

Perceptions, motivation factors, and barriers to a COVID-19 booster immunization in a subpopulation of KSA

A cross-sectional study

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Abstract

The current cross-sectional survey was designed to evaluate the perception, motivation factors and barriers to a COVID-19 booster immunization in a subpopulation of the Kingdom of Saudi Arabia. A total of 520 respondents were selected by a simple random sampling method. The questionnaire was designed in multiple languages and categorized as; demographic details, perceptions, motivation factors, and barriers to acceptance of a booster dose of COVID-19 vaccine among the respondents. Both anonymous, self-administered, closed-ended online, and paper-based questionnaire was used to assess the above parameters. A higher proportion of the respondents were females (55.2%) with an age range of 36.7 ± 7.7 years. About 36.2% of respondents had a poor perception of the booster dose. Significant differences in the levels of perceptions were found among different age groups and also among the respondents with or without chronic medical conditions. Nearly 49.8% of respondents had hesitation about the booster dose, 58.8% of respondents recommended others to get the booster vaccine at the earliest and 49.8% preferred to develop natural immunity to infection. The hesitation for the booster was more among the female respondents and the older age groups (≥ 60 years) though a large number (43.2%) believe that the booster vaccination is going to end the pandemic worldwide. Further nationwide studies involving different subpopulations are recommended. Public health education is the need of the hour to reduce such barriers and hesitancy.

Abbreviations: COVID-19 = Coronavirus disease-19.

Keywords: booster dose, COVID-19, hesitancy, motivational factor, perception, Saudi Arabia

1. Introduction

Vaccines are the most successful and cost-efficient public health interventions ever developed, saving millions of lives every year.^[1] Coronavirus disease-19 (COVID-19) booster vaccine uptake is an important part of the pandemic response plan. Findings from the Israel cohort study conclude that providing a booster dose of the mRNA vaccine BNT162b2 following a 2-dose initial series is significantly associated with both improvements in the immunological response to the vaccine

antigen and reduction in the risk of symptomatic and asymptomatic infection.^[2] There is a felt need for taking booster dose of COVID-19 vaccines, primarily in response to concerns about possible waning immunity, the transmission of breakthrough infections, and the emergence of new viral variants with increased transmissibility.^[3–5] Necessary steps should be taken by the government and public health authorities, in line with the local culture, to increase vaccination acceptance and foster positive attitudes towards the vaccine.^[6] WHO and its partners have taken consistent efforts to immunize the public against

The authors extend their appreciation to the Deanship of Scientific Research at King Khalid University, Abha, Kingdom of Saudi Arabia for funding this work through the Large Research Group Project under grant number (RGP-1/351/1443).

Informed consent was obtained from all subjects involved in the study.

The authors have no conflicts of interest to disclose.

The datasets generated during and/or analyzed during the current study are not publicly available, but are available from the corresponding author on reasonable request.

The study was conducted in accordance with the Declaration of Helsinki, and approved by the Institutional Review Board College of Dentistry, King Khalid University, Saudi Arabia to acquire ethical clearance (IRB/KKUCOD/ETH/2020-21/020).

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How to cite this article: Abullais SS, Arora S, Parveen S, Mahmood SE, Baba SM, Khalid I, Khader MA, Elgib MFA. Perceptions, motivation factors, and barriers to a COVID-19 booster immunization in a subpopulation of KSA: A cross-sectional study. *Medicine* 2022;101:47(e31669).

Received: 2 September 2022 / Received in final form: 13 October 2022 / Accepted: 13 October 2022

<http://dx.doi.org/10.1097/MD.00000000000031669>

misinformation in the current crisis.^[7] Disseminating accurate health information regarding COVID-19 and confronting the misinformation is both an individual and institutional responsibility.^[8] Nearly 4% of the 22,139 fully vaccinated adults in the UK who took part in the University College London COVID-19 Social Study reported that they were uncertain about receiving a COVID-19 booster vaccine, and a further 4% were unwilling to receive it.^[9] Nearly 15% of the 1145 Chinese respondents did not accept COVID-19 booster vaccination and the primary reason for refusing booster vaccination was concern about vaccine safety among them.^[10] Although recent studies have examined the acceptance level of COVID-19 booster vaccination among different subpopulations and countries^[6,9-13]; however, these findings cannot be generalized to the Saudi population. There is a crucial need to assess the perceptions and acceptance regarding the booster dose of the COVID-19 vaccine among the general population in Saudi Arabia and to frame specific strategic interventions to create positive perceptions of the COVID-19 booster vaccine. This study aims to assess the perceptions and acceptance of the general population about COVID-19 booster dose in the Aseer region of Saudi Arabia.

