

Perception and practices on COVID-19 vaccination and booster dose acceptability among health-care workers – A questionnaire-based study

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Abstract

Aim: To assess the perception and practices on COVID-19 vaccination and to determine the predictors of booster dose acceptability among health-care workers (HCWs) in South India.

Materials and Methods: We conducted an anonymous cross-sectional survey on the perception and practices on COVID-19 vaccination and booster dose acceptability among the HCWs in South India. We prepared an online self-administered validated questionnaire, and the Google form link to it was circulated from March 28, 2022 to April 27, 2022, in the social media groups of the HCWs. We used binary logistic regression to identify the predictors of booster dose acceptability among HCWs.

Results: Overall, we obtained 572 valid responses, of which the majority were from paramedical workers compared to doctors. Most of the respondents were unmarried females aged <30 years. Around 31.6% had been previously diagnosed with COVID-19. About 97.9%, 88.8%, and 12.6% of the participants have taken the first, second, and booster doses of the COVID-19 vaccine, respectively. Among the respondents, 19.7% refused to take the booster dose. The main reason for booster dose refusal is the belief that two doses of the COVID-19 vaccine are sufficient to confer disease protection. Believing vaccination to be one of the most effective measures in COVID-19 prevention and being doctors by profession were the chief predictors of booster dose acceptance among HCWs.

Conclusion: While the uptake of the primary COVID-19 vaccination series was commendable among Indian HCWs, booster dose was taken only by a minority of them.

Keywords: Booster dose, COVID-19 vaccine, healthcare workers

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INTRODUCTION

A novel pathogenic strain of coronavirus (severe acute respiratory syndrome-coronavirus-2), initially detected in clusters in December 2019, started spreading across countries to disastrous proportions and wreaked havoc on people's life. It subsequently became a pandemic

with the World Health Organisation (WHO) declaring it a public health emergency of international concern on January 30, 2020.^[1] As per the WHO, over 664 million cases including 6.72 million deaths due to COVID-19 were reported globally as of January 24, 2023.^[2]

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Herd immunity and various preventive strategies like vaccination, social distancing, adherence to cough etiquette, wearing a face mask, hand-washing, travel restrictions, and quarantine have helped to contain the rapid spread of the infection.^[3] Among them, herd immunity and vaccination were paramount, leading to a decline in the caseload and mortality rate.^[4] The COVID-19 vaccines available in India include Covishield, Covaxin, Sputnik-V, Moderna, Janssen, ZyCoV-D, Corbevax, Covovax, and Sputnik light.^[5]

Coronavirus being an RNA virus rapidly undergoes mutations causing new upsurges in COVID-19 infection with the variant strains.^[6] Furthermore, global vaccine inequity predisposes to the emergence of new variants. While some countries struggle to achieve target vaccine coverage, a few are beyond the threshold, reaching child vaccination and extensive booster vaccination programs.^[7]

India has faced three COVID-19 pandemic waves which peaked in September 2020, May 2021, and January 2022 respectively.^[8] Omicron is the recent variant of concern that was first reported from South Africa and is the dominant variant circulating globally.^[9]

Despite the prevalence of ambiguity regarding the effectiveness of available vaccines for Omicron and other variants, researchers speculate prevention of severe disease, since current vaccines enhance T-cell mediated immune response, which is not antibody-dependent.^[8] Literature shows that the initial two doses of vaccination were sufficient to prevent severe disease, but it was ineffective in preventing infection acquisition and milder forms of the disease. Hence, a third dose is recommended to increase the vaccine efficacy against symptomatic disease and severe outcomes.^[10] Due to an increase in breakthrough infections, the spread of new variants, and a reduction in long-term protection, many countries have started administering booster doses.^[7] In India, a third dose of COVID-19 vaccination for healthcare workers (HCWs), frontline workers (FLWs), and people above 60 years was made available from January 10, 2022, and for people aged 18–59 years from April 10, 2022.^[11]

HCWs, being priority groups for vaccination and important stakeholders for vaccination advocacy among patients, it is essential to understand their perceptions of COVID-19 vaccination. Thus, the present study aimed to assess the perception and practices on COVID-19 vaccination and to determine the predictors of booster dose acceptability among HCWs in South India.

MATERIALS AND METHODS

We conducted an anonymous cross-sectional survey using a pre-designed and validated online questionnaire among the HCWs in South India. HCWs include doctors (including dentists) and paramedical workers (PMWs). PMWs consist of nurses, pharmacists, technicians, physiotherapists, and optometrists. The questionnaire was designed using Google Forms and circulated electronically through social media platforms (WhatsApp groups of professional associations), for about a month (March 28, 2022–April 27, 2022).

