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Concise Communication

Risk factors for reduction in adherence to protective measures following coronavirus disease 2019 (COVID-19) vaccination and vaccine perceptions among healthcare workers, in São Paulo, Brazil

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Abstract

A survey evaluated 2,300 healthcare workers following the first dose of a coronavirus disease 2019 (COVID-19) vaccine in a tertiary-quaternary hospital in São Paulo, Brazil. Adherence to protective measures following vaccination was compared to previous non-work-related behaviors. Younger age, previous COVID-19, and burnout symptoms were associated with reduced adherence to mitigation measures.

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Control of the coronavirus disease 2019 (COVID-19) pandemic is challenging, and the spread of severe acute respiratory coronavirus virus 2 (SARS-CoV-2) is difficult to contain. Preventing infections in healthcare workers (HCWs) remains critical, and prevention efforts focus on individual precautions, especially after COVID-19 vaccination. Community exposures have been associated with increased risk of SARS-CoV-2 infection in HCWs,[1] highlighting the importance of further understanding this context.

In a reference university hospital in Brazil, we evaluated whether there was a change in non-work-related COVID-19 mitigation behaviors in HCWs following the first dose of COVID-19 vaccine, associated factors, and vaccine perceptions.

Methods

In this cross-sectional study, we evaluated HCWs at the Hospital das Clinicas da Faculdade de Medicina da Universidade de São Paulo (HCFMUSP), a tertiary-quaternary hospital with 2,200 hospital beds and ~30,000 workers that serves as a regional COVID-19 referral facility. The COVID-19 vaccination campaign started at HCFMUSP on January 18, 2021, and 22,523 doses of CoronaVac vaccine (Sinovac/Butantan) were administered to HCWs in 4 days. From February 5 to March 3, 2021, HCWs were invited to answer an online questionnaire accessed using a quick-response (QR) code. The questionnaire was used to collect sociodemographic, occupational, and clinical data. Duplicates were individually analyzed and the last submitted answer was kept, except when it was incomplete. Exclusion criteria comprised previous vaccination in 2020 or unknown vaccination date. Informed consent was obtained from all participants.

Perceptions regarding vaccination were addressed by questions focusing on vaccine importance, effectiveness, safety, and mandatory vaccination. Burnout symptoms were evaluated using a freely available single-item tool, previously demonstrated as a reliable option in the healthcare setting,[2] freely translated into Portuguese by the study investigators. The burnout threshold was indicated when the answer met level 3 or greater of 5 possible answers. Adherence to social distancing and personal protective measures (ie, mask use and hand hygiene) were assessed by questions that evaluated behavior changes in the month following vaccination campaign, compared with previous baseline adherence (ie, hand hygiene and mask use) or with the second semester of 2020 (ie, social distancing). The survey explicitly stated that work activities should not be considered in the response. The questionnaire is provided in the Supplementary Material (online).

This study was approved by the hospital ethics committee (CAPPesq CAAE: 42708721.0.0000.0068).

Data analysis

Categorical variables are reported as absolute numbers and percentages, and continuous variables are reported as median and interquartile range (IQR). The associations between sociodemographic, clinical, and occupational characteristics with self-

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reported decreases in adherence to personal protective measures and social distancing were evaluated using a bivariate logistic regression model. Bivariate associations with a $P \leq .10$ were selected for a multivariate logistic regression analysis, in which significance was set at $P \leq .05$. We used SPSS version 20 software (IBM, Armonk, NY) for these analyses.

Results

In total, 2,618 HCWs answered the questionnaire. Only the 2,587 HCWs who had received the first COVID-19 vaccination were included in the study, and 287 answers were excluded due to record duplicates (n = 261), vaccination date in 2020 (n = 12) or unknown (n = 14), resulting in a study group of 2,300 HCWs. Supplementary Table S1 (online) presents the sociodemographic, occupational, and clinical characteristics of study participants. Most were female (80%), aged 18–81 years (median, 42 years; IQR, 34–54), and were not married (53.8%). Most HCWs provided direct patient care: physicians (23.5%), nursing technicians (19.6%), nurses (14%), and multidisciplinary team (11.7%). Half of these HCWs had worked in COVID-19-related areas (50.6%), mainly in the intensive care unit (43.5%). Additionally, 35.7% reported having comorbidities (mostly hypertension, 42.0%), 27.9% self-reported burnout symptoms, and 27.8% had had COVID-19.