2. Material and methods

The current prospective, cross-sectional study was carried out among the subpopulation of Kingdom of Saudi Arabia from September 1, 2021, to November 30, 2021. The sample was composed of 520 respondents selected from Aseer region of Saudi Arabia. The study sample size was estimated using the Raosoft sample size calculator (Raosoft.com [2015], Raosoft, Inc., Seattle, WA). A minimum of 385 participants were required at a margin of error of 5%, a 95% confidence interval, and a population size of 2.212 million at a 50% response distribution.

The participants were selected by a simple random sampling technique. The questionnaire was designed in English language and categorized into 3 segments: demographics and general characteristics of the participants; perception of the participants about booster dose; and participant's acceptance of a booster dose. The questionnaire was translated to Arabic language by professional translator and back translation was also performed to assure the appropriateness of the questions in the questionnaire form.

The present survey design was introduced before the institutional review board at the College of Dentistry, King Khalid University, Saudi Arabia to acquire ethical clearance (IRB/KKUCOD/ETH/2020-21/020). The present study was carried out both online and physically in full accordance with the regulations established by the Declaration of Helsinki. The assessment of perception and acceptance of booster dose was done utilizing an anonymous, self-administered, closed-ended online, and paper-based questionnaire. The questionnaire was distributed to the Saudi population residing in both rural/urban regions and working in the government/private sector. Online questionnaire was distributed through social media (WhatsApp and Facebook) and personal email, whereas paper-based was distributed in person by contacting the respondents. Written informed consent was obtained from all the participants before filling out the survey form. The confidentiality of data was well-preserved throughout the study by keeping it anonymous and asking the participants to select honest answers and options.

A pilot survey was done on 30 randomly selected participants from Saudi Arabia before initiating the actual data collection, however, these pilot samples were not added to the final sample size. The prime objective of the pilot survey was to guarantee the validity and reliability of the questionnaire. The face and content validity of the questionnaire was assessed by specialists in the fields of research. Content validity was evaluated by the content validity index, which was 0.82. The reliability of the questionnaire was assessed by using test-retest reliability method.

The questionnaire was modified according to the participant's suggestions and comments to make it more comprehensive and understandable. Acceptance scores were computed by offering a "1" score for each positive/correct response and a "0" score for each negative/wrong response. The participant's perception responses were assessed using 5-point Likert scale, ranging from 1 to 5 (1 = strongly disagree; 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree). The final scores were presented in the form of a percentage by adding all the points of the respondents followed by calculating the percentage. The final acceptance and perception scores were divided into 3 classes depending on percentage: poor perception (0–40%), fair perception (41 < 70%), and good perception (70% and above).

After complete data collection, the collected data was cleaned, coded, and entered in Excel. The data on categorical variables are shown as n (% of respondents - prevalence) and the data on continuous variables is presented as mean and standard deviation (SD). The inter-group statistical comparison of the distribution of categorical variables was tested using Pearson's Chi-square test. In the entire study, *P* values less than .05 were considered to be statistically significant. The entire data was statistically analyzed using Statistical Package for Social Sciences (SPSS version 22.0, IBM Corporation) for MS Windows.

3. Results

3.1. Demographic characteristics

A total of 520 respondents from Saudi Arabia were recruited. Table 1 shows that a higher proportion of respondents were females (55.2%) and were aged between 20 and 39 years (59.4%) followed by 40 to 59 years (31.1%). The mean \pm SD of the age of the respondents was 36.7 \pm 7.7 years. Nearly half of the respondents (47.3%) obtained a graduate degree. A higher proportion (83.2%) of the respondents have no health insurance. Besides, 53% of the respondents visited government clinics and only 18.7% have a chronic disease. However, 2% and 6.1% of respondents have severe adverse reactions and allergies to the vaccine respectively. A higher proportion of 311 (59.8%) of the respondents has taken a double dose of the Pfizer vaccine followed by 125 (24.0%) who have taken a combination dose of Pfizer + Oxford AstraZeneca.

Table 2 shows the mean (SD) scores of gender and age in relation to chronic medical condition, severe adverse reaction and allergy to vaccine. All the calculated *P*-values were non-significant.

3.2. Perception toward COVID-19 booster immunization

Table 3 shows the association between the respondent's demographic variable and perception of COVID-19 booster dose. Out of 520 respondents, 79 (15.2%) respondents had a good perception, 253 (48.7%) had a fair perception, and 158 (36.2%) reported a poor perception of a booster dose. The distribution of level of perception about booster doses did not differ significantly among the respondents of different gender, education, insurance coverage, and visiting clinics (*P*-value > 0.05). However, female respondents, graduates, and those visiting the government clinics revealed a slightly better level of perception. Significant differences in the levels of perceptions were found in association with different age groups. The age groups of 20–39 years had a fair level of perception than other age groups (*P*-value < .05).

