates	3 (2.4%)
Other	3 (2.4%)

mean age for the sample was 57 years, and the majority were female. Participants' living situation was varied with the greatest proportion reporting they lived with their partner. The most common primary diagnosis was rheumatoid arthritis, followed by ankylosing spondylitis (Table 2). The most commonly prescribed medication was methotrexate, whilst 29 participants (23.0%) were taking hydroxy-chloroquine. Forty-four participants (34.9%) either experienced changes to their medications or stopped their medications entirely over lockdown.

3.2 | Correlates of COVID-19 fear

In the first step of the regression of COVID-19 fear, age accounted for 7.2% of the variance (Table 3), which was statistically significant ($p < 0.01$). Specifically, younger age was associated with higher levels of COVID-19 fears ($\beta = -0.268$, $p < 0.01$). The addition of medical characteristics on step two of the regression accounted for a further 7.7% of variance in COVID-19 fear ($p < 0.05$). This was due to whether an individual had been tested for SARS-CoV-2, which was associated with a higher level of COVID-19 fears ($\beta = 0.216$, $p < 0.05$). None of the medications related to COVID-19 were significantly related to fear when added on the third step of the regression. The addition of wellbeing characteristics on the final step of the regression accounted for a further 11.9% of variance in COVID-19 fear ($p < 0.001$), and this was due to a greater number of flares being related to higher COVID-19 fears ($\beta = 0.262$, $p < 0.01$), which was the only significant variable in the final model.

3.3 | Correlates of perceived SARS-CoV-2 infection risk

In the regression of perceived risk of SARS-CoV-2 infection, the two steps adding age and medical characteristics did not account for a statistically significant proportion of the variance in perceived risk (Table 4). However, being tested for SARS-CoV-2 was significantly related to perceived risk ($\beta = 0.192$, $p < 0.05$). Medications accounted for a further 8.4% of the variance in perceived risk of SARS-CoV-2 infection in the third step of the regression, with use of biologics being significantly related to higher perceived risk ($\beta = 0.290$, $p < 0.01$). An additional 8.5% of variance in perceived risk of SARS-CoV-2 infection was accounted for when wellbeing characteristics were added in the final step of the regression ($p < 0.01$), but only being on biologics remained significant in this model.

4 | DISCUSSION

The findings of this survey from a key moment in the COVID-19 pandemic demonstrate that a range of factors are related to fears about COVID-19 and perceived risk of SARS-CoV-2 infection. Specifically, COVID-19 fears was higher among younger people and

TABLE 2 Diagnoses, medications and health characteristics

Characteristic	Percentage	<i>n</i>
Rheumatic disease		
Rheumatoid arthritis	75.6%	96
Ankylosing spondylitis	23.8%	30
Osteoarthritis	17.5%	22
Fibromyalgia	3.2%	4
Psoriatic arthritis	3.2%	4
Systemic lupus erythematosus	1.6%	2
Other	4.0%	5
Relevant medications		
Anti-inflammatories	42.1%	53
Prednisone	18.9%	24
Disease-modifying drugs		
Methotrexate	46.8%	59
Hydroxychloroquine	23.0%	29
Leflunomide	18.3%	23
Sulphasalazine	9.5%	12
Azathioprine	0.8%	1
Biologics		
Adalimumab	26.2%	33
Etanercept	7.9%	10
Rituximab	7.1%	9
Tocilizumab	5.6%	7
Infliximab	2.4%	3
Stopped medication during alert level 4	12.7%	16
Changed medication dose during alert level 4	22.2%	28
Flares during lockdown		
None	41.5%	51
One	17.9%	22
More than one	40.7%	50
	Mean (SD)	<i>n</i>
Functional disability (HAQ)	1.02 (0.81)	123
Fatigue-related disability	4.37 (2.78)	123
Fear of COVID-19	13.71 (11.28)	124
Perceived risk of SARS-CoV-2 infection	42.23 (25.19)	125

Abbreviation: HAQ, Health Assessment Questionnaire.

those who had been tested for SARS-CoV-2 in Aotearoa New Zealand, although only the number of flares experienced over the initial lockdown remained associated with COVID-19 fears in the final model. Perceived risk of SARS-CoV-2 infection was also higher among those who had been tested for SARS-CoV-2, but only taking a biologic medication remained associated with perceived risk of SARS-

CoV-2 infection in the final model. It is important to understand that certain groups of people with rheumatic disease may have highest fears about COVID-19 and perceived risk of infection so that healthcare professionals can account for these concerns and support patients during the challenges presented by the ever-evolving global pandemic.

Our finding that having been tested for SARS-CoV-2 was associated with higher perceived risk of SARS-CoV-2 infection and higher fears about COVID-19 is understandable, given that those being tested must have been either showing symptoms or a perceived or actual close contact of an identified case. Regardless of how strictly one has followed the public health campaign implemented, the unpredictability of the pandemic and presence of asymptomatic infected individuals can lead individuals to believe their test result has a chance of being positive (Vargas, 2020). Equally, the global pandemic becomes personal once an individual has had to be tested themselves, which helps to explain our findings about having been tested for SARS-CoV-2 relating to higher perceived risk regarding contracting the infection.