Vaccine perceptions are presented on Supplementary Table S2 (online). Almost all participants (99.7%) had received CoronaVac (Sinovac/Butantan), had received the influenza vaccine in the previous year (91.4%), and had never skipped vaccination for non-medical reasons (92.8%). Most HCWs totally agreed with the importance of vaccination (96.8%), its effectiveness (84.9%), and its safety (80.7%). Most totally or partially agreed that vaccination should be mandatory (84.0%), and 65.8% reported having received messages with negative content on COVID-19 vaccines.

Study participants reported higher percentages of strict or high adherence levels to mask use (96.4%) and hand hygiene (91.5%) compared to social distancing measures (63.8%). Comparing the month following vaccination to previous behaviors, 24.3% of HCWs reported reduced social distancing and 7.1% reported reduced adherence to personal protective measures (ie, hand hygiene and mask use) (Table 1).

In the multivariate analysis, younger age, previous COVID-19, and self-reported perception of burnout were directly associated with reduced adherence to both social distancing and personal protective measures (Table 2).

Table 1. Self-Reported Adherence to Protective Measures Outside the Work Setting of the 2,300 Healthcare Workers in a Tertiary-Quaternary University Referral Hospital for COVID-19, in Sao Paulo, Brazil

Characteristics	No. (%)
Adherence to social distancing measures in the second semester 2020	
Strict adherence	459 (20.0)
High adherence	1,007 (43.8)
Regular adherence	601 (26.1)
Low or nonadherent	233 (10.1)
Has your level of compliance to social distancing measures changed in the last month?	
No	1,561 (67.9)
Yes, complying less with social distancing measures	559 (24.3)
Yes, complying better with social distancing measures	180 (7.8)
Level of adherence to mask use	
Strict adherence	1,712 (74.4)
High adherence	505 (22.0)
Regular adherence	78 (3.4)
Low or nonadherent	5 (0.2)
Level of adherence to hand hygiene	
High adherence	2,119 (91.5)
Regular adherence	193 (8.4)
Low or nonadherent	2 (0.1)
Has your level of compliance to personal protective measures changed in the last month?	
No	1,570 (68.3)
Yes, more adherent	567 (24.7)
Yes, less adherent	163 (7.1)

Discussion

Mitigation measures are effective[3] and still essential to reduce SARS-CoV-2 transmission, although its success depends on personal adherence to these measures. Study participants reported higher adherence to personal protective measures compared to social distancing, with a lower tendency to reduce them following vaccination (7.8% vs 24.3%, respectively). Among HCWs, younger age, previous COVID-19, and burnout symptoms were associated with reduced adherence to mitigation measures outside the workplace. These behavior changes occurred despite incomplete vaccination and when the country was experiencing its worst moment in the pandemic and was becoming the pandemic epicenter.

Younger age has been previously associated with a lower adherence to protective measures,[4] which was corroborated by our study. A possible explanation for this is the higher perception of risk among the older age group. Other sociodemographic factors previously demonstrated as possible adherence predictors to protective measures, such as female sex,[4] were not replicated in our study.

Individual behaviors may also be influenced by risk compensation (ie, when there is a reduced adherence to protective measures as a consequence of a lower individual perception of risk, secondary to the adoption of other preventive measures, such as vaccination). This process can be important following vaccination,[5] and it is also a reasonable explanation for lower adherence among those who have had a previous COVID-19 infection.

Mental health may influence adherence to preventive measures, but published results have been controversial. Some studies have shown that depressive symptoms are a risk factor for lower adherence,[6] but other studies consider them a protective factor.[7] Also, higher stress levels may be associated with reduced adherence to protective measures,[7] which supports our findings regarding self-reported burnout. The explanation for this association is still not well understood.