Table 4 shows significant differences in the levels of perceptions found in association with a chronic medical condition (*P* value < .05). The respondents who had no chronic medical condition had a fair level of perception than respondents who have a chronic medical condition. The distribution of level of perception about booster dose did not differ significantly among groups with severe adverse reaction and allergy to the vaccine (*P*-value > .05). However, respondents who had no severe

Table 1
Sociodemographic characteristics, medical history, and vaccination status of the respondents.

Parameters	Variable	N = 520 (%)
Sociodemography		
Gender	Male	232 (44.8)
	Female	288 (55.2)
Age (yr)	<20	26 (5.0)
	20–39	309 (59.4)
	40–59	162 (31.1)
	> 60	23 (4.5)
	Education	Secondary
	Diploma	157 (30.1)
	Graduate	245 (47.3)
	Post graduate	51 (9.8)
Insurance	Yes	87 (16.8)
	No	433 (83.2)
Clinics visited	Government	276 (53.0)
	Private	244 (47.0)
Medical history		
Chronic medical condition	Yes	97 (18.7)
	No	423 (81.3)
Severe adverse reaction	Yes	10 (2.0)
	No	510 (98.0)
Allergy to vaccine	Yes	32 (6.1)
	No	488 (93.9)
Vaccination status		
Single dose	Pfizer	10 (1.9)
	Oxford AstraZeneca	-
	Moderna	3 (0.5)
	Johnson and Johnson	-
Double dose	Pfizer	311 (59.8)
	Oxford AstraZeneca	44 (8.46)
	Moderna	2 (0.4)
	Johnson and Johnson	-
Combination	Pfizer + Oxford AstraZeneca	125 (24.0)
	Pfizer + Moderna	19 (3.6)
	Oxford AstraZeneca + Moderna	4 (0.7)
	Any other combination	2 (0.4)
Booster dose	Yes	21 (4.0)
	No	499 (96.0)

adverse reaction and allergy to the vaccine had a fair level of perception.

3.3. COVID-19 booster immunization acceptance

Tables 5 and 6 show the characteristics of respondents who would accept and refuse COVID-19 booster doses. Out of 520 respondents, 259 (49.8%) had hesitation about the booster dose. A total of 306 (58.8%) and 258 (49.8%) respondents recommended others to get the booster vaccine at the earliest and preferred to develop natural immunity to infection respectively.

Insignificant differences were found in the acceptance of booster doses among respondents of different gender, ages, education, and insurance coverage. A higher proportion (65.8%) of the males recommended others to get the booster vaccine at the earliest as compared to females (53.5%). A higher proportion (60.9%) of those respondents aged ≥ 60 years had a hesitation for booster dose as compared to other age groups (48.1–51.9%). About 65.6% of the respondents who have secondary education recommended others to get the booster vaccine at the earliest as compared to those with higher educational levels. A higher proportion (59.6%) of respondents who have health insurance recommended others to get the booster vaccine at the earliest compared to those (58.7%) who have no health insurance. A higher proportion (56.6%) of respondents who visited private clinics had a hesitation for booster dose as compared to those (43.1%) who visited government clinics, the difference being statistically significant. About 65.5% of respondents who visited government clinics recommended others to get the booster vaccine at the earliest as compared to those (51.2%) who visited private clinics, the difference being statistically significant. A higher proportion (57.0%) of respondents who visited private clinics preferred to develop natural immunity to infection as compared to those (43.5%) who visited government clinics, the difference being statistically significant.

Insignificant differences were found in the acceptance of booster doses among respondents with chronic medical conditions and severe adverse reactions. A higher proportion (60.2%) of respondents who have a chronic medical condition recommended others to get the booster vaccine at the earliest as compared to those (58.5%) who have no chronic medical condition. About 81.8 % of respondents who have severe adverse reactions recommended others to get the booster vaccine at the earliest as compared to those (58.3%) who have no severe adverse reaction. A higher proportion (78.8%) of respondents who have an allergy to the vaccine had a hesitation for booster dose as compared to those (47.7%) who have no allergy to the vaccine, the difference being statistically significant. About 72.7 % of respondents who have no allergy to the vaccine did not recommend others to get the booster vaccine at the earliest as compared to those (38.9%) who have an allergy to the vaccine, the difference being statistically significant. A higher proportion (69.7%) of respondents who have an allergy to vaccine preferred to develop natural immunity by infection as compared to those (48.6%) who have no allergy to vaccine, the difference being statistically significant.

