

# Coronavirus Vaccine Hesitancy among Patients Attending Rheumatology Clinic in North West Anglia NHS Foundation Trust: An Observational Pilot Study

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## Abstract

**Background:** Since the start of an unprecedented vaccination campaign against Covid-19 the authors have started to come across rheumatology patients who were reluctant to have vaccination. Due to the diversity of the local population it was hypothesized that certain socio economic characteristics were predictive of vaccine hesitancy. The aim of this study was to assess the uptake of COVID-19 vaccine among patients attending rheumatology clinics in a large District General Hospital (DGH) in the East of England, as well as to establish perceived barriers in receiving COVID-19 vaccine and to assess the extent of vaccine hesitancy among the target population.

**Methods:** This single center cross-sectional observational pilot study was conducted using questionnaires distributed to patients attending rheumatology outpatients for a face to face appointment. Data were collected on baseline social and demographic characteristics as well as knowledge, attitude and behaviors regarding coronavirus vaccination. We collected 395 anonymous responses and then analyzed those using descriptive statistical methods. Logistic regression models were performed to assess the associations between outcomes and demographic related variables. The Hosmer-Lemeshow goodness of fit tests was used to evaluate the model fit.

**Results:** There was a very high COVID-19 vaccine uptake among the sampled population (96.71%), notably higher than among the general population (90.4%) at the time of the study. In our study, the older population had a higher vaccine uptake ( $P < 0.001$ ). White British ethnicity was a good predictor of vaccine uptake. There was no demonstrable link between educational attainment or monthly income and vaccine uptake. Older study participants tended to believe that the vaccine was safe to have whilst taking immunosuppressive medications.

**Conclusions:** Our study demonstrated excellent uptake of COVID-19 vaccine in our local population attending rheumatology clinics. Being older and having white British ethnicity were strong predictors of vaccine uptake.

**Keywords:** COVID-19 vaccine • Vaccine hesitancy • Rheumatology population • Questionnaire

## Introduction

In 2021 the UK started an unprecedented vaccination campaign to protect the population against Coronavirus (COVID-19) infection. Given vulnerability of patients receiving immunosuppressive medications, BSR guidance 'COVID-19 Vaccinations' and Green Book Chapter 14a emphasized that all Rheumatology patients, particularly those taking immunosuppressive medications, should receive Coronavirus vaccine "All patients should be encouraged to receive a COVID-19 vaccine, regardless of treatment regimen or underlying diagnosis" [1,2]. "Ensuring that these patients are a priority group is important for this current round of vaccination" [3].

However, in clinical practice the authors have come across patients who were not willing to have a vaccine. The WHO has declared vaccine hesitancy to be one of the ten greatest threats to global health since 2019 [4]. Given the ethnically diverse population of the catchment area of our trust in the East

of England with over 15% born outside the UK [5]. It was useful to establish which patient groups were more likely to decline a vaccine, and understand the perceived barriers these patients might have. It was also hypothesized that the vaccine uptake could correlate with the household income and educational attainment as seen in some previous studies [6].

## Materials and Methods

The aim of this observational single-center pilot study was to assess the uptake of COVID-19 vaccine among patients attending rheumatology clinics at a large East of England NHS Trust and to evaluate knowledge, attitudes, and behaviors related to COVID-19 vaccination in this population.

### Study design

This is a single center cross-sectional observational pilot study. A two-

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part anonymous questionnaire was developed (Supplementary File). Part one included questions about basic socioeconomic characteristics such as age, gender, and ethnic origin, type of employment, educational attainment and monthly income. Part two included questions about attitudes, behaviors and knowledge about COVID-19 vaccine (views on vaccine safety, efficiency, safety in rheumatological conditions and whilst taking immunosuppressive medications) as well as ascertaining whether the participant was offered and received the vaccine.

## Data collection

Questionnaires were offered to all patients attending a face to face appointment in rheumatology clinics by members of the clinical research team. All patients had been sent a letter with a patient information sheet two weeks prior to their clinic appointment. Patients were also sent contact details in case they wanted to complete the questionnaire in any other language. No identifiable patient data were collected.