A high level of fear and perceived risk can be argued to have short-term benefits as research has demonstrated both are critical for individuals to adhere to testing requirements and public health measures (Vargas, 2020). It has not, however, been determined whether there is a limit to the level of fear or perceived risk that one can experience before it has a negative effect on wellbeing or adherence with public health measures. Therefore, future research could further explore the relationship between fear/perceived risk and complying with public health measures. Surprisingly, level of fears about COVID-19 were higher for those participants who were younger. During lockdowns, younger people with rheumatic disease may be more likely to have to adjust to working from home, have financial stability concerns, and be of an age where they have family members dependent on them in their home (e.g., school-aged children). All of these issues have the potential to make younger people's lockdown experience more challenging and result in our finding about higher fears among these younger patients.

The number of flares participants had experienced during the Alert Level 4 lockdown in Aotearoa New Zealand was the single variable most robustly associated with fears about COVID-19 after controlling for other variables. This finding concurs with previous research demonstrating that reductions in positive mood among people with rheumatic disease are seen on days when fatigue is high and physical activity is low (Hegarty et al., 2015), which is associated with periods of flare. Given that fatigue is both a common symptom of rheumatic disease and SARS-CoV-2 infection (Hegarty et al., 2015; Rothan & Byrareddy, 2020), it is logical for people with rheumatic disease to wonder whether a period of flare is a sign of SARS-CoV-2 infection. In doing so, participants are likely to fuel the concern that they are more susceptible to contracting SARS-CoV-2, thus amplifying their fears about COVID-19.

Interestingly, participants taking the DMARD hydroxychloroquine did not differ from other in their perceived risk of SARS-CoV-2 infection or fears about COVID-19 despite the specific media

TABLE 3 The coefficients from the regression of level of fears about COVID-19 ($n = 119$)

Step	Predictors	COVID-19 Related fear				ΔR^2
		B	Standard error	β	P	
1	Demographics					0.072**
	Age	-0.245	0.081	-0.268	0.003**	
2	Medical characteristics					0.077*
	Age	-0.233	0.083	-0.256	0.006**	
	Rheumatoid arthritis diagnosis	2.728	2.398	0.103	0.258	
	Tested for COVID-19	5.798	2.403	0.216	0.017*	
	Medical appointment cancellations	2.485	2.028	0.106	0.223	
3	Medication type					0.018
	Age	-0.232	0.084	-0.254	0.007**	
	Rheumatoid arthritis diagnosis	0.829	2.838	0.031	0.771	
	Tested for COVID-19	5.490	2.455	0.204	0.027	
	Medical appointment cancellations	2.147	2.096	0.092	0.308	
	Hydroxychloroquine	3.053	2.627	0.114	0.248	
	DMARDs	1.560	2.576	0.067	0.546	
	Biologics	0.964	2.047	0.043	0.639	
	Steroids	0.281	2.737	0.010	0.918	
4	Wellbeing characteristics					0.119***
	Age	-0.159	0.087	-0.174	0.070	
	Rheumatoid arthritis diagnosis	0.155	2.686	0.006	0.954	
	Tested for COVID-19	3.820	2.372	0.142	0.110	
	Medical appointment cancellations	1.164	1.987	0.050	0.559	
	Hydroxychloroquine	1.936	2.480	0.072	0.437	
	DMARDs	2.640	2.434	0.113	0.281	
	Biologics	1.495	2.039	0.066	0.465	
	Steroids	-2.438	2.657	-0.084	0.316	
	Functional disability (HAQ)	1.230	1.577	0.089	0.437	
	Fatigue-related disability	0.615	0.439	0.153	0.164	
	Flares	3.275	1.163	0.262	0.006**	

Abbreviations: DMARD, disease-modifying anti-rheumatic drug; HAQ, Health Assessment Questionnaire.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

attention (Mendel et al., 2020). Hydroxychloroquine restrictions may not have been considered as likely in Aotearoa New Zealand as they were in other countries (Mahase, 2020; Mendel et al., 2020). However, individuals taking biologics reported higher perceived risk of contracting SARS-CoV-2 infection. This demonstrates the concerns that media reports can raise about how immunosuppressant medications like DMARDs may cause of more severe outcomes of COVID-19 (El-Awaisi et al., 2020; Leigh et al., 2020), which also align with the evidence-based advice given during patient education about DMARDs. Hence, it could be beneficial for rheumatology health professionals to inform patients about recent findings that biologic

medications minimally increase an individual's risk of SARS-CoV-2 infection (Lahiri & Dixon, 2015; Listing et al., 2005; Sood et al., 2020). Providing patients with this kind of information could provide reassurance by helping patients understand the extent to which the various medications they are taking do or do not increase their risk of contracting SARS-CoV-2.