Ethical consideration

This study was approved by the Research and the Institutional Human Ethics committee (Study number EC/07/2022) of our Medical College and Hospital. Electronic informed consent was obtained from all the participants through a mandatory question at the beginning of the questionnaire, after explaining the aim and purpose of the study. Participants' confidentiality and anonymity were maintained throughout the study. The study was conducted as per the Good Clinical Practice guidelines.

Sample size

Taking the percentage of the booster dose acceptability among HCWs in Czechia a European country as 71.3%,^[12] the sample size for the present study at a 99% confidence level and 5% absolute precision, using Open Source Epidemiologic Statistics for Public Health software (OpenEpi) software version 3.01 [Copyright (c) 2003, 2008 Andrew G. Dean and Kevin M. Sullivan, Atlanta, GA, USA], was estimated to be 543 and rounded off to 550.

Study tool

A self-developed structured online questionnaire was prepared to assess the perceptions and practices on COVID-19 vaccination and booster dose acceptance among HCWs. Due to the self-administered nature of the questionnaire, we developed both English and vernacular language versions for ease of participant filling.

Ten subject experts evaluated the contents of both versions of the questionnaire leading to the modification of several items. A multitude of questions and their options were revised, deleted, or added to ensure context specificity, consistency, objectivity, and language clarity.

Each version of the questionnaire was pilot tested on 20 HCWs (10 each of doctors and PMWs) for verifying its comprehensibility, feasibility, and acceptance. We did not include the pilot study data in the main study results.

The reliability of the final version of the questionnaire was assessed by Cronbach's alpha. A value of 0.71 for the English version and 0.70 for the vernacular version suggest that they are reliable.^[13]

The final version of the questionnaire had 15 questions, primarily of multiple-choice questions with a few Likert scale questions. The online questionnaire (Google Form) starts with the option for participants to choose their preferred language, after which they can proceed with the survey. The initial paragraph explains the study details (title, aim, purpose, voluntary participation, assurance of anonymity and confidentiality, and contact details of Principal Investigator (PI)), followed by a mandatory question on willingness for participation (e-consent).

The questionnaire consists of two sections; demographic details (6 questions), and perception and practices of COVID-19 vaccination and booster dose acceptability (9 questions). The first section covers age, gender, marital status, residence, profession, and previous diagnosis of COVID-19. Further, the subsequent section on the perception and practices of COVID-19 vaccination and booster dose acceptability began with a Likert scale question to measure participants' perceived importance of vaccination in controlling the spread of COVID-19. Other questions included were the number of doses of COVID-19 vaccine taken with the type of vaccine taken during each dose, adverse effects experienced with COVID-19 vaccines, eligibility to receive booster, and reasons for acceptance/hesitance towards the primary series of vaccines and booster dose.

Statistical analysis

Categorical variables were expressed as frequency (percentage). The Chi-square test was used to assess the association between profession and uptake of the COVID-19 vaccine (along with the reasons for their behaviour). For regression analysis, respondents who have already taken the booster or reported willingness for it were considered as "accepting COVID-19 booster" and those not willing as "refusing COVID-19 booster." Unadjusted and adjusted binary logistic regression was done to determine the predictors of COVID-19 booster dose acceptability. The independent variables were age, gender, marital status, attitude to vaccination as one of the most effective measures in the prevention of COVID-19 infection, profession, and previous diagnosis of COVID-19. All tests were two-tailed and a $P < 0.05$ was considered statistically significant. Statistical analysis was done using SPSS (Statistical Package for Social Sciences) software version 24 (IBM Corp., USA).

RESULTS

Overall, we obtained 572 valid responses, of which the majority were from PMWs compared to doctors. Most of the respondents were unmarried females aged <30 years. About 31.6% had been previously diagnosed with COVID-19. Table 1 shows the sociodemographic characteristics of the respondents.

Practices of COVID-19 vaccination by respondents and willingness for booster

A total of 560 (97.9%), 508 (88.8%), and 72 (12.6%) respondents have vaccinated themselves with the first, second, and booster doses of the COVID-19 vaccine, respectively. The uptake of the first dose was similar among doctors and PMWs. However, a significantly greater percentage of doctors compared to PMWs took the second (93.1% vs. 86.7%; $P = 0.023$) and booster doses (25% vs. 6.5%; $P < 0.001$) of the vaccine [Figure 1].

