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Clinical Microbiology and Infection 27 (2021) 1064–1066

Contents lists available at ScienceDirect

Clinical Microbiology and Infection

journal homepage: www.clinicalmicrobiologyandinfection.com

Letter to the Editor

Acceptance of coronavirus disease 2019 vaccine among health-care personnel in India: a cross-sectional survey during the initial phase of vaccination

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ARTICLE INFO

Article history:
Received 14 February 2021
Received in revised form
18 March 2021
Accepted 22 March 2021
Available online 31 March 2021

Editor: L. Leibovici

To the Editor

Phase III trials of coronavirus disease 2019 (COVID-19) vaccines have shown high preventive efficacy against symptomatic infection and acceptable safety profiles in a record time, yet their public acceptance would be an essential deterrent to pandemic control [1]. The hesitancy towards a safe and effective vaccine against a severe infection is a major global health threat and commonly referred to as the 'pandemic public health paradox', previously well-observed with influenza [2,3]. Health-care personnel (HCP) are among the first to receive the COVID-19 vaccination. Their immunization benefits are twofold—reduced morbidity and mortality from symptomatic disease and prevention of transmission to family members and medically vulnerable patients. Moreover, HCP play a critical role in disseminating accurate information [4]. Therefore, it is vital to consider their attitudes about COVID-19 vaccination to address universal vaccination barriers.

An observational, cross-sectional survey was conducted through a web-based questionnaire among HCP, exposed directly or indirectly to COVID-19 patients at their workplace, across India between 20 and 24 January 2021. The Institutional Ethics Committee of PGIMER, Chandigarh (India) approved the study (No. INT/IEC/2021/SPL-124). The choice to participate in the survey was optional, and electronic consent was taken before the questionnaire. The questionnaire was self-designed through mutual discussion and agreement. It comprised 25 items of open-ended or multiple-choice questions focused on sociodemographic characteristics, exposure risk, self-reported beliefs and knowledge about the COVID-19 infection and vaccine, attitudes towards vaccination, and reasons for acceptance or hesitancy. It was operationalized using Google forms and circulated through the WhatsApp messaging app.

Out of 754 HCP who responded, 33 were excluded either because they wished not to participate or had already received the vaccine. Participants represented a random sample of the HCP of 26 Indian states with about 90% from Chandigarh ($n = 183$), Tamil Nadu ($n = 107$), Karnataka ($n = 47$), Haryana ($n = 40$), Punjab ($n = 38$), Uttar Pradesh ($n = 37$), Andhra Pradesh ($n = 34$), Delhi ($n = 31$), Kerala ($n = 26$), Himachal Pradesh ($n = 25$), Rajasthan ($n = 22$), Odisha ($n = 19$), Jammu and Kashmir ($n = 18$) and Telangana ($n = 18$). Registered doctors and nursing professionals comprised 85.3% and 7.8%, respectively, and the remaining 6.9% included laboratory staff, physiotherapists, dieticians, health-care assistants and others. The participants responded to a four-choice question about the intention to receive an available COVID-19 vaccine as 'definitely yes' ($n = 328$, 45.5%), 'probably yes' ($n = 244$, 33.8%), 'probably no' ($n = 124$, 17.2%), and 'definitely no' ($n = 25$, 3.5%). The first two responses were taken as vaccine acceptance and the last two as hesitancy, and accordingly, the participants were divided into two groups: 'Yes' and 'No'.

The effects of sociodemographic characteristics, exposure risk and self-reported knowledge and beliefs on vaccine acceptance were determined using cross-tabulations and χ^2 test analysis with statistical significance set at a p value of <0.05 (Table 1). Logistic regression analysis further demonstrated that the strongest independent association with non-acceptance was a belief that the vaccine's usefulness is minimal or slight in infection prevention (OR 7.057; 95% CI 3.978–12.520; p 0.000), the next associations were being a nursing professional by occupation (OR 3.617; 95% CI 1.213–10.784; p 0.021), a belief that the disease is not severe or severe only with co-morbid conditions (OR 0.445; 95% CI

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https://doi.org/10.1016/j.cmi.2021.03.008
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Table 1
Sociodemographic profile, exposure risks and self-reported knowledge and beliefs of health-care personnel with a comparison between 'Yes' and 'No' groups