## Participants

Eligibility criteria were adults 18 years and older, attending Rheumatology clinic appointments in person. Patients aged less than 18 years old, patients who were booked for a telephone consultation and people who lacked capacity were excluded from the study. Questionnaires were also translated in three commonly spoken languages in the local area (Polish, Lithuanian and Urdu). The study was approved by the national Health Research Authority (HRA).

## Statistical analysis

There were 395 questionnaires completed by patients attending face to face rheumatology clinic appointments at the two main hospital sites within the Trust over the period from October to November 2021. The sample size was determined based on a two-sided 95% confidence interval with a precision of 0.05. Assuming the prevalence of having Covid-19 vaccine uptake was about 70% among rheumatology patients in the local area, 395 participants was required assuming there were 20% missing values. Continuous data are presented as mean and the standard deviation or median and the inter-quartile ranges and categorical variables are expressed as percentages. Logistic regression models were performed to assess the associations between outcomes and demographic related variables. The Hosmer-Lemeshow goodness of fit tests was used to evaluate the model fit. A 5% significance level was used (two-tailed). The responses were entered into an Excel spreadsheet.

The STATA statistical computer package was used to analyze the data.

## Results

Of the 395 participants, 65% were women, 71% were above the age of 45, 66.3% identified as White British (Figure 1). Interestingly, the data from Census 2011 showed that 71% of the population served by two hospitals was White British. 46% of participants were in paid employment. Only three questionnaires were completed in other languages (one in Polish, one in Lithuanian, one in Urdu).

There was an exceptionally high Coronavirus vaccine uptake rate among the sample population (96.71%), which is notably higher than England's national figures at the time of the study- 90.4% of the general population have received at least one dose of the vaccine by mid November 2021. Over 93% of participants believed the vaccine was both safe and effective.

Univariate analysis demonstrated that the older participants were more likely to agree to have the vaccine (OR (95%CI): 2.05 (1.37-3.05),  $p < 0.001$ ). In terms of ethnicity there was a possible association between being White British and agreeing to have the vaccine (OR (95%CI): 3.16 (0.99-10.09),  $p = 0.052$ ). Participants working part-time were more likely to agree to vaccination in univariate analysis (0.19 (0.04-0.89),  $p = 0.036$ ). There was no demonstrable link between educational attainment and agreement to have the vaccine; neither was there a link with monthly income.

Multivariate logistic regression model demonstrated that only age and White British ethnic background were associated with agreement to vaccination against Coronavirus (Table 1). We have also sought to establish an association between demographic characteristics and trust in vaccine safety using multivariate logistic regression model. Increasing age was the only characteristic which demonstrated significant association with belief that the vaccine is safe (Table 2).

One fifth of the respondents did not answer the question about COVID vaccine safety with their medications. Older people tended to believe that the vaccine was safe to have whilst taking immunosuppressive medications ( $P = 0.05$ ). There was no significant association demonstrated between demographic characteristics and belief that vaccination might affect their rheumatological condition (Table 3).