A higher proportion (84.6%) of respondents who have taken a single dose had a hesitation for booster dose as compared to those who have taken a different dose, the difference being statistically significant. About 62.0% of respondents who have taken a combination dose recommended others to get the booster vaccine at the earliest as compared to those who have taken a different dose, the difference being statistically significant. A higher proportion (92.3%) of respondents who have taken a single dose preferred to develop natural immunity to

Table 2
Mean scores of gender and age with respect to chronic medical condition, severe adverse reaction and allergy to vaccine.

Test	N	Gender		p	Age (yr)				P
		Male	Female		<20	20–39	40–59	>60	
		Mean ± SD	Mean ± SD		Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	
Chronic medical condition	519	1.80 ± 0.391	1.82 ± 0.392	0.711 ^{NS}	1.81 ± 0.394	1.76 ± 0.427	1.86 ± 0.352	1.89 ± 0.312	.48 ^{NS}
Severe adverse reaction	519	1.97 ± 0.182	0.144 ± 0.123	0.073 ^{NS}	1.99 ± 0.117	1.97 ± 0.180	1.99 ± 0.112	1.94 ± 0.247	.208 ^{NS}
Allergy to vaccine	519	1.94 ± 0.255	1.93 ± 0.276	0.220 ^{NS}	1.89 ± 0.117	1.95 ± 0.227	1.92 ± 0.275	1.98 ± 0.146	.233 ^{NS}

Notes: P-value for Chi-square test. P-value < .05 is considered to be statistically significant. NS = statistically nonsignificant.

Table 3
Association of sociodemographic variables with the perception levels.

Parameters	Variables	Good perception (N = 79)	Fair perception (N = 253)	Poor perception (N = 188)	P value
		No (%)	No (%)	No (%)	
Gender	Male	26 (11.2)	111 (47.8)	95 (40.9)	.087 ^{NS}
	Female	53 (18.5)	141 (49.1)	93 (32.4)	
Age	< 20	3 (11.5)	6 (23.1)	17 (65.4)	.021**
	20 - 39	44 (14.3)	158 (51.3)	106 (34.4)	
	40 - 59	27 (16.7)	73 (45.1)	62 (38.3)	
	>60	5 (21.7)	15 (65.2)	39 (13.0)	
Education	Secondary	13 (19.6)	29 (43.9)	24 (36.3)	.205 ^{NS}
	Diploma	30 (19.1)	75 (47.8)	52 (33.1)	
	Graduate	33 (13.5)	122 (49.8)	90 (36.7)	
	Post graduate	3 (5.9)	26 (51.0)	22 (43.1)	
Insurance	Yes	10 (11.5)	46 (52.9)	31 (35.6)	.514 ^{NS}
	No	69 (15.9)	207 (47.8)	157 (36.3)	
Clinics visited	Government	38 (13.8)	127 (46.0)	111 (40.2)	.116 ^{NS}
	Private	41 (16.8)	126 (51.6)	77 (31.6)	

P value for Chi-square test. P value < 0.05 is considered to be statistically significant.

*P value < .05.

**P value < .001.

^{NS} = Statistically nonsignificant.

Table 4
Association of medical history and vaccination status with the perception.

Parameters	Variables	Good Perception (N = 79)	Fair Perception (N = 253)	Poor Perception (N = 188)	P value
		No (%)	No (%)	No (%)	
Chronic medical condition	Yes	25 (25.8)	44 (45.4)	28 (28.9)	.005**
	No	54 (12.8)	209 (49.4)	160 (37.8)	
Severe adverse reaction	Yes	2 (20)	2 (20.2)	6 (60)	.176 ^{NS}
	No	77 (15.1)	251 (49.2)	182 (35.7)	
Allergy to vaccine	Yes	6 (18.8)	20 (62.5)	6 (18.8)	.232 ^{NS}
	No	73 (15)	232 (47.6)	182 (27.4)	
Vaccination status	Single dose	2 (15.4)	8 (61.5)	3 (23.1)	.629 ^{NS}
	Double dose	50 (14)	177 (49.6)	130 (36.3)	
	Combination dose	27 (18)	68 (45.3)	55 (36.7)	

P value for Chi-square test. P value < .05 is considered to be statistically significant.

*P value < .05.

**P-value < .001.

^{NS} = statistically nonsignificant.

infection as compared to those who have taken different doses, the difference being statistically significant.