In Brazil, the denial environment is an important background factor that may have negatively affected HCW adherence to protective measures. Despite this political scenario, low COVID-19 vaccine hesitancy among adults has been reported in Brazil.[8] In addition, as the pandemic extends through a chronic phase, a

Table 2. Evaluation of Factors Associated With Reduction in Adherence to Social Distancing and Personal Protective Measures Among Healthcare Workers in a Tertiary-Quaternary University Referral Hospital for COVID-19, in Sao Paulo, Brazil.

	Social Distancing				Personal Protective Measures			
	Bivariate Analysis		Multivariate Analysis		Bivariate Analysis		Multivariate Analysis	
Variable	OR (95% CI)[a]	*P* Value	OR (95% CI)[a]	*P* Value	OR (95% CI)[a]	*P* Value	OR (95% CI)[a]	*P* Value
Age, y[b]	0.966 (0.958–0.974)	< .001	0.974 (0.964–0.983)	< .001	0.963 (0.949–0.977)	< .001	0.971 (0.955–0.986)	< .001
Sex, female	1.129 (0.885–1.439)	.329			0.728 (0.503–1.053)	.092	0.726 (0.495–1.065)	.102
Married	0.749 (0.618–0.909)	.003	0.885 (0.722–1.084)	.237	0.758 (0.548–1.049	.095	0.918 (0.651–1.295)	.628
Work category		.004		.364		.192		
Administrative staff	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)		
Physician	1.035 (0.748–1.432)	.833	0.903 (0.646–1.261)	.548	1.043 (0.610–1.784)	.877		
Multidisciplinary health team	1.825 (1.276–2.611)	.001	1.201 (0.820–1.757)	.347	1.162 (0.629–2.149)	.631		
Nursing technician	0.942 (0.670–1.324)	.731	0.778 (0.549–1.103)	.159	1.235 (0.719–2.120)	.445		
Nurse	1.163 (0.814–1.660)	.407	0.887 (0.613–1.285)	.527	1.126 (0.626–2.027)	.692		
Laboratory/radiology/pharmacy	1.111 (0.775–1.592)	.566	0.936 (0.646–1.356)	.725	0.572 (0.285–1.150)	.117		
General services	0.794 (0.353–1.784)	0.576	0.822 (0.363–1.864)	.640	2.235 (0.855–5.842)	.101		
Pre-existing condition	0.689 (0.561–0.847)	< .001	0.877 (0.699–1.100)	0.255	0.734 (0.518–1.039)	.081	0.965 (0.660–1.413)	.856
Previous COVID-19 infection	1.461 (1.190–1.794)	< .001	1.387 (1.121–1.716)	0.003	2.069 (1.496–2.863)	< .001	1.888 (1.356–2.629)	<.001
Positive feeling after vaccination	0.951 (0.737–1.227)	.701			0.703 (0.475–1.039)	.077	0.761 (0.510–1.135)	.181
Burnout	1.696 (1.384–2.079)	< .001	1.445 (1.167–1.788)	0.001	2.008 (1.451–2.780)	< .001	1.753 (1.251–2.457)	.001

Note. OR, odds ratio; CI, confidence interval.
[a]Odds ratio (95% confidence interval).
[b]Age was evaluated as a continuous variable.

temporal shift in adherence to protective measures has been observed, raising the possibility of pandemic fatigue.[9]

This study had several limitations. Voluntary active access to the questionnaire may have skewed this survey toward participants more concerned or with a better knowledge of COVID-19. We did not have a group of unvaccinated HCWs; therefore, we were not able to assess whether vaccination has a real role in changing individual behaviors. Even with a possible selection bias, HCW adherence to vaccination in our hospital was very high. Another limitation of this study was the cross-sectional design, with data collected through a questionnaire and thereby relying on participant's memories, allowing memory bias. The study was also performed in a single center, although it was possible to gather a reasonable and diverse sample of HCWs.

In conclusion, younger age, previous COVID-19 infection and self-reported perception of burnout were associated with a decreased adherence to protective measures in HCWs following COVID-19 vaccination. Strategies to decrease COVID-19 incidence in HCWs must focus on these groups.

Supplementary material. To view supplementary material for this article, please visit https://doi.org/10.1017/ice.2022.142

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