The involvement of the PORTAL study cohort is the main strength of this study because it allowed us to promptly conduct of a survey with a cohort of participants who are invested in sharing their experiences of living with a rheumatic disease in Aotearoa New Zealand. All participants had previous experience participating in

TABLE 4 The coefficients from the regression of level of perceived risk of infection with SARS-CoV-2 ($n = 118$)

Step	Predictors	Perceived risk of SARS-CoV-2 infection				ΔR^2
		B	Standard error	β	P	
1	Demographics					0.021
	Age	-0.297	0.187	-0.146	0.115	
2	Medical characteristics					0.057
	Age	-0.276	0.195	-0.136	0.159	
	Rheumatoid arthritis diagnosis	5.516	5.670	0.092	0.333	
	Tested for COVID-19	11.525	5.594	0.192	0.042*	
	Medical appointment cancellations	3.961	4.729	0.076	0.404	
3	Medication type					0.084*
	Age	-0.270	0.190	-0.133	0.158	
	Rheumatoid arthritis diagnosis	0.888	6.425	0.015	0.890	
	Tested for COVID-19	9.786	5.511	0.163	0.079	
	Medical appointment cancellations	3.866	4.712	0.074	0.414	
	Hydroxychloroquine	6.248	5.896	0.104	0.292	
	DMARDs	5.072	5.791	0.097	0.383	
	Biologics	14.617	4.612	0.290	0.002**	
	Steroids	-3.169	6.147	-0.049	0.607	
4	Wellbeing characteristics					0.085**
	Age	-0.195	0.201	-0.096	0.333	
	Rheumatoid arthritis diagnosis	-0.996	6.220	-0.017	0.873	
	Tested for COVID-19	6.755	5.454	0.113	0.218	
	Medical appointment cancellations	2.023	4.579	0.039	0.660	
	Hydroxychloroquine	4.339	5.701	0.072	0.448	
	DMARDs	6.819	5.601	0.130	0.226	
	Biologics	14.262	4.692	0.283	0.003**	
	Steroids	-8.355	6.113	-0.129	0.175	
	Functional disability (HAQ)	4.764	3.629	0.153	0.192	
	Fatigue-related disability	1.055	1.012	0.117	0.300	
	Flares	4.282	2.704	0.153	0.116	

Abbreviations: DMARD, disease-modifying anti-rheumatic drug; HAQ, Health Assessment Questionnaire.

* $p < 0.05$; ** $p < 0.01$.

similar online surveys and the cohort has suitable diversity in terms demographics as well as health status and use of various medications like biologics. Despite the benefits of surveying an existing cohort, the ethnic homogeneity of the sample prevented us from assessing whether ethnicity was related to COVID-19 fear or perceived risk of SARS-CoV-2 infection among people with rheumatic disease in Aotearoa New Zealand and future global research is needed to address this.

Additionally, although the online survey method removes some concerns about sample bias during lockdown, response may still have been more likely among people with easy access to a computer or

fewer burdens from work and caregiving. Moreover, individuals with particular views about COVID-19 or extremely positive or negative experiences may have been more inclined to respond, and this could be overcome in future research by developing brief surveys with already defined cohort and encouraging participation regardless of views or experiences. Future research could also benefit from recruiting participants with rheumatic disease through various venues such as healthcare consultations and community organisations to gain a wider range of perspectives on COVID-19 and using qualitative methods to understand emerging any patterns in fears about COVID-19.

Aotearoa New Zealand has been in the unique position of having low community transmission rates since the end of the Alert Level 4 lockdown in May 2020 (Baker, Wilson, & Anglemeyer, 2020), allowing participants to focus their responses about experiences of lockdown to one time period. However, there are ongoing uncertainties about the future reopening of borders and the potential for community transmission despite vaccinations being available. The situation in Aotearoa New Zealand is distinct from many other countries that have experienced multiple waves and multiple nationwide lockdowns in attempting to control transmission rates and this means that the findings of our study add to the existing international research by providing evidence of the correlates of fears about COVID-19 and perceived risk of SARS-CoV-2 infection following the clinical distinction between understanding risk of negative outcomes and risk of infection that has been recommended when discussing COVID-19 (Finnikin & Spiegelhalter, 2021). The findings of this study thus provide health professionals with further evidence about the psychological reactions to COVID-19 that will assist in providing appropriate reassurance and responsive care for people with rheumatic disease as the pandemic progresses and beyond.

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CONFLICT OF INTEREST

All authors declare no conflict of interest.

ETHICS STATEMENT

Ethical approval for this study was granted by the Southern Health and Disability Ethics Committee (15/STH/95/AM04).

AUTHOR CONTRIBUTIONS

All authors contributed to the concept and design of the study, and the interpretation of the data. All authors contributed to the acquisition of data, and Dr Treharne, Ms Johnstone, and Mr Fletcher were involved in the data analysis. All authors were involved in drafting the manuscript and approved the revised manuscript ahead of publication. All authors agree to be accountable for all aspects of the work regarding accuracy and integrity.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are not available as this was not agreed to by participants.

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