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COVID-19 vaccine confidence in the post-vaccination era: Perceptions among adults with immune-mediated inflammatory diseases

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ABSTRACT

Objective: Assess the perceived protection afforded by a range of COVID-19 vaccines in immune-mediated inflammatory diseases patients previously vaccinated against SARS-CoV-2.
Study design: Survey.
Methods: On-line cross-sectional survey aimed at evaluating the perceived protection (and its determinants) afforded by a range of COVID-19 vaccines among immune-mediated inflammatory diseases previously vaccinated for COVID-19.
Results: Out of 493 eligible respondents who lived in Brazil, 397 (80.5%) were confident that their primary vaccination series would protect them against severe COVID-19. In multivariate analysis, only overlapping immune-mediated inflammatory diseases remained (negatively) associated with the perception of protection.
Conclusions: No influence was found between COVID-19 vaccine types and the perception of protection after initial vaccinations.

1. Introduction

Patients with immune-mediated inflammatory diseases (IMID) have an increased burden of infections, which is attributed to the underlying IMID, comorbidities, and immunosuppressive therapy [1]. Thus, prevention of infectious illnesses is of utmost importance in the management of these disorders.

Vaccination is an attractive method to prevent certain infections by inducing or boosting protective responses. In the context of patients with IMID, vaccines should ideally be administered before the planned immunosuppression or during disease quiescence in order to maximize vaccine immunogenicity [1]. More recently, massive coronavirus disease 2019 (COVID-19) vaccination rollouts have started across the globe, with vulnerable people, including those with immunocompromising conditions, generally being granted priority for vaccination [2–4]. In support of widespread recommendations for COVID-19 vaccination of high-risk individuals, the Brazilian registry of IMID patients infected with COVID-19 (ReumaCoV) has shown that high levels of immunosuppression are associated with unfavorable outcomes of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection [5].

Regarding phase III pivotal trials of COVID-19 vaccines, efficacy results of the most widely used vaccine platforms were quite discrepant, ranging from efficacy above 90% for COVID-19 messenger RNA (mRNA) vaccines to 50.7% for CoronaVac, an inactivated whole-virion SARS-CoV-2 vaccine. However, these trials did not include immunocompromised individuals [6]. As a consequence, there was great concern among clinicians whether a specific COVID-19 vaccine platform should be preferentially recommended for patients with IMID. To our knowledge, this question remains unanswered. Therefore, to explore this issue, we designed a study primarily aimed at assessing the perceived protection afforded by a range of COVID-19 vaccines in IMID adults previously vaccinated against SARS-CoV-2.

2. Methods

From September 3, 2021 to February 6, 2022, we performed an

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online cross-sectional survey of adults with IMID who were treated by rheumatologists of a large private practice group in Brazil. The recruited patients received a standardized questionnaire by email or messaging application (WhatsApp™). Individuals who were not confirmed to have IMID, below 18 years old, or unvaccinated for COVID-19 were excluded from the analyses. Electronic informed consent was obtained from all survey participants. Study approval was acquired through the ethics committee of Leforte Hospital, São Paulo (CAAE: 50875521.6.0000.5485).

We collected a range of data from the survey, including patient demographics, clinical characteristics, previous history of SARS-CoV-2 infection, perceived protection after receiving at least one dose of a COVID-19 vaccine available in Brazil, adverse events post-COVID-19 vaccination, and willingness to receive an additional dose of COVID-19 vaccine (i.e., a dose of vaccine administered after the primary series to people who may be less likely to mount a protective immune response after initial vaccination). The perception of protection was assessed by asking participants if they were confident that the primary vaccination series received, as per pivotal COVID-19 vaccine efficacy trials, would protect them against severe SARS-CoV-2 infection. Briefly, the COVID-19 vaccine from Janssen/Johnson & Johnson (Ad26. COV2-S) was used in pivotal phase III trial as a single dose, while the immunogens from Pfizer/BioNTech (BNT162b2), Sinovac (CoronaVac), and Oxford/AstraZeneca (ChAdOx1 nCoV-19) were given as a two-dose series [6].

Categorical variables are presented as number (%) and compared using Chi-square or Fisher's exact test, as appropriate. Continuous data are shown as mean ± standard deviation and compared using Student's *t*-test. Multivariate logistic regression analysis was performed with the dependent variable as the perception of protection conferred by the primary COVID-19 vaccination regimen and the independent variables as those with $p < 0.2$ in the univariate analysis. Statistical significance was set at $p < 0.05$. All analyses were performed using IBM SPSS Statistics 20.