Figure 1 shows the barriers associated with acceptance of the COVID-19 booster dose. A very low proportion of 12 (2.4%) of the respondents reported that “my chronic diseases warn me against the booster dose.” While a higher proportion of 239 (45.9%) of the respondents reported that they have no barriers to a booster dose. Figure 2 shows the motivation factors associated with acceptance of COVID-19 booster dose. Nearly half of the respondents 225 (43.2%) were motivated to get a COVID-19 booster dose as it would help in the resolution of the pandemic situation worldwide. While only 16 (3%) of respondents were motivated to get a COVID-19 booster dose due to chronic diseases.

4. Discussion

In a recent study in Jordan, healthcare workers have demonstrated an optimistic outlook toward COVID-19 vaccinations.^[14] The acceptance of the COVID-19 vaccine by healthcare workers in recent previous studies around the globe had been from 20% to 94%.^[15–32] Certain European countries (such as Poland, Germany, France, and Italy), China,^[33] Turkey, and Canada had higher rates (≥ 70%) contrasting the Middle Eastern and

African nations having lower rates (≤ 50%). Receiving the booster dose among healthcare workers in Israel led to a significantly reduced COVID-19 infection rate compared to the ones who did not receive it.^[2] It would be interesting to check the acceptance of booster doses among the public. This study aimed to check the acceptance of people in Saudi Arabia for the booster dose and to evaluate the factors related to their hesitation and factors motivating them for the booster dose.

In the present study, 520 people participated with a higher proportion of females (55.2%) involved. The majority of the respondents (83.2%) did not have a health insurance policy. Regarding the perception of the booster dose only 15.2% had a good perception while a majority (48.7%) had a fair perception and the rest (36.2%) had a poor perception. The perception differed significantly among the various age groups and the age group of 20–19 years had a fair level of perception as compared with other groups. The female respondents, the graduate group, and those visiting the government hospitals had better perceptions than the others.

Significant differences were found in the perception levels concerning chronic medical conditions with the respondents not having any chronic medical condition having a fair level of perception to respondents who had chronic medical conditions. In a study in UAE, it was found that participants with chronic

Table 5
Relation of demographic variables and acceptance for a booster dose.

Parameters	Variable	Hesitation for the booster dose			Recommend others to get the booster dose at the earliest			Preference to develop natural immunity by infection		
		Yes (%)	No (%)	P value	Yes (%)	No (%)	P value	Yes (%)	No (%)	P value
Gender	Male	106 (45.9)	125 (54.1)	.179 ^{NS}	152 (65.8)	79 (34.2)	.009 ^{NS}	120 (52.5)	109 (47.6)	.333 ^{NS}
	Female	152 (52.8)	136 (47.2)		154 (53.5)	134 (46.5)		137 (47.6)	151 (52.4)	
Age (yr)	< 20	14 (51.9)	13 (48.1)	.602 ^{NS}	20 (74.1)	7 (25.9)	.304 ^{NS}	11 (40.7)	16 (59.3)	.720 ^{NS}
	20–39	148 (48.1)	160 (51.9)		183 (59.4)	125 (40.6)		156 (51)	150 (49)	
	40–59	83 (51.6)	83 (51.6)		91 (56.5)	70 (43.5)		80 (49.7)	81 (50.3)	
	> 60	14 (60.9)	14 (60.9)		11 (47.8)	12 (52.2)		11 (47.8)	12 (52.2)	
Education	Secondary	29 (43.2)	38 (56.7)	.087 ^{NS}	44 (65.6)	23 (34.3)	.293 ^{NS}	33 (49.2)	34 (50.5)	.423 ^{NS}
	Diploma	91 (57.2)	68 (42.8)		89 (56)	70 (44)		89 (56)	70 (44)	
	Graduate	113 (46.5)	130 (53.5)		148 (60.9)	95 (39.1)		113 (46.9)	128 (53.1)	
	Post-graduate	26 (52.0)	24 (48.0)		24 (48.0)	26 (52)		23 (43)	27 (57)	
Insurance	Yes	46 (51.7)	43 (48.3)	.697 ^{NS}	53 (59.6)	36 (40.4)	.882 ^{NS}	48 (53.9)	41 (46.1)	.392 ^{NS}
	No	213 (49.4)	216 (50.2)		253 (58.7)	178 (41.3)		210 (51.0)	219 (51)	
Clinics visited	Government	121 (43.8)	155 (56.2)	.004**	181 (65.5)	95 (34.4)	.001***	120(43.5)	156 (56.5)	.002**
	Private	138 (56.6)	106 (43.4)		125 (51.2)	119 (48.8)		138 (57)	104 (43)	

P value for Chi-square test. P value < .05 is considered to be statistically significant.

