

Acceptability of a Fourth Dose of the COVID-19 Vaccine among the Al-Baha Population in Saudi Arabia

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ABSTRACT

Introduction: Vaccine uptake may affect the capacity of vaccination to prevent and control the spread of COVID-19. However, little is known about vaccine hesitancy in the Al-Baha region of Saudi Arabia.

Aims: The present study aimed to assess the intentions of the Al-Baha population to get a fourth dose of the COVID-19 vaccine and to explore the associated sociodemographic determinants of their intentions.

Material and Methods: A cross-sectional survey was distributed to Al-Baha residents in Saudi Arabia between 1 February 2022 and 31 March 2022. The participants were asked about their willingness to get a fourth dose of the COVID-19 vaccine in relation to their demographic data.

Results and Discussion: Among the 934 participants (57.3% male, 42.2% female), 73.3% intended to receive a fourth dose of the COVID-19 vaccine, 10.5% were uncertain and 15.8% refused vaccination. Analysis of univariate association indicated that the intention to get a fourth dose of the COVID-19 vaccine differed significantly by gender ($p < 0.0001$), age ($p < 0.0001$), education level ($p = 0.0002$), marital status ($p = 0.0003$), employment status ($p = 0.001$) and province ($p = 0.0005$).

Conclusion: Vaccine hesitancy is mediated by several personal beliefs and demographic factors. The intention to get vaccinated reflects beliefs and attitudes about vaccines. To address concerns about vaccination, experts should explain how vaccination can decrease the spread of COVID-19 to others.

Key words: Vaccination, Beliefs, Hesitancy, COVID-19, Saudi Arabia

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INTRODUCTION

The multiple strains of the novel coronavirus disease (COVID-19) are still a major health burden worldwide. As of 15 May 2022, COVID-19 has produced more than 518 million confirmed cases and caused more than six million deaths globally [1]. In Saudi Arabia, there have been over 763,000 confirmed cases of COVID-19 and over 9,100 deaths [2]. Worldwide, COVID-19 has impacted most people at the mental, social, financial and personal levels [3,4].

From a religious perspective, Saudi Arabia is considered the most important destination for several millions of

Muslims for Umrah and Hajj; thus, it was one of the first countries to implement strict precautionary measures to prevent and control the spread of the epidemic [5]. The criteria for the success of public health efforts in several regions include instilling acquired immunity in a large number of people; currently, the level of acquired immunity is estimated at 67% [6]. Although the degree and duration of protection from vaccines are still enigmatic, the most effective method of preventing and controlling the pandemic is vaccination. Globally, the development of vaccines against COVID-19 has created a glimmer of hope. Vaccination not only reduces the spread of the disease but also protects non-immunized people in the general population [7].

On the other hand, vaccine acceptance and trust in the safety and effectiveness of immunization will play a crucial role in attaining the ideal coverage required for herd immunity. Herd immunity is considered one of the primary goals of vaccination worldwide [8]. It is understandable that there is hesitancy about getting the COVID-19 vaccine, as it was approved under emergency use protocols and developed in a short period of time;

this has increased the public's fear and anxiety, and it may affect acceptance of the vaccine [9]. Moreover, the lack of information disseminated by several media could substantially decrease people's willingness to receive a COVID-19 vaccine [10].

Early research from several European countries (April 2020) illustrated that hesitancy about receiving a COVID-19 vaccine was prevalent among adults (26%), and about the same proportion of hesitant people has been reported in the United States [11]. Moreover, a subsequent investigation carried out in July 2020 indicated that rejection of the vaccine was approximately 33% among the adult population [12]. There were significant demographic variations in vaccine acceptance patterns, with a greater probability of refusing the vaccine among females and those with low levels of education and low incomes, as well as among people who had not been vaccinated against influenza in recent years [12-14].