3. Results

A total of 505 responses were collected over the study period. Of these, 12 were excluded (9 duplicates, 2 persons unvaccinated for COVID-19, and 1 person <18 years old), resulting in 493 responses eligible for analysis.

Characteristics of the participants are shown in Table 1. Participants were predominantly middle-aged women of Caucasian descent, with IMID diagnosis duration of <5 years. Comorbidities were reported in 280 patients (57%), especially cardiovascular diseases (127 of 280; 45.3%). Regarding IMID diagnoses, spondyloarthritis accounted for nearly half of cases, followed by rheumatoid arthritis, connective tissue diseases, overlapping IMID, and vasculitis. At the time the survey was answered, most patients were off systemic corticosteroids but on disease-modifying antirheumatic drug therapy.

The primary COVID-19 vaccination regimens and the number of recipients per regimen were as follows: non-replicating viral vector, 295 patients (290 Oxford/AstraZeneca, 5 Janssen/Johnson & Johnson); mRNA, 99 patients (all Pfizer/BioNTech); and inactivated whole-virion, 99 patients (all CoronaVac). An additional dose of COVID-19 vaccine had already been received by 109 (37.6%) vaccinees with Oxford/AstraZeneca, 43 (43.4%) with CoronaVac, 37 (37.4%) with Pfizer/BioNTech, and 1 (20%) individual initially vaccinated with Janssen/Johnson and Johnson's COVID-19 immunogen. Out of the 303 participants who had not yet received an additional dose of COVID-19 vaccine, 281 (92.7%) were willing to get vaccinated. Of note, the willingness to receive an additional dose was higher among vaccinees with Pfizer/BioNTech (61 of 62; 98.4%) and CoronaVac (55 of 56; 98.2%) as compared with recipients of a non-replicating viral vector COVID-19 vaccine (165 of 185; 89.2%) ($p = 0.03$ for both comparisons).

With regard to the perception of protection conferred by the primary COVID-19 vaccination series, 397 (80.5%) out of 493 eligible respondents were confident that the vaccines would protect them against severe COVID-19, as opposed to 96 (19.5%) who were unsure or not confident. In our univariate analysis (Table 1), the following explanatory variables were associated with confidence in the primary COVID-19 vaccination regimen: age ≥60 years, Caucasian descendance, women, spondyloarthritis, vasculitis, overlapping IMID, current use of systemic corticosteroids, and receipt of Pfizer/BioNTech's COVID-19 immunogen ($p < 0.20$). In the final logistic regression model, only overlapping IMID remained (negatively) associated with the perception of protection conferred by the primary COVID-19 vaccination series (Supplementary data).

Table 1
Participant characteristics stratified according to perceived protection from the primary COVID-19 vaccination series.

Characteristic	All participants N = 493	"Confident" group N = 397	"Unsure & not confident" group N = 96	p
Age, years, mean (SD)	49.8 (12.7)	49.5 (12.5)	50.8 (13.8)	0.38
Age ≥60 years	106 (21.5)	80 (20.1)	26 (27.1)	0.16
Women	406 (82.3)	322 (81.1)	84 (87.5)	0.17
White skin color	345 (70)	272 (68.5)	73 (76)	0.17
IMID diagnosis ≥5 years	170 (34.5)	132 (33.2)	38 (39.6)	0.28
IMID diagnosis >10 years	74 (15)	57 (14.3)	17 (17.7)	0.42
IMID diagnosis [a]				
Spondyloarthritis	242 (49.1)	205 (51.6)	37 (38.5)	0.02
Rheumatoid arthritis	162 (32.9)	129 (32.5)	33 (34.4)	0.71
Connective tissue diseases [b]	52 (10.5)	41 (10.3)	11 (11.5)	0.71
Vasculitis	14 (2.8)	9 (2.3)	5 (5.2)	0.16
Overlapping IMID	19 (3.8)	10 (2.5)	9 (9.4)	0.004
Current drug treatment				
Systemic corticosteroid	193/489 (39.5) (39.5) 9.5)	149/394 (37.8)	44/95 (46.3)	0.13
Non-biologic DMARD [c]	324 (65.7)	261 (65.7)	63 (65.6)	>0.99
Biologic DMARD [d]	296 (60)	240 (60.4)	56 (58.3)	0.72
Comorbidities[e]	280 (56.8)	225 (56.7)	55 (57.3)	>0.99
Initial COVID-19 vaccination				
Oxford/ AstraZeneca	290 (58.8)	233 (58.7)	57 (59.4)	>0.99
Pfizer/BioNTech	99 (20.1)	85 (21.4)	14 (14.6)	0.15
CoronaVac	99 (20.1)	75 (18.9)	24 (25)	0.20
Janssen/Johnson & Johnson	5 (1)	4 (1)	1 (1)	>0.99
COVID-19 post-vaccination	27 (5.5)	22 (5.5)	5 (5.2)	>0.99

Abbreviations: DMARD, disease-modifying anti-rheumatic drug; IMID, immune-mediated inflammatory diseases; SD, standard deviation.

