

BRIEF REPORT

Acceptability of Vaccines Against Preventable Infections Including Coronavirus Disease 2019 Among Patients With Rheumatic Disease

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Objective. Vaccination against preventable infections is widely recommended for patients with systemic rheumatic disease. The coronavirus disease 2019 (COVID-19) pandemic has highlighted variability in attitudes toward vaccination, particularly with the use of novel vaccine platforms. We studied attitudes toward vaccination against COVID-19 and other preventable infections among patients with systemic rheumatic disease and compared these against the general population.

Methods. We surveyed patients treated at Brigham and Women's Hospital for systemic rheumatic disease using a secure web-based survey or paper survey in English or Spanish, from December 2020 to April 2021. We included survey questions used in the nationwide Harris Poll (October 2020 and February 2021), allowing the comparison of responses with those from the general population. Response frequencies were estimated and compared using descriptive statistics.

Results. Of 243 participants (25% response rate), the mean age was 56 years, 82% were women, and 33% were nonwhite. Rheumatoid arthritis (50%) and systemic lupus erythematosus (28%) were the most common diagnoses. Thirty percent had been hospitalized previously for any infection. Seventy-six percent worried a lot or somewhat about contracting COVID-19. Attitudes toward vaccination were very favorable, with 92% having received a flu shot in the past year and 84% desiring a COVID-19 vaccine as soon as possible compared with 30% to 40% of Harris Poll respondents ($P < 0.001$). Physician recommendation to receive a vaccine and desire to avoid infection were the most common reasons for desiring vaccinations.

Conclusion. Vaccine acceptability, including toward COVID-19 vaccines, was high among this population of patients with systemic rheumatic disease seen at an academic medical center cohort. Physician recommendation is a key factor for vaccine uptake.

INTRODUCTION

Vaccine-preventable illnesses such as influenza, pneumococcal pneumonia, herpes zoster, and coronavirus disease 2019 (COVID-19) pose a serious risk to patients with systemic rheumatic disease, leading to hospitalizations, increased costs of care, and disability (1,2). Vaccination against preventable

illness is generally recommended for patients with systemic rheumatic diseases; exceptions include the use of live-virus vaccines with particular immunomodulator therapies (3). Despite the availability and general safety of vaccines against these pathogens, uptake of influenza, pneumococcal, herpes zoster, and human papillomavirus vaccines in patients with rheumatic disease is variable (2).

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SIGNIFICANCE & INNOVATIONS

- Eighty-four percent of patients with systemic rheumatic diseases expressed willingness to receive a coronavirus disease 2019 (COVID-19) vaccine as soon as possible, compared with 30% to 40% of general population respondents in nationwide Harris Polls.
- Many patients (76%) with systemic rheumatic disease who were using immunomodulators expressed concern about contracting COVID-19.
- Patients rated their physician's recommendation as the most important factor in deciding whether receipt of a vaccine was acceptable.

Vaccination rates during the COVID-19 pandemic highlight the variability in attitudes toward vaccination, particularly using novel vaccine platforms that have undergone accelerated development and testing (4,5). Preventing COVID-19 in patients with systemic rheumatic disease is paramount for protecting individual patients and promoting public health, as immunosuppressed patients may serve as a reservoir for COVID-19, with prolonged viral shedding and increased opportunity for the development of viral variants (6). The American College of Rheumatology recently recommended vaccination against COVID-19 for the vast majority of patients with systemic rheumatic disease (7). Phase 3 clinical trial data in nonrheumatic populations demonstrate excellent safety and efficacy of COVID-19 vaccines for preventing severe COVID-19 illness (8,9). Moreover, limited data in patients with systemic rheumatic disease suggest similar safety profiles, with reduced immunogenicity in the context of certain immunomodulators (10,11). Because of the paucity of safety and efficacy data on the COVID-19 vaccine in patients with systemic rheumatic disease, as well as the special concerns related to immunomodulator use, there may be important differences in attitudes toward COVID-19 vaccination between patients with systemic rheumatic disease and the general population.

Little is known about vaccine attitudes in patients with systemic rheumatic disease and about their attitudes compared with those of the general population, specifically regarding COVID-19 vaccination. We aimed to identify attitudes toward infections and vaccination against COVID-19 and other preventable illnesses among patients with systemic rheumatic disease and to compare these with those of the general population.