As of 31 May 2022, more than 65,800,000 people had received their first, second and third COVID-19 vaccine doses in Saudi Arabia [2]. With the increased amount of data regarding the new COVID-19 vaccines in the media and other sources of information, the attitudes and perceptions of the public may have changed [15]. Thus, it is necessary to understand the attitudes of individuals towards obtaining a fourth dose of the COVID-19 vaccine and identify any possible barriers that may affect people's decisions in the context of this vaccine. This study aimed to assess the sociodemographic characteristics of COVID-19 vaccine hesitancy among Al-Baha residents in Saudi Arabia.

MATERIAL AND METHODS

Participants and questionnaire administration

This cross-sectional study was conducted among the population of the Al-Baha region in the Kingdom of Saudi Arabia. A total of 934 participants were involved in this simple random cross-sectional study. The participants completed a structured questionnaire on a particular designated platform (Google Forms) between 1 February 2022 and 31 March 2022. The questionnaire consisted of two key sections. The first focused on sociodemographic information, including gender, age, education level, marital status, employment status and province. The second section consisted of a set of questions adapted from previously published studies [12,16,17] and electronically circulated using several social media platforms.

The questionnaire in this study had 30 items and was originally in English. However, most of the participants spoke Arabic, so it was translated from English to Arabic. The questionnaire was modified according to the respondents' comprehension levels while maintaining the meaning and content. The reliability of the questionnaire was examined using Cronbach's alpha test. The estimated standardized Cronbach's

alpha was 0.67, which demonstrated acceptable internal consistency regarding the reliability of the 30 items on the questionnaire.

Measures

The participants were asked several questions about COVID-19 (n=7) and a possible fourth dose of the COVID-19 vaccine (n=16). For questions about the fourth dose of the COVID-19 vaccine, the participants in this study were asked to imagine that the fourth dose was widely available. The questions measured theoretical constructs, including susceptibility to COVID-19, COVID-19 severity, benefits of a fourth dose of COVID-19 vaccination, barriers to being vaccinated with a fourth dose, the ability to be vaccinated with a fourth dose, behavioral control, subjective norms, knowledge, anticipated regret and trust in the government (i.e. the Ministry of Health). These items also investigated the participants' concerns about a fourth dose of vaccination allowing life to get back to 'normal' and having to follow other restrictions for COVID-19 if vaccinated with the fourth dose. The participants rated the 23 questions on a five-point scale (0-4) ranging from 'strongly disagree' to 'strongly agree'.

The participants were also asked about the extent to which they thought that 'coronavirus poses a risk to' people in Saudi Arabia and to themselves personally, with answers on a five-point scale ranging from 'no risk at all' to 'major risk'. Furthermore, the participants were asked if they thought they 'have had, or currently have coronavirus', with answers also on a five-point scale, ranging from 'definitely not' to 'definitely'. Moreover, they were asked if they personally knew anyone who had COVID-19 and if their employer would want them to have a fourth dose of COVID-19 vaccination (with the possible answers being 'yes' and 'no'). To measure intentions to get a fourth dose of COVID-19 vaccination, the participants were asked to state how likely they would be to have the fourth dose 'when the fourth dose of coronavirus vaccination becomes available to [them]' on a five-point scale, with answers including 'very unlikely', 'unlikely', 'uncertain', 'likely' and 'very likely'. Positive responses ('very likely' and 'likely') and negative responses ('very unlikely' and 'unlikely') were then combined into 'very likely' and 'very unlikely' categories, respectively, for the subsequent analysis.

Statistical analysis

Statistical Package for Social Sciences software version 26.0 (IBM, Inc., Armonk, New York, NY, USA) was used in this study to perform the statistical analysis. The demographic characteristics of the participants were summarized as frequencies and percentages. Pearson's chi-square test was used to assess the association between demographic characteristics and the intention to get a fourth dose of coronavirus vaccination. In terms of validity and reliability, the standardized Cronbach's alpha procedure was used to examine the questionnaire. For all statistical tests, a p-value of 0.05 was considered the significance level.

Ethical approval

In this study, ethical approval was obtained from the deanship of scientific research at Al-Baha University, with reference number 1443-21-43115814-1.