[a] Other diagnoses: sarcoidosis, n = 2; scleromyxedema, n = 1; familial mediterranean fever, n = 1.

[b] Conditions reported: Sjögren syndrome, systemic lupus erythematosus, systemic sclerosis, localized scleroderma, inflammatory myopathies, polymyalgia rheumatica, and antiphospholipid syndrome.

[c] Drugs under use: hydroxychloroquine, methotrexate, leflunomide, sulfasalazine, mycophenolate, azathioprine, JAK inhibitor, and calcineurin inhibitor.

[d] Drugs under use: adalimumab, etanercept, infliximab, golimumab, certolizumab, abatacept, secukinumab, ixekizumab, ustekinumab, guselkumab, rituximab, tocilizumab, and intravenous immunoglobulin.

[e] Conditions surveyed: cardiovascular disease, diabetes mellitus, chronic lung disease, chronic renal disease, obesity, chronic liver disease, multiple sclerosis, depression, anxiety disorder, fibromyalgia, human immunodeficiency virus/ acquired immunodeficiency syndrome, and malignancy.

4. Discussion

In this study, we found no influence of SARS-CoV-2 vaccine types on the perception of protection after initial vaccinations. After more than two years through the pandemic, it remains critical to bolster confidence in all approved COVID-19 vaccines, primarily because new SARS-CoV-2 variants and subvariants keep emerging, which necessitates new rounds of immunization to compensate for the ability of newer strains to escape immune protection from vaccination [7].

Confidence in COVID-19 vaccines, however, might vary over time. According to a large Brazilian cross-sectional study by Moore et al. involving the general population, the two most trusted COVID-19 vaccines in January 2021 were Covishield (Oxford/AstraZeneca formulation) (80.1%) and CoronaVac (76.3%), with Pfizer/BioNTech's immunogen rated at 70.6%. No data relative to Janssen/Johnson & Johnson's COVID-19 vaccine was provided by the authors in the paper [8]. Of note, Covishield and CoronaVac were the only COVID-19 vaccines used in Brazil at that time, and were produced in partnership with renowned national scientific institutions, which probably increased their public visibility. In our study, which began about eight months after the study of Moore et al., confidence in the protection provided by the primary COVID-19 vaccination regimens was at 85.8% among vaccinees with Pfizer/BioNTech, 80.3% with Oxford/AstraZeneca, 80% with Janssen/Johnson & Johnson, and 75.7% with CoronaVac [8]. Importantly, the rollout of COVID-19 vaccines manufactured by Pfizer/BioNTech and Janssen/Johnson & Johnson started in Brazil in mid-2021.

Another interesting finding of our study was the low COVID-19 vaccine hesitancy among the participants, in which only 27 (5.5%) of 493 eligible respondents were unsure or unwilling to receive an additional dose of COVID-19 vaccine. Two prior surveys carried out in Brazil, one with IMID adults unvaccinated for COVID-19 [9] and the other with adults from the general population [8], give support to our data. In the former study, the authors reported that 744 (81.9%) of 908 patients were willing to get vaccinated against SARS-CoV-2 [9], while in the latter study, Moore et al. reported 154,928 (89.5%) of 173,178 adults intended to or had already been vaccinated against COVID-19 [8]. Overall, these figures from Brazil are promising, suggesting that vaccine hesitancy, which is considered by the World Health Organization as one of the major threats to global health [10], does not seem to heavily impact the COVID-19 vaccination rollout in the country.

Regarding the negative association of overlapping IMID with perceived protection from the primary COVID-19 vaccination series, we believe that it might relate to concerns among IMID individuals about the efficacy, immunogenicity, and safety of vaccination in general [1].

Our study also has limitations. Because we used a convenience sample, our results may not be generalizable. Additionally, no proof of COVID-19 vaccination was solicited.

In summary, our real-world data in adults with IMID shows no apparent difference in the perceived protection against severe SARS-CoV-2 infection among all COVID-19 vaccines available in Brazil.

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Competing interests

The authors declare that there is no conflict of interest.

Ethical approval

Study approval was acquired through the ethics committee of Leforte Hospital (CAAE: 50875521.6.0000.5485). Electronic informed consent was obtained from all survey participants.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.puhip.2023.100419.

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