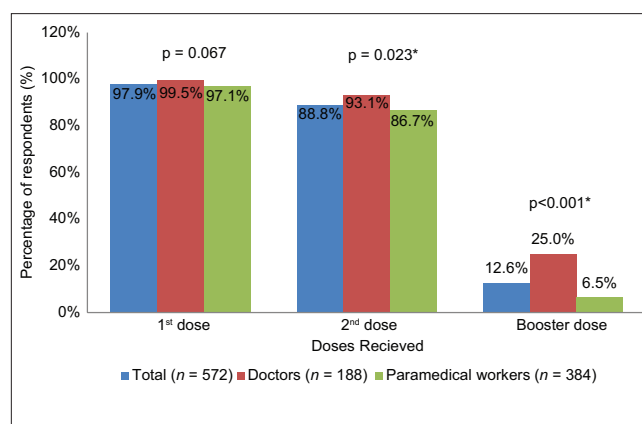


Figure 1: COVID-19 vaccination status of the healthcare workers ($n = 572$). Chi-square test was used for comparing uptake of COVID-19 vaccination series among doctors and paramedical workers. * $P < 0.05$ was considered statistically significant

Table 1: Sociodemographic characteristics of the respondents ($n=572$)

Parameter	Frequency (%)		
	Total ($n=572$)	Doctors ($n=188$)	PMWs ($n=384$)
Age (years)			
<30	419 (73.3)	114 (60.6)	305 (79.4)
30–50	134 (23.4)	61 (32.4)	73 (19)
>50	19 (3.3)	13 (6.9)	6 (1.6)
Gender			
Male	217 (37.9)	74 (39.4)	143 (37.2)
Female	355 (62.1)	114 (60.6)	241 (62.8)
Marital status			
Unmarried	416 (72.7)	89 (47.3)	327 (85.2)
Married	156 (27.3)	99 (52.7)	57 (14.8)
Diagnosed with COVID-19			
No	391 (68.4)	99 (52.7)	292 (76)
Yes	181 (31.6)	89 (47.3)	92 (24)

PMWs=Paramedical workers

Among the first dose vaccine recipients ($n = 560$), 403 (72%), 133 (23.6%), and 24 (4.3%) participants took Covishield, Covaxin, and other vaccines, respectively. Similarly, a greater proportion of second dose recipients ($n = 508$) took Covishield ($n = 369$; 72.6%) and Covaxin ($n = 119$; 23.4%) compared to other vaccines ($n = 20$; 3.9%). Similarly, of the booster dose recipients ($n = 72$), 60 (83.3%), 9 (12.5%), and 3 (4.2%) HCWs took Covishield, Covaxin, and other vaccines, respectively.

Of the total respondents, 72 (12.6%) have already taken booster, 387 (67.7%) were willing to take it, and 113 (19.7%) refused it. Of the 387 (67.6%) willing to booster, 185 (32.3%) were eligible since they had completed 9 months after their 2nd dose, and the remaining 202 (35.3%) were ineligible [Figure 2]. The booster refusal was more among PMWs ($n = 89$; 23.2%) compared to doctors ($n = 24$; 12.8%) and it was statistically significant ($P = 0.003$).

Perceptions of COVID-19 vaccination by respondents- reasons for acceptance/refusal [Table 2]

Primary series

The salient reasons for acceptance of the primary COVID-19 vaccination series among HCWs were awareness about vaccine safety, followed by fear of COVID-19 disease and compulsion by government authorities. Except for fear of disease and family compulsion, which were predominant among doctors and PMWs, respectively, the other reasons for acceptance were similar among both groups.

The major reasons quoted by HCWs for not taking the primary vaccination series were lack of confidence in vaccine effectiveness, fear of the vaccine’s adverse effects, recent COVID-19 infection conferring natural immunity, and history of previous vaccine allergy. The reasons were similar among both doctors and PMWs.

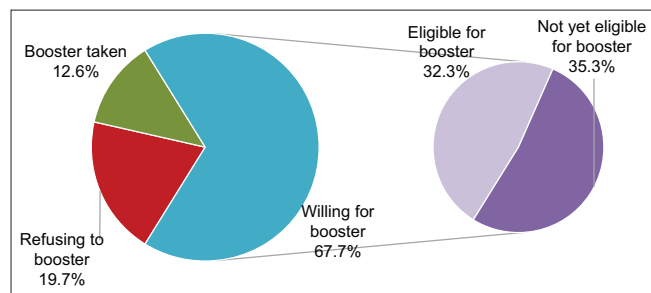


Figure 2: Willingness to receive the booster dose among the healthcare workers (during the conduct of the study, eligibility for booster dose was 9 completed months after second dose of vaccine)

Booster dose

The driving forces behind accepting the COVID-19 booster dose among HCWs were conferring protection against COVID-19 variants, faith in the vaccine’s effectiveness in decreasing disease-related morbidity/mortality, established vaccine safety, compulsion by government authorities, and compulsion by family. Compared to PMWs, a significantly greater number of doctors accepted the booster for its protection against COVID-19 variants, faith in vaccine effectiveness, and compulsion by government authorities.