RESULTS

Demographic characteristics

In this study, 934 participants were included in the analysis. More than half of the study population was male (57%). Most respondents were aged 18–45 years (82.9%), resided in Al-Baha (46.4%) and were currently employed (47.9%). Most participants held a bachelor’s degree (71.6%) and were married (55.8%) (Table 1).

Descriptive statistics

In terms of the item ‘We are all responsible for reducing the spread of coronavirus’, the participants were roughly in strong agreement about this response, with a mean of 3.3 and an SD of 0.98. It is also worth noting that the participants reported considerable trust in the Ministry of Health to manage the COVID-19 pandemic in Saudi Arabia, with a mean of 3.12 and an SD of 1.04 (Table 2). The participants perceived a moderate risk of COVID-19 to people in Saudi Arabia and to themselves personally (39.4% and 37.3%, respectively) (Table 3).

Vaccination intention

Overall, 688 participants (73.7%) indicated that they would receive a fourth dose of the COVID-19 vaccine as soon as it became available, 98 (10.5%) were

uncertain about obtaining vaccination and 148 (15.8%) indicated that they would not receive a fourth dose. Unadjusted univariate association analysis revealed that the intention to receive a fourth dose of COVID-19 vaccination significantly differed by gender ($p < 0.0001$), age ($p < 0.0001$), education level ($p = 0.0002$), marital status ($p = 0.0003$), employment status ($p = 0.001$) and province ($p = 0.0005$) (Table 1).

DISCUSSION

Vaccination is one of the most important approaches in public health to prevent the spread of infectious diseases worldwide; however, the effectiveness of vaccines depends on their use. In recent years, some observations have been confirmed during outbreaks of resurgent measles and pertussis due to widespread anti-vaccine attitudes [18,19]. Thus, efforts towards vaccination can be undermined by negative attitudes that play a role in mediating vaccine refusal, which could threaten the main goal of herd immunity [20]. The present study found that 73.7% of participants intended to get a fourth dose of the COVID-19 vaccine, whereas only 26.3% of individuals were uncertain about getting or unwilling to get a fourth dose. There was no major difference between males and females in terms of refusing to receive a fourth dose (16.4% and 15.2%, respectively).

The results of this study showed interesting findings. Generally, COVID-19 vaccine uptake in Saudi Arabia is lower than that reported in other countries. For instance, cross-sectional studies have indicated that the proportion

Table 1: Demographic characteristics of the participants and their distribution according to the intention to get the fourth dose of coronavirus vaccination (n=934).

Parameter	Category	N (%)	Intention to be vaccinated, n (%)			Chi-Square	P value
			Very likely (n=688)	Uncertain (n=98)	Very unlikely (n=148)		
Gender	Male	538 (57.3)	374 (69.5)	76 (14.1)	88 (16.4)	19.138	<0.0001
	Female	396 (42.2)	314 (79.3)	22 (5.6)	60 (15.2)		
Age	18-25 y	356 (37.9)	228 (64.0)	54 (15.2)	74 (20.8)	42.634	<0.0001
	26-35 y	212 (22.6)	160 (75.5)	10 (4.7)	42 (19.8)		
	36-45 y	210 (22.4)	170 (81.0)	22 (10.5)	18 (8.6)		
	≥46 y	156 (16.6)	130 (83.3)	12 (7.7)	14 (9.0)		
Education level	<Secondary education	22 (2.3)	16 (72.7)	4 (18.2)	2 (9.1)	25.944	0.0002
	Secondary education	170 (18.1)	104 (61.2)	28 (16.5)	38 (22.4)		
	University	672 (71.6)	508 (75.6)	66 (9.8)	98 (14.6)		
	Post-graduate	70 (7.5)	60 (85.7)	0 (0.0)	10 (14.3)		
Marital status	Unmarried	388 (41.3)	256 (66.0)	54 (13.9)	78 (20.1)	25.374	0.0003
	Widower	8 (0.9)	8 (100.0)	0 (0.0)	0 (0.0)		
	Married	524 (55.8)	414 (79.0)	44 (8.4)	66 (12.6)		
Employment status	Divorced	14 (1.5)	10 (71.4)	0 (0.0)	4 (28.6)	23.89	0.001
	Student	272 (29.0)	180 (66.2)	40 (14.7)	52 (19.1)		
	Not working	212 (22.6)	146 (68.9)	24 (11.3)	42 (19.8)		
	Employed-Government	384 (40.9)	312 (81.3)	26 (6.8)	46 (12.0)		
Province	Employed-Private	66 (7.0)	50 (75.8)	8 (12.1)	8 (12.1)	31.58	0.0005
	Al-Baha	436 (46.4)	322 (73.9)	54 (12.4)	60 (13.8)		
	Al-Aqiq	304 (32.4)	214 (70.4)	30 (9.9)	60 (19.7)		
	Al-Makhwah	18 (1.9)	10 (55.6)	0 (0.0)	8 (44.4)		
	Al-Mandaq	32 (3.4)	26 (81.3)	4 (12.5)	2 (6.3)		
	Baljurashi	126 (13.4)	106 (84.1)	6 (4.8)	14 (11.1)		
Qilwah	18 (1.9)	10 (55.6)	4 (22.2)	4 (22.2)			