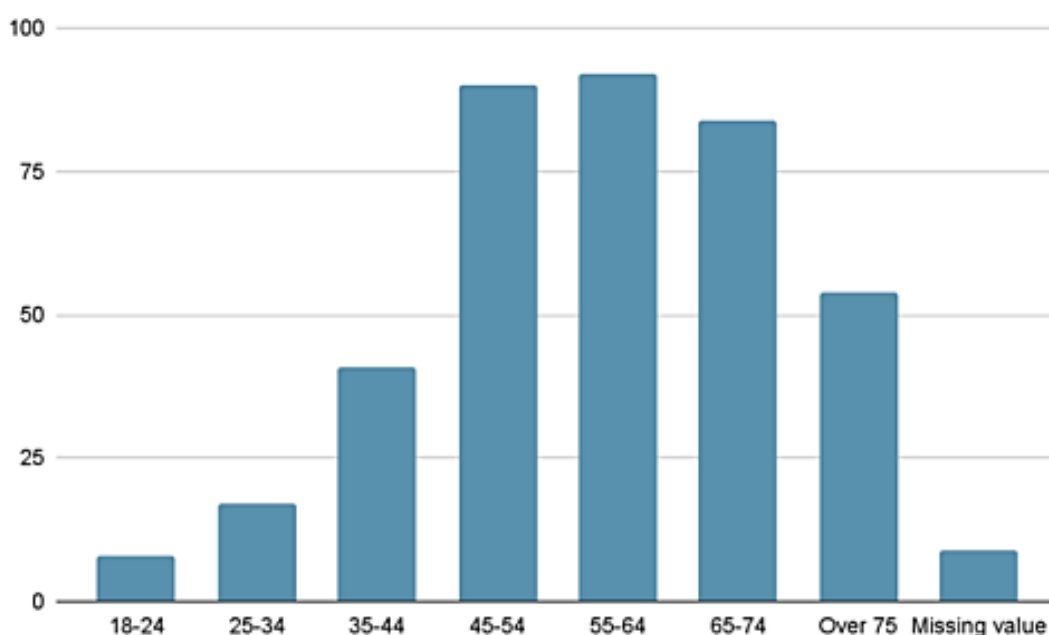


Figure 1. Age distribution of the participants.

**Table 1.** Association between demographic characteristics and agreement to have a COVID-19 vaccine.

	Univariate analysis		Multivariable analysis	
	OR (95%CI)	p-value	OR (95%CI)	p-value
Male	1.71 (0.46-6.32)	0.42	-	-
Age group	2.05 (1.37-3.05)	<0.001	3.07 (1.59-5.95)	0.001
White British <sup>a</sup>	3.16 (0.99-10.09)	0.052	6.54 (1.27-33.55)	0.024
		Employment <sup>b</sup>		
Full time	0.31 (0.07-1.26)	0.1	-	-
Part time	0.19 (0.04-0.89)	0.036	-	-
		Education <sup>c</sup>		
A levels	0.44 (0.11-1.81)	0.26	-	-
University	0.64 (0.14-2.94)	0.57	-	-
		Income <sup>d</sup>		
500-1,000	0.49 (0.05-4.59)	0.53	-	-
1,001-2000	0.81(0.09-7.53)	0.86	-	-
2,001-3,000	1.66 (0.10-27.41)	0.73	-	-
>3,000	1 (0.06-16.69)	1	-	-

**Note:** <sup>a</sup>other white; <sup>b</sup>not working; <sup>c</sup>GCSE; <sup>d</sup>< £500 per month.

**Table 2.** Association between demographic characteristics and trust in COVID-19 vaccine safety.

	Univariate analysis		Multivariable analysis	
	OR (95%CI)	p-value	OR (95%CI)	p-value
Male	1.22 (0.46-3.27)	0.69	-	-
Age group	1.46 (1.08-1.97)	0.015	2.04 (1.32-3.15)	0.001
White British <sup>a</sup>	1.61 (0.58-4.44)	0.36	-	-
		Employment <sup>b</sup>		
Full time	0.63 (0.23-1.73)	0.37	-	-
Part time	0.70 (0.18-2.74)	0.61	-	-
		Education <sup>c</sup>		
A levels	1.58 (0.32-7.80)	0.58	-	-
University	0.67 (0.21-2.19)	0.51	-	-
		Income <sup>d</sup>		
500-1,000	1.09 (0.29-4.05)	0.89	-	-
1,001-2000	1.11 (0.36-3.45)	0.85	-	-
2,001-3,000	1.95 (0.38-10.04)	0.43	-	-
>3,000	2.41 (0.28-20.89)	0.42	-	-

**Note:** <sup>a</sup>other white; <sup>b</sup>not working; <sup>c</sup>GCSE; <sup>d</sup><£500 per month.

**Table 3.** Association between demographic characteristics and belief that COVID-19 vaccine may affect participant's rheumatological condition.

	Univariate analysis	
	OR (95%CI)	p-value
Male	0.97 (0.60-1.58)	0.91
Age group	0.77 (0.65-0.91)	0.002
White British <sup>a</sup>	0.77 (0.44-1.33)	0.35
	Employment <sup>b</sup>	
Full time	2.46 (1.44-4.20)	0.001
Part time	2.34 (1.13-4.85)	0.02
	Education <sup>c</sup>	
A levels	1.17 (0.61-2.27)	0.63
University	1.48 (0.79-2.75)	0.22
	Income <sup>d</sup>	
500-1,000	1.91 (0.71-5.09)	1.29
1,001-2000	1.82 (0.73-4.55)	0.2
2,001-3,000	1.47 (0.53-4.02)	0.46
>3,000	1.53 (0.48-4.83)	0.47

**Note:** <sup>a</sup>other white; <sup>b</sup>not working; <sup>c</sup>GCSE; <sup>d</sup><£500 per month.

No significant variables were identified in MV analysis.