The main reason for booster dose refusal among HCWs is the belief that two doses of the COVID-19 vaccine are sufficient to confer disease protection. Other reasons are a lack of confidence in vaccine effectiveness and fear of its adverse effects. The misconception that two doses are adequate is more prevalent among PMWs than doctors.

Side effects experienced after taking the COVID-19 vaccine [Figure 3]

As shown in Figure 3, the most common side effects experienced by the respondents were arm pain (75.5%), followed by fever (61.8%), and injection site pain (59.3%). About 49.5% reported not experiencing any side effects. Other side effects experienced were headache, generalized weakness/fatigue, joint pain, injection site swelling, giddiness, itching, nausea, excess sweating, and rashes.

Predictors of COVID-19 booster vaccine acceptance

In unadjusted binary logistic regression, it is evident that married HCWs have 2.3 times higher odds (95% confidence interval [CI]: 1.3–3.9; $P = 0.003$) of accepting COVID-19 booster compared to unmarried individuals. Similarly, HCWs who agreed to vaccination as one of the most effective measures in the prevention of COVID-19 have 4.3 times higher odds (95% CI: 2.3–8.1; $P < 0.001$) of booster

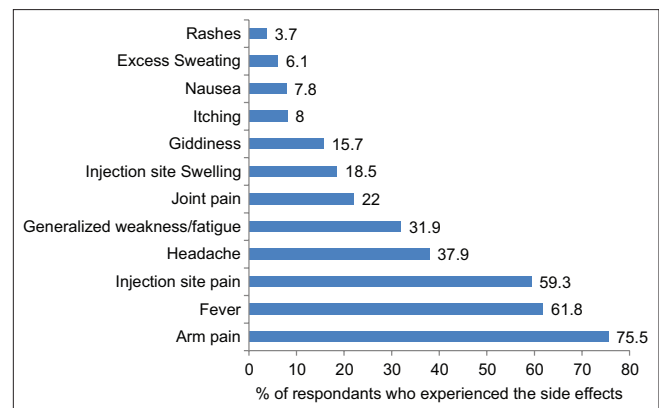


Figure 3: Side effects experienced by respondents ($n = 572$) after COVID-19 vaccination. Since some respondents chose more than one side effect, the percentage sum of all the options was more than 100%. Also, 49.5% of the respondents did not experience any side effects

acceptance compared to those who disagreed. Also, doctors have 2.1 times higher odds (95% CI: 1.3–3.4; $P = 0.004$) of booster acceptance compared to PMWs [Table 3].

After adjusting for other independent variables, except marriage, the other two factors were significantly associated with booster acceptance [Table 4].

DISCUSSION

Vaccination has become inevitable in the war against the COVID-19 virus. HCWs being FLWs face high viral exposure and are also major influencers of the public's views on COVID-19 vaccines. Hence, it is highly essential to assess their perception and practices on COVID-19

Table 2: The reasons for acceptance or refusal of COVID-19 vaccination among health-care workers (n=572)