*P value < .05.

**P value < .001.

^{NS} statistically nonsignificant.

Table 6
Relation of medical history and vaccination status with acceptance for a booster dose.

Parameters	Variable	Hesitation for the booster dose			Recommend others to get the booster dose at the earliest			Preference to develop natural immunity by infection		
		Yes (%)	No (%)	P value	Yes (%)	No (%)	P value	Yes (%)	No (%)	P value
Chronic medical condition	Yes	49 (50.0%)	49 (50.0%)	.966 ^{NS}	59 (60.2%)	39 (39.8%)	.762 ^{NS}	42 (42.9%)	56 (57.1%)	.126 ^{NS}
	No	210 (49.8%)	212 (50.2%)		247 (58.5%)	175(41.5%)		216 (51.4%)	204 (48.6%)	
Severe adverse reaction	Yes	8 (72.7%)	3 (27.3%)	.124 ^{NS}	9 (81.8%)	2(18.2%)	.118 ^{NS}	7 (63.6%)	4 (36.4%)	.354 ^{NS}
	No	251 (49.3%)	258 (50.7%)		297 (58.3%)	212 (41.7%)		251 (49.5%)	256 (50.0%)	
Allergy to vaccine	Yes	26 (78.8%)	7 (21.2%)	.002*	9 (27.3%)	24 (72.7%)	.001**	23 (69.7%)	10 (30.3%)	.038*
	No	232 (47.7%)	254 (52.3%)		297 (61.1%)	189 (38.9%)		235 (48.6%)	249 (50.5%)	
Vaccine status	Single dose	11 (84.6%)	2 (15.4%)	.036*	2 (15.4%)	11 (84.6%)	.005*	12 (92.3%)	1 (7.7%)	.001**
	Double dose	180 (50.4%)	177 (49.6%)		209 (58.5%)	148 (44.5%)		164 (46.1%)	192 (53.9%)	
	Combination dose	71 (47.3%)	79 (52.7%)		93 (62.0%)	57 (38.0%)		85 (57.0%)	64 (43.0%)	

P-value for Chi-square test. P value < .05 is considered to be statistically significant.

*P value < .05.

**P value < .001.

^{NS} statistically nonsignificant.

medical conditions are more likely to be compliant with the booster dose.⁶¹ The participants not having any severe adverse reaction or allergy to the vaccine had a fair level of perception than the others who had a severe adverse reaction and allergy. It was also found that a higher proportion of persons having health insurance (53.9%) preferred to develop natural immunity to infection as compared to persons no have insurance (51%). Similarly, a significant difference in the levels of perceptions was found concerning different combinations of vaccines with the participants who have taken a combination of Pfizer and Oxford AstraZeneca vaccine doses having a fair level of perception in comparison to those who had taken different vaccines. The participants who have taken the Pfizer vaccine dose had a fair level of perception as compared to ones having taken different vaccines.

About the acceptance/hesitation of the booster dose, nearly half (49.8%) of the participants had hesitation. This hesitation could be due to multiple factors such as allergy, adverse reaction, lack of confidence in the existing vaccines, lack of knowledge, and economic reasons. The acceptance rate was less in comparison to recent studies in China, UAE, and Nigeria

where the acceptance of the public for the booster was 84.8%, 70.2%, and 80.9% respectively.⁶¹ The hesitation in the current study was more among the females (52.8%) as compared to the males (45.9%), among the elderly group (≥ 60 years) (60.9%), and more among the people belonging to the diploma category (57.2%). This contrasts with a study in Japan where hesitation to the booster was more among the younger age groups and those with higher antibody levels.¹¹¹ In a similar study among younger women in rural Australia, nearly 44% of the participants were unsure or reluctant about the vaccine.¹³⁴ A significantly higher proportion of persons visiting the private clinics (56.6%) were hesitant about the booster dose in comparison to the people visiting the government clinics (43.1%). In a Chinese study, it was found that people working in the government sector are more inclined toward vaccination.¹¹² The people (72.7%) with a previous severe adverse reaction were more hesitant about the booster compared to the others (49.3%) without such an incident. A statistically significant proportion of people (78.8%) with an allergy to the vaccine were hesitant to booster dose compared to the others (47.7%) without any previous allergy. Also, a statistically significant proportion of persons