Factor	Total ($n = 721$)	Yes ($n = 572$)	No ($n = 149$)	p value
Age groups (years)				
18–24	128 (17.8)	99 (77.3)	29 (22.7)	0.271
25–34	442 (61.3)	345 (78.1)	97 (21.9)	
35–44	83 (11.5)	70 (84.3)	13 (15.7)	
45–54	30 (4.2)	23 (76.7)	7 (23.3)	
55–64	29 (4.0)	26 (89.7)	3 (10.3)	
65 or above	9 (1.2)	9 (100)	—	
Male gender	439 (60.9)	362 (82.5)	77 (17.5)	0.010
Married status	311 (43.1)	252 (81.0)	59 (19.0)	0.328
Occupation				
Doctor	615 (85.3)	496 (80.7)	119 (19.3)	0.000
Nursing professional	56 (7.8)	32 (57.1)	24 (42.9)	
Others	50 (6.9)	44 (88.0)	6 (12.0)	
Medical co-morbidities[a]	222 (30.8)	181 (81.5)	41 (18.5)	0.331
Ever received influenza vaccination	272 (37.7)	221 (81.3)	51 (18.7)	0.588
HCP having direct exposure with suspected or confirmed COVID-19 patients	501 (69.5)	389 (77.6)	112 (22.4)	0.091
HCP having previously contracted confirmed COVID-19 infection[b]	149 (20.7)	109 (73.2)	40 (26.8)	0.036
Do you believe that COVID-19 is a potentially severe or fatal infection?				
Yes	299 (41.5)	256 (85.6)	43 (14.4)	0.001
No	26 (3.6)	17 (65.4)	9 (34.6)	
Only in persons with co-morbid conditions, immunodeficiency states, or older age	396 (54.9)	299 (75.5)	97 (24.5)	
Do you believe a vaccine will be useful in preventing COVID-19 infection?				
Minimal (<10%)	41 (5.7)	12 (29.3)	29 (70.7)	0.000
Slightly (10%–30%)	77 (10.7)	47 (61.0)	30 (39.0)	
Somewhat (30%–60%)	294 (40.8)	233 (79.3)	61 (20.7)	
Mostly (60%–90%)	263 (36.5)	235 (89.4)	28 (10.6)	
Very (>90%)	46 (6.4)	45 (97.8)	1 (2.2)	
Are you concerned about the adverse effects of the vaccine?				
Minimal (<10%)	133 (18.4)	127 (95.5)	6 (4.5)	0.000
Slightly (10%–30%)	193 (26.8)	174 (90.2)	19 (9.8)	
Somewhat (30%–60%)	183 (25.4)	149 (81.4)	34 (18.6)	
Mostly (60%–90%)	118 (16.4)	68 (57.6)	50 (42.4)	
Very (>90%)	94 (13.0)	54 (57.4)	40 (42.6)	
What is your chance of reinfection (in persons who previously had COVID-19[b])?	(N = 149)			
Minimal (<10%)	40 (26.8)	32 (80.0)	8 (20.0)	0.804
Slightly (10%–30%)	44 (29.5)	30 (68.2)	14 (31.8)	
Somewhat (30%–60%)	50 (33.6)	36 (72.0)	14 (28.0)	
Mostly (60%–90%)	12 (8.0)	9 (75.0)	3 (25.0)	
Very (>90%)	3 (2.0)	2 (66.7)	1 (33.3)	

Abbreviations: COVID-19, coronavirus disease 2019; HCP, health-care personnel.
Values are given as *n* (%).
[a] Medical co-morbidities include obesity ($n = 112$), hypertension ($n = 62$), diabetes mellitus ($n = 38$), chronic lung diseases ($n = 38$), cardiac co-morbidities ($n = 20$), chronic kidney disease ($n = 12$), chronic liver disease ($n = 11$), human immunodeficiency virus infection ($n = 10$) and others ($n = 41$).
[b] Confirmed with reverse transcription polymerase chain reaction or antigen testing.

0.285–0.696; p 0.000) and a concern (somewhat, mostly, or very) about adverse effects of the vaccine (OR 0.150; 95% CI 0.088–0.255; p 0.000). Endorsement and testing by colleagues, friends or family, or political figures significantly influenced the willingness of HCP who were likely to receive the vaccine but were not sure ('probably yes') more than they influenced the attitude of HCP who said 'probably no' (78.3% versus 51.6%, p 0.000).

The reasons to receive vaccination given by the willing HCP ($n = 572$) were protection of self (66.0%), family (65.1%), the patients (40.5%), and the entire community through herd immunity (54.7%). Most of the participants desired a free-of-cost vaccine provided by the government (66.1%) or employer (11.9%), and only 22.0% wanted to buy one. A government institution was the preferred site to receive vaccination compared with a private one (54.5% versus 5.8%); 39.7% were comfortable with any site. When provided with an option, 36.9% preferred a domestic (Indian) vaccine, 26.9% desired a foreign or imported vaccine, and 36.2% agreed on either. A favourable attitude for influenza vaccination this year was shown by 40.4% ($n = 292$) of HCP, which was significantly more prevalent in those willing to receive a COVID-19 vaccine compared with their counterparts (47.2% versus 14.8%, p 0.000).

In conclusion, analysing different components of the health belief model, this nationwide survey, primarily contributed to by young doctors, found that although about 80% of HCP support COVID-19 vaccination, they also rely on endorsement and testing first by others (e.g. colleagues, friends) [5]. The three strong associations with non-acceptance were (a) concerns about vaccination effectiveness for disease prevention, (b) concerns about adverse effects, and (c) low perceived disease severity. Although being a nursing professional was independently associated with vaccine hesitancy, given their only 8% contribution to the survey, this would need to be confirmed with clinical interviews to understand better and address their specific concerns or misconceptions. To achieve maximum vaccination rates, health-care facilities, besides providing vaccines, should initiate effective programmes, including educating HCP on the benefits of vaccination and the dangers of non-vaccination.

Authors' contributions

NS conceptualized the idea, developed the theoretical formalism, analysed the data and wrote the first draft of the manuscript. SK wrote the first draft and revised the manuscript. AKP developed the theoretical formalism, analysed the data, revised the manuscript and supervised the project. All the authors

vouch for the accuracy and completeness of the data. No one who is not an author contributed to the writing of the manuscript.

Transparency declaration

This manuscript in part or in full has not been submitted or published anywhere. The authors declare that they have no conflicts of interest.

Acknowledgement

The authors are grateful to Mrs Sunaina Verma for timely intellectual assistance and help in statistics.

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