Types of vaccine	Parameters	Doctors (n=188)	PMWs (n=384)	P
Primary series (1 st /2 nd dose)	Reason(s) for acceptance			
	Fear of COVID-19 disease (n=187)	76 (40.4)	111 (28.9)	0.006*
	Awareness about vaccine safety (n=400)	140 (74.5)	260 (67.7)	0.098
	Peer's motivation (n=35)	15 (8)	20 (5.2)	0.194
	Compulsion by family (n=32)	3 (1.6)	29 (7.6)	0.004*
	Compulsion by government authorities (n=72)	27 (14.4)	45 (11.7)	0.371
	Reason(s) for refusal			
	History of previous vaccine allergy (n=7)	1 (0.5)	6 (1.6)	0.292
	Lack of confidence in vaccine's effectiveness (n=34)	8 (4.3)	26 (6.8)	0.232
	Fear of vaccine's adverse effects (n=18)	5 (2.7)	13 (3.4)	0.64
Recent COVID-19 infection conferring natural immunity (n=11)	1 (0.5)	10 (2.6)	0.09	
Booster dose	Reason(s) for acceptance			
	Protection against COVID-19 variants (n=287)	113 (60.1)	174 (45.3)	0.001*
	Faith in vaccine's effectiveness in decreasing disease-related morbidity/mortality (n=156)	84 (44.7)	72 (18.8)	<0.001*
	Established vaccine safety (n=129)	45 (23.9)	84 (21.9)	0.58
	Compulsion by government authorities (n=32)	16 (8.5)	16 (4.2)	0.034*
	Compulsion by family (n=11)	1 (0.5)	10 (2.6)	0.09
	Reason(s) for refusal			
	Two doses sufficient to confer disease protection (n=61)	9 (4.8)	52 (13.5)	0.001*
Lack of confidence in vaccine effectiveness (n=35)	9 (4.8)	26 (6.8)	0.352	
Fear of vaccine's adverse effects (n=19)	8 (4.3)	11 (2.9)	0.383	

* $P < 0.05$ was considered statistically significant. P values are based on Chi-square test; All the above parameters were not mutually exclusive and the percentage sum of all the options was $> 100\%$ since some respondents chose more than one option. PMWs=Paramedical workers

Table 3: Predictors of COVID-19 booster dose acceptability among health-care workers by unadjusted binary logistic regression (n=572)

Characteristics	Frequency (%)		Unadjusted OR (95% CI)	P
	Accepting COVID-19 booster (n=459)	Refusing COVID-19 booster (n=113)		
Age category (years)				
≤30 (n=419)	331 (79)	88 (21)	1 (reference)	NA
30–50 (n=134)	111 (82.8)	23 (17.2)	1.3 (0.8–2.1)	0.335
>50 (n=19)	17 (89.5)	2 (10.5)	2.3 (0.5–10)	0.282
Gender				
Male (n=217)	170 (78.3)	47 (21.7)	1 (reference)	NA
Female (n=355)	289 (81.4)	66 (18.6)	1.2 (0.8–1.8)	0.37
Marital status				
Unmarried (n=416)	321 (77.2)	95 (22.8)	1 (reference)	NA
Married (n=156)	138 (88.5)	18 (11.5)	2.3 (1.3–3.9)	0.003*
Attitude to vaccination as one of the most effective measures in the prevention of COVID-19				
Do not agree (n=44)	23 (52.3)	21 (47.7)	1 (reference)	NA
Agree (n=528)	436 (82.6)	92 (17.4)	4.3 (2.3–8.1)	<0.001*
Profession				
PMWs (n=384)	295 (76.8)	89 (23.2)	1 (reference)	NA
Doctors (n=188)	164 (87.2)	24 (12.8)	2.1 (1.3–3.4)	0.004*
Previously diagnosed with COVID-19				
No (n=391)	313 (80)	78 (20)	1 (reference)	NA
Yes (n=181)	146 (80.7)	35 (19.3)	1 (0.7–1.6)	0.86

* $P < 0.05$ was considered statistically significant. P values are based on the unadjusted binary logistic regression model. NA=Not applicable, OR=Odds ratio, CI=Confidence interval, PMWs=Paramedical workers

Table 4: Predictors of COVID-19 booster dose acceptability among health-care workers by adjusted binary logistic regression (n=572)

Characteristics	Adjusted OR (95% CI)	P
Marital status		
Unmarried (n=416)	1 (reference)	NA
Married (n=156)	1.7 (1-3.1)	0.06
Attitude to vaccination as one of the most effective measures in the prevention of COVID-19		
Do not agree (n=44)	1 (reference)	NA
Agree (n=528)	4.6 (2.4-8.7)	<0.001*
Profession		
PMWs (n=384)	1 (reference)	NA
Doctors (n=188)	1.9 (1.1-3.2)	0.025*

*P<0.05 was considered statistically significant. P values are based on the adjusted binary logistic regression model NA=Not applicable, OR=Odds ratio, CI=Confidence interval, PMWs=Paramedical workers

vaccination and determine predictors of booster dose acceptance among them. The study results could guide the health authorities and public health experts in India to design interventions to enable maximum acceptance of COVID-19 vaccination.