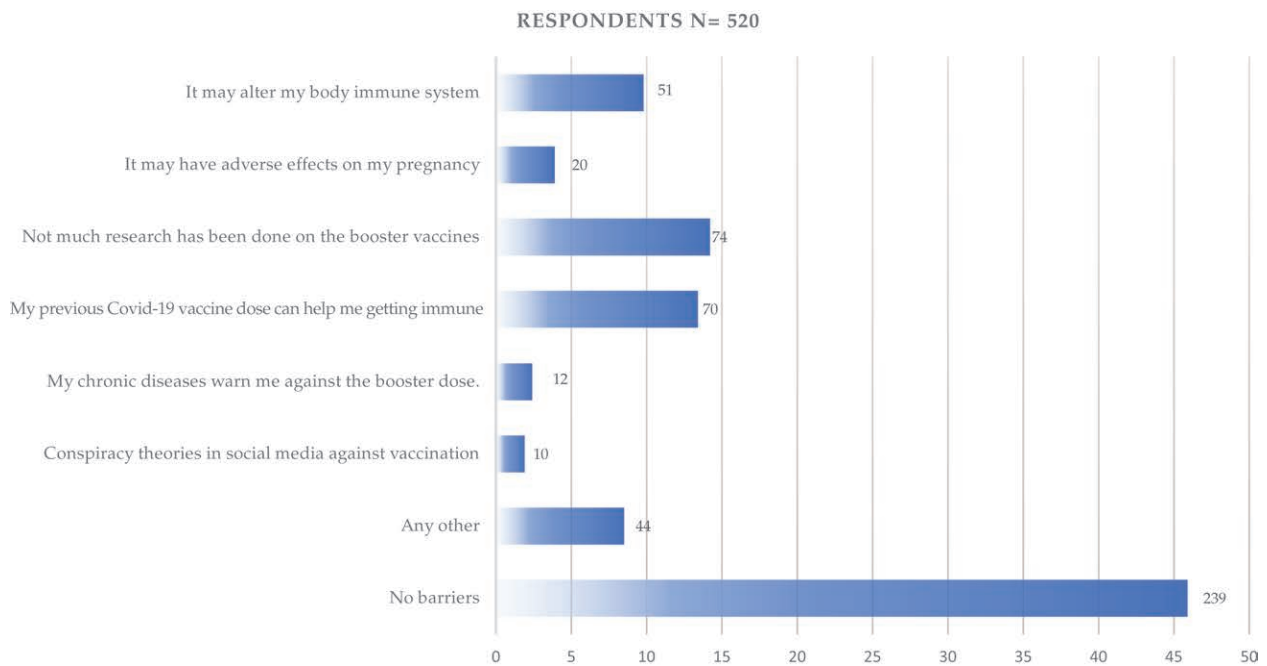


Figure 1. Barriers associated with acceptance of COVID-19 booster dose.