METHODS

We invited a convenience sample of patients to participate if they had been previously diagnosed with systemic rheumatic disease and had two or more virtual or in-person visits to Brigham and Women's Hospital Arthritis Center from 2019 to 2020. Patients who previously provided permission to receive emails about research opportunities were invited to

Table 1. Characteristics of 243 survey respondents

Characteristics	Results
Age, mean (SD), y	56.0 (14.5)
Gender, %	
Man	18.1
Woman	81.5
Transgender	0.4
Race, %	
White	66.7
Black	10.3
Asian	15.6
Other or choose not to answer	9.5
Latinx ^a	12.5
Primary language, %	
English	91.8
Spanish	6.6
Other	1.7
Living situation, ^b %	
Alone	17.7
Roommates	2.9
Partner/spouse	64.6
Children	34.6
Other family	13.6
Assisted living or skilled nursing facility	0.4
Total annual household income, ^a %	
<\$50 000	14.2
\$50 000 to \$100 000	24.3
\$100 000 to >\$200 000	57.7
Choose not to answer	17.2
Highest level of education, ^a %	
High school graduate or less	7.4
Some college	16.5
College graduate	34.3
Postcollege degree	41.7
Systemic rheumatic disease, %	
Rheumatoid arthritis	49.8
Systemic lupus erythematosus	27.6
Psoriatic arthritis	13.2
Other ^c	9.5
Rheumatic disease treatment, ^b %	
None	12.4
Conventional synthetic DMARD	60.1
TNF inhibitor	18.5
Other biologic	14.0
JAK inhibitor	9.9
Glucocorticoid	16.5
Self-reported comorbidities, %	
Cancer	11.9
Lung disease	20.2
Chronic kidney disease	9.9
Coronary artery disease	4.1
Diabetes	9.5
Heart failure	2.9
Hypertension	34.6
Obesity	15.2
Stroke	5.8
Current smoker, %	2.5
Has a primary care doctor, ^a %	97.5
Always wears sunscreen, ^a %	51.3
Always wears a seatbelt, %	98.4

Abbreviations: DMARD, disease-modifying antirheumatic drug; JAK, Janus kinase; TNF, tumor necrosis factor.

^a Data were missing for Latinx (n = 3), income (n = 4), education (n = 1), primary care doctor (n = 1), and sunscreen (n = 5).

^b Categories are not mutually exclusive.

^c Inflammatory myositis (n = 7), scleroderma (n = 7), ankylosing spondylitis (n = 4), giant cell arteritis (n = 4), or polymyalgia rheumatica (n = 1).

complete a secure, web-based REDCap survey in English or Spanish. Other patients were invited to participate via mailed letters. Efforts were made to over-recruit Spanish-speakers and nonwhite patients, given the disproportionate burden of COVID-19 in these populations. Surveys were distributed from December 2020 to January 2021; responses were accepted through April 2021.

The survey included questions about demographics, socioeconomic status, rheumatic disease diagnoses and treatments, comorbidities relevant to the risk of severe COVID-19, prior infections, prior vaccination, COVID-19 infection, and vaccination against COVID-19.

We summarized responses with descriptive statistics. Survey responses were compared with general population responses from the nationwide Harris Poll Survey Wave 36 (October 2020, $n = 1954$ respondents) and Wave 50 (February 2021, $n = 2043$ respondents), which included questions similar to those asked on our survey, using χ^2 tests (12). The Partners HealthCare Institutional Review Board approved all aspects of this study (protocol 2020P003229).

RESULTS

We invited 968 patients to participate and received 243 completed surveys (25.1% response rate). Participants had a mean age of 56.0 years, 81.5% were women, and 33.3% were nonwhite; 6.6% completed the survey in Spanish (Table 1). Three-quarters of participants had a college degree or higher. Rheumatoid arthritis was the most common rheumatic disease (49.8%), followed by systemic lupus erythematosus (27.6%) and psoriatic arthritis (13.2%); the remainder of patients (9.5%) had inflammatory myositis ($n = 7$), scleroderma ($n = 7$), ankylosing spondylitis ($n = 4$), giant cell arteritis ($n = 4$), or polymyalgia rheumatica ($n = 1$). Of respondents, 87.6% were using a disease-modifying antirheumatic drug (DMARD) and/or glucocorticoids. Among the comorbidities associated with increased risk for severe COVID-19, hypertension was most common (34.6%), followed by lung disease (20.2%) and obesity (15.2%). Current smoking was rare (2.5%).

Thirty percent of respondents had previously been hospitalized for any type of infection. Attitudes toward vaccination were positive, with 90.5% indicating they were “very in favor” or “pretty much in favor” of vaccines in general (Table 2). The uptake of the influenza vaccine in the past year was very high (92.4%). Prior pneumococcal vaccination (71.2%) was more frequent than vaccination against herpes zoster (48.2%). Recommendation by a doctor (89.7%) and the desire to avoid infection (70.4%) were the most common reasons for previously receiving vaccines. Among the 10.7% of respondents who had declined a vaccine in the past, reasons included concerns about the possible flare of rheumatic disease ($n = 5$), concerns about safety ($n = 4$), not believing in getting vaccines ($n = 4$), previous adverse reaction to vaccines ($n = 4$), and allergy ($n = 3$).