Practices of COVID-19 vaccination by respondents and willingness for booster

Our study revealed a high uptake of the primary COVID-19 vaccination series among the South Indian HCWs (>88%). It is encouraging to find that 97.9% and 88.8% of the respondents were vaccinated with the first and second doses respectively, at the time of survey administration. A similar study conducted a year earlier among Indian HCWs from January 24, 2021 to February 28, 2021 showed that only 64.3% received a COVID-19 vaccine.^[14] Thus, it is evident that there has been an increase in the number of vaccinated HCWs from 2021 to 2022, possibly due to accumulating vaccine safety reports and a hike in cases in India in May 2021, and January 2022. Similar findings were observed worldwide with the acceptance rate of the primary vaccination series ranging from 80.9% to 95.2%.^[12,15]

Our study shows that 12.6% of the respondents have taken the booster dose, and 67.7% were willing to receive it, leading to a high proportion (80.3%) of booster dose acceptance. A similar study on Indian HCWs showed that 84% were willing to receive the COVID-19 booster dose.^[16] Our results were also consistent with other studies where the acceptance of booster doses among HCWs ranged between 67% and 73.8%.^[12,16,17] Our study result was discordant with that done in Italy where the acceptance rate was only 52.6%.^[18]

Also, acceptance of COVID-19 vaccination (specifically 2nd and booster dose) was more among doctors compared

to PMWs. This finding was consistent with the studies done in Canada and Palestine where physicians were more willing to vaccinate themselves than nurses.^[15,19] This may be due to higher knowledge about vaccination among doctors than PMWs.^[19]

Perceptions of COVID-19 vaccination by respondents-reasons for acceptance/refusal

Regarding the HCWs' beliefs on COVID-19 vaccines, influencing their vaccination practices, the most prevalent reasons for acceptance of the primary series were awareness about vaccine safety, fear of disease, and the government mandate for vaccination. A few HCWs who have not yet completed the primary series had concerns regarding vaccine effectiveness and side effects and also believed that a recent COVID-19 infection conferred natural immunity. Our findings were congruent with similar studies reporting fear of disease and doubts about vaccine safety as the predominant reasons for accepting and hesitating vaccination respectively.^[20-22]

Similarly, in our study, most of the HCWs accepting booster dose believed it protected against COVID-19 variants and was efficacious in causing a decrease in disease-associated morbidity/mortality. Our findings are congruent with similar studies on HCWs worldwide, revealing faith in vaccine safety and efficacy, being predominant reasons for booster acceptance.^[12,16,18]

In our study, the HCWs who refused to take the booster believed that two doses were sufficient for disease protection and were still suspicious about vaccine safety and efficacy. In a similar study on Indian HCWs, the most prevalent reasons for booster refusal were apprehensions regarding the vaccine's efficacy against the emerging variants and its safety.^[16,18,23]

Side effects experienced after taking the COVID-19 vaccine

Our study shows that the most common side effects of vaccination among the respondents were arm pain, fever, injection site pain, headache, and fatigue. Similarly, in other studies, milder side effects were the most common, and severe allergic reactions or anaphylaxis were reported only in very few participants (0.3%).^[24,25]

Predictors of COVID-19 booster vaccine acceptance

The present study found that being married, believing vaccination to be one of the most effective measures in COVID-19 prevention, and being doctors by profession were the chief predictors of booster dose acceptance

among HCWs. Surprisingly, increasing age and being previously diagnosed with COVID-19 were not significant predictors of booster acceptance and similar results were observed among Egyptian HCWs.^[20] Contrastingly, a study on Canadian HCWs has shown males and people aged more than 50 years were more likely to accept the booster doses.^[15]

The limitations of this study include the possibility of sampling bias (due to the electronic nature of the survey), female preponderance, and over-representation of adults aged <30 years. Moreover, recall bias and social desirability bias may also exist. However, the anonymous nature of the survey would have helped to minimize the social desirability bias.

CONCLUSION

Our study shows that the majority of the HCWs (>88%) have completed their primary vaccination series. Although a large proportion (80.3%) were accepting to take the booster dose, only a minority (12.6%) has actually taken their booster shots. Believing vaccination to be one of the most effective measures in the COVID-19 prevention and being doctors by profession were the important predictors of booster dose acceptance among HCWs. Self-perceived adequacy of the primary vaccination series and concerns over vaccine efficacy and safety were the major barriers to booster dose acceptance among HCWs. Thus, targeted interventions to increase awareness regarding the importance of the booster dose among HCWs are essential, which in turn would aid in promoting booster acceptance among the general population. Furthermore, further qualitative research exploring the HCWs' misconceptions hindering vaccine acceptance would provide deeper insights into the problem and aid in devising strategies to address them.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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