Table 2: Descriptive statistics for continuous items measuring beliefs and attitudes about COVID-19 and the fourth dose of COVID-19 vaccination and vaccination intention. Data are mean (standard deviation) on a 0-4 numerical rating scale (0=strongly disagree, 4=strongly agree).

	Item	Mean (SD)
Attitudes and beliefs about COVID-19	I am worried about catching coronavirus	2.03 (1.24)
	I believe that coronavirus would be a mild illness for me	2.37 (1.09)
	Too much fuss is being made about the risk of coronavirus	2.63 (1.13)
	We are all responsible for reducing the spread of coronavirus	3.33 (0.98)
	I believe I am immune to coronavirus	2.44 (1.14)
	The coronavirus pandemic has had a big impact on my life	2.53 (1.21)
Attitudes and beliefs about the fourth dose of COVID-19 vaccination	I trust the Ministry of Health to manage the coronavirus pandemic in Saudi Arabia	3.12 (1.04)
	The fourth dose of coronavirus vaccination should be mandatory for everyone who is able to have it	1.96 (1.43)
	Without the fourth dose of coronavirus vaccination, I am likely to catch coronavirus	1.79 (1.21)
	If I get the fourth dose of coronavirus vaccination, I will be protected against coronavirus	1.58 (1.17)
	If I don't get the fourth dose of coronavirus vaccination and end up getting coronavirus, I would regret not getting the vaccination	1.79 (1.23)
	It would be very easy for me to have the fourth dose of coronavirus vaccination	2.89 (1.07)
	The fourth dose of coronavirus vaccination could give me coronavirus	1.71 (1.22)
	I would be worried about experiencing side effects from the fourth dose of coronavirus vaccination	2.44 (1.27)
	I might regret getting the fourth dose of coronavirus vaccination if I later experiencing side effects from the vaccination	2.22 (1.31)
	Most people will get the fourth dose of coronavirus vaccination	2.69 (1.08)
	Other people like me will get the fourth dose of coronavirus vaccination	2.75 (1.03)
	In general, the fourth dose of coronavirus vaccination is a good thing	2.68 (1.17)
	I am afraid of needles	1.37 (1.33)
	If I get the fourth dose of coronavirus vaccination, I think I would not need to follow social distancing and other restrictions for coronavirus	1.37 (1.20)
	I know enough about the coronavirus illness to make an informed decision about whether or not to get the fourth dose of coronavirus vaccination	2.58 (1.07)
I know enough about the fourth dose of coronavirus vaccination to make an informed decision about whether or not to get the vaccination	2.33 (1.10)	
Vaccination intentions	Only people who are at risk of serous illness from coronavirus need to get the fourth dose of coronavirus vaccination	1