The comments in the open ended questions mostly focused on the lack of easily available information about the effect of vaccination on patients with rheumatological conditions. Several participants also mentioned that they trusted medical professionals' advice in this regard.

## Discussion

The study demonstrated a remarkable uptake of COVID-19 vaccine among the local rheumatology population. This is in stark contrast to the results of two surveys which estimated that COVID-19 vaccine hesitancy hovers around 40%-50% among patients with rheumatic diseases [7]. However, our study failed to identify distinct socioeconomic characteristics of people who are more likely to refuse vaccination against coronavirus infection. It appears that only increasing age is a reliable predictor of vaccine acceptance. Similar large-scale study of the UK general population identified that the largest predictors of both COVID-19 vaccine uncertainty and refusal were low-income groups, having not received a flu vaccine last year, poor adherence to COVID-19 government guidelines, female gender, and living with children. Amongst vaccine attitudes, intermediate to high levels of mistrust of vaccine benefit and concerns about future unforeseen side effects were the most important determinants of both uncertainty and unwillingness to vaccinate against COVID-19. It should be noted here that flu vaccine uptake among people over the age of 65 in the local area has increased dramatically in 2020/2021 with 77.9% receiving flu vaccine. This is in contrast to the average of 70% uptake in the previous year's [8]. Increasing age was found to be associated with increased acceptance of vaccination in our and other studies [9].

Perhaps the most significant finding of several recent studies into vaccine hesitancy is the willingness of patients with autoimmune and rheumatic diseases to be vaccinated increases when recommended by a physician [9]. Although this was not formally assessed in our study, free text comments from participants suggest that this is the case in the local population as well.

The study has several limitations. Although the sample size was adequate, high vaccine uptake rate among the participants meant that the actual number of participants who refused vaccination was very low (N=15), making it impossible to draw any statistically and clinically significant conclusions on the socioeconomic characteristics of these people. Authors admit that there perhaps was selection bias, as only patients attending face to face appointments were included in the study. Therefore, potentially more clinically stable patients receiving telephone consultations were not included in the study. It is possible that some patients, who were not willing to receive vaccination, were not willing to participate in the study either, thereby skewing the results.

## Conclusion

Our study demonstrated excellent uptake of COVID-19 vaccine in our local population. Being older and having white British ethnicity were found to be strong predictors of vaccine uptake. There is a need for a large-scale, UK-wide observational study into the vaccine hesitancy among rheumatology population to inform clinicians about ways of addressing the issue.

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## Ethical approval and consent to participate

The study was approved by the national HRA and Health and Care Research Wales (HCRW). The study was carried out in accordance with the declaration of Helsinki.

As per study protocol, no identifiable patient data were collected, therefore written informed consent was not sought. Implied consent was used instead. The implied consent procedure was approved by the Health Research Authority and Research Ethics Committee. London-Camberwell St. Giles Research Ethics Committee provided a favourable ethics opinion for the research on the basis described in the application form, protocol and supporting documentation. REC reference 21/LO/0524.

## Consent for Publication

Not applicable. Written consent for publication was not sought as all patient data were anonymous. Patient information sheet stated that the results of the study might be published in a medical journal.

## Availability of Data and Materials

The datasets generated and/or analyzed during the current study are available in the Harvard Data verse repository, (<https://doi.org/10.7910/DVN/BPUEV8>).

## Competing Interests

The authors declare that they have no competing interests.

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## Author Contributions

JP designed the study, developed the study protocol, analyzed the data and took part in the writing of the manuscript. VS took part in study design, data analysis and were a major contributor to the writing of the manuscript. FM made a major contribution to the design of the study. PS took part in the study design, data analysis and writing of the manuscript. DC took part in the study design, study registration and ethics approval. HB was responsible for data collection. JZ provided statistical analysis. All authors critically reviewed the final manuscript.

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