Table 2. Vaccination history and attitudes toward vaccination

	Percentage
Vaccines in general	
Where would you consider yourself on the following spectrum regarding vaccines in general? ^a	
I am strongly against vaccines	0
I am pretty much against vaccines	1.7
Neutral	7.9
I'm pretty much in favor	17.8
I am very in favor of vaccines	72.7
Received flu shot last year ^a	92.4
Previous vaccines (ever)	
Flu	97.5
Pneumonia	71.2
Shingles	48.2
Tdap	51.9
Yellow fever	7.0
Hepatitis A	19.8
Hepatitis B	30.5
HPV	10.7
Reasons for receiving previous vaccines	
Doctor advised me to get it	89.7
Important for community health	45.3
Easy to do	36.6
Wanted to avoid infection	70.4
International travel	18.1
Cost was covered by health insurance	20.6
Family encouraged me to get it	7.0
Other ^c	6.6
Ever declined a vaccine that your doctor recommended for you to get	10.7
COVID-19 vaccine ^b	
When there is a coronavirus vaccine, will you get vaccinated?	
Yes	91.4
No	1.7
Not sure	7.0
When would you want to get the coronavirus vaccine? ^a	
As soon as possible	84.1
Within the first year that it's available but not as soon as possible	10.0
I would want to wait until other people have been getting it for at least 1 year	5.9
Features of a coronavirus vaccine rated “important” or “very important” ^a	
Safety	95.4
How well it works	94.9
Cost to me	27.7
If I have to stop my medicines	61.5
Only one dose (versus several doses) required	24.7

Abbreviation: COVID-19, coronavirus disease 2019; HPV, human papillomavirus.

N = 243.

^a Data were missing for general attitude toward vaccines ($n = 1$), flu shot last year ($n = 5$), timing of COVID vaccine ($n = 4$), vaccine safety ($n = 2$), how well it works ($n = 7$), cost ($n = 8$), stopping medications ($n = 12$), and number of doses ($n = 8$).

^b Survey distribution began before any COVID-19 vaccine had received United States Food and Drug Administration Emergency Use Authorization.

^c Required by employer or school ($n = 7$) was most common.

The desire to receive a COVID-19 vaccine was very high, with 91.4% wanting to get vaccinated; 7.0% were unsure, and 1.7% did not want to get vaccinated. Variation by self-reported

racial and ethnic groups was observed, with 79.2% of Black participants desiring COVID-19 vaccination as compared with 83.3% of Latinx participants, 92.1% of Asian participants, and 93.1% of white participants (Supplemental Table). Intent to receive a COVID-19 vaccine (yes vs no/not sure) did not differ by immunomodulator use ($P = 0.99$), race ($P = 0.16$), or Latinx ethnicity ($P = 0.10$). Enthusiasm for receiving a COVID-19 vaccine as soon as possible was high (84.1%) in our cohort. The percentage of Harris Poll general population respondents indicating they were very likely to get a COVID-19 vaccine as soon as possible was significantly lower compared with our cohort (29% in October 2020 [$P < 0.001$] and 42% in February 2021 [$P < 0.001$]).

Survey participants rated safety (95.4%) and effectiveness (94.9%) as the most important features of a COVID-19 vaccine. Of participants, 61.5% noted concerns about needing to stop their immunomodulator treatment around the time of vaccination. Eighty-five percent of participants said they were very likely to get a COVID-19 vaccine if it decreased their risk of infection by approximately 75%, and 91.6% were very likely to go get it if it reduced the risk by more than 90%. For comparison, 31% of respondents to the Harris Poll survey (October 2020) were very likely to get a COVID-19 vaccine if it reduced risk by approximately 75%, and 38% were very likely if the vaccine reduced risk by more than 90%.

Participants reported worrying a lot (44.0%) or somewhat (41.6%) about contracting COVID-19; 5.8% reported prior COVID-19 infection (Table 3). Two-thirds reported having a family member or friend with COVID-19 infection. Physical distancing behaviors were common, including staying home as much as possible (89.3%), wearing a mask every time outside of the house (94.7%), and avoiding public transportation (77.8%).

DISCUSSION

Vaccine acceptability was high in this cohort of patients with systemic rheumatic disease treated at an academic medical center, in whom approximately one-third had been previously hospitalized for an infection. Recommendation by a doctor and the desire to avoid infection were the most common reasons for previously receiving vaccines. Influenza vaccine uptake was nearly universal; by comparison, 56.8% of adults in Massachusetts were vaccinated against influenza in the 2019 to 2020 season (13). Prior vaccination against pneumococcus and herpes zoster was common among participants. Eighty-six percent of participants were worried a lot or somewhat about contracting COVID-19, and physical distancing measures were widely practiced. Intent to be vaccinated against COVID-19 as soon as possible was significantly more common among patients with systemic rheumatic disease compared with the general population.

A survey of 732 patients with systemic rheumatic disease in Turkey reported that half were undecided about whether to get a COVID-19 vaccine as of January 2021 (14). Among 1266

Table 3. Attitudes and practices related to COVID-19

	Percentage
In general, how much do you worry about having an infection that would require you to be hospitalized? ^a	
A lot	32.4
Somewhat	43.2
Not at all	24.5
Are you worried about getting infected with the coronavirus?	
I have already had the coronavirus	5.8
I worry a lot	44.0
I worry somewhat	41.6
I am not worried	8.6
What is your best guess as to whether you will get the coronavirus in the next 6 months? ^a	
I have already had it	5.5
I don't think I will get it	63.3
I think I will get a mild case	10.1
I think I will get seriously ill	21.1
Friends or family member had coronavirus infection	64.6
Exposed to someone with COVID-19 ^a	16.2
How many times have you been tested for coronavirus using a nasal swab? ^a mean (SD)	3.0 (6.6)
Contact with others in the workplace ^b	
Limited contact with others	43.2
Frequent contact with others	11.9
Direct contact with patients with COVID-19	1.7
Not currently working	46.5
What types of physical distancing measures are you practicing?	
I stay at home as much as I can	89.3
I am working remotely	36.6
I wear a mask every time I leave the house	94.7
I avoid public transportation	77.8
I am not interacting with anyone beyond the people I live with	42.8
My school-aged children are doing virtual learning	8.2
I socialize with people outdoors	46.5
I'm not taking any measures for physical distancing	0.8

Abbreviation: COVID-19, coronavirus disease 2019.

^a Data missing for hospitalization worry ($n = 2$), best guess ($n = 6$), exposed to COVID ($n = 2$), and number of COVID-19 tests ($n = 8$).

^b Categories are not mutually exclusive.

European patients with systemic rheumatic disease surveyed in December 2020, 54% were willing to get vaccinated against COVID-19, 32% were uncertain, and 13% were unwilling (4). Two Italian surveys of patients with systemic rheumatic disease reported that 54% (of 626) and 81% (of 202) were willing to get a COVID-19 vaccine (5,15). Higher educational level, older age, and male sex were associated with increased COVID-19 vaccine willingness in those studies (5,15). Immunosuppressive medication use was not associated with COVID vaccine acceptability among patients with systemic rheumatic disease in our study or in prior work (5).

Physician recommendation has a positive impact on vaccine uptake among patients with a rheumatic disease (16). Specific to COVID-19 vaccines, endorsement by a physician was the most important factor influencing patients with rheumatic disease to

accept a COVID-19 vaccine (15). Results from the present study confirm these prior findings.

Limitations of the present study include enrolling patients from only one academic medical center; most patients were local residents, but they may not reflect a typical rheumatic disease patient cohort. The response rate of 25% is acceptable and expected to result in similar findings to a higher response rate (17). However, some of the nonresponders may not have been as enthusiastic about receiving a COVID-19 vaccine compared with responders. Secular trends in knowledge about COVID-19 vaccines changed during the study period and may have influenced results as well as comparability to the Harris Poll Wave 36 (October 2020). Participants were predominantly female with a high educational level and high use of preventive health measures, which limits generalizability. However, 13% of respondents identified as Latinx, and 33% were nonwhite, representing populations that are at higher risk for severe COVID-19 in the general population.

In conclusion, the acceptability of a COVID-19 vaccine was substantially higher in our cohort of patients with systemic rheumatic disease compared with the general population. Concern about contracting COVID-19 was very common. Physician recommendation to receive a vaccine against COVID-19 or other preventable illnesses is the most important factor influencing vaccine uptake in this population, followed by the desire to avoid infection.

AUTHOR CONTRIBUTIONS

Dr. Tedeschi drafted the manuscript and all authors revised it critically for important intellectual content. All authors approved the final version to be published. Dr. Tedeschi had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Study conception and design. Tedeschi, Chandler, Gravalles, Solomon.

Acquisition of data. Ellrod, Stratton, Tedeschi.

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