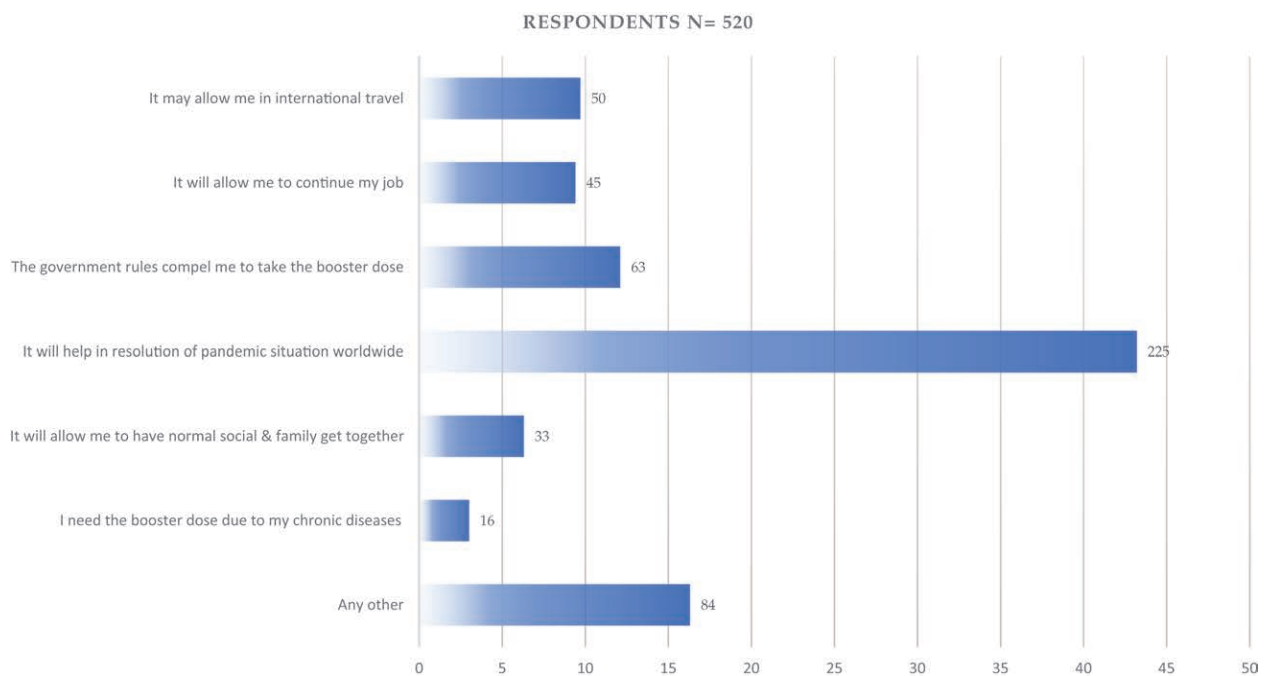


Figure 2. Motivators associated with acceptance of COVID-19 booster dose.

(84.6%) with a single dose of vaccination were hesitant about the booster compared to those who had taken different doses.

About 58.8% of participants would recommend others to get the booster dose at the earliest. A significantly higher proportion of people (65.5%) visiting government clinics would recommend others to get the booster vaccine at the earliest as compared to those (51.2%) who visit private clinics. Similarly, a higher proportion of the people (81.8%) having previous adverse reactions would recommend the booster to the others (58.3%) as compared to the ones without such adverse incidents. A significantly higher proportion of people (72.7%) not having an allergy to the vaccine would recommend the vaccine

earliest to others as compared to the others (38.9%) without any allergy.

Nearly half (49.5%) of the participants liked the natural way of infection to develop immunity and females had a slightly higher preponderance for it. A higher proportion (59.3%) of the younger age group (< 20 years) did not want to be infected as a way to develop natural immunity and similarly, a larger proportion of them wanted to recommend the booster vaccination to others. A larger proportion of postgraduates (57%) did not prefer infection as a means of natural immunity but on the other hand, a statistically significant proportion of people (57%) visiting the private clinics preferred natural immunity by infection

over those (43.5%) visiting the government clinics. On the other hand, the majority of the people (57.1%) suffering from chronic conditions did not prefer natural immunity through infection as compared with those (48.6%) not suffering from chronic conditions. On the contrary, a higher proportion (63.6%) of respondents who have severe adverse reactions preferred to develop natural immunity by infection as compared to those (49.5%) who have no severe adverse reaction.

A statistically significant proportion of respondents (69.7%) with an allergy to vaccines preferred the natural way to develop immunity by infection as compared to the others (48.6%) without any allergy. Similarly, a higher proportion of participants (92.6%) (statistically significant) with a single dose prefer to develop natural immunity to infection compared to those with different doses.

Regarding the barriers to the booster large proportion of the participants (45.9%) cited no barriers to the booster dose. The primary reason for not accepting the booster in a similar study in China was uncertainty about its safety.^[6] In Japan^[6] the reason behind the motivation for the booster dose was the belief of the participants that it will help in ending the COVID-19 pandemic. In a similar Chinese study, the main reason for accepting the booster was to get protection against the ongoing viral strains.^[6] In Japan a recent study found the main reasons for the acceptance of vaccines to be “it is required for infection control,” and “vaccines are very successful.”^[6] The reasons for the barriers need to be evaluated carefully by government agencies and policymakers to reduce the hesitancy for the booster vaccination and improve the acceptance rates of the general public which is the only way to overcome the pandemic, especially in the plight of ongoing and upcoming different strains of COVID-19.

The only effective way to end the COVID-19 pandemic and come out of it relies on countering the transmission of the virus which can indeed be done by the effective vaccination drive around the globe. So, other than the government agencies responsibly procuring the vaccines it equally depends on the willingness of the citizens of that country to come forward to get vaccinated and come out of the laid-back approach.^[11] One of the limitations of the current study is the way of data collection, i.e. online and face to face distribution of questionnaires because of the difference in the responses received by both modes. However, both modes were used to maximize the number of participants because COVID-19 protocol prevented the investigators from gathering personal contacts.

5. Conclusion

Our study's strength is that it has made a unique attempt to assess the acceptance of a booster dose for COVID-19 in a subpopulation of Saudi Arabia and also to identify the factors related to hesitancy. However, the study has certain limitations such as it is a cross-sectional study and involves only a particular region and subpopulation of the Kingdom of Saudi Arabia. Hence, further nationwide multicenter studies with a larger sample size involving different regions and subpopulations are recommended. Public health education is the need of the hour to reduce the identified barriers and hesitancy related to the COVID-19 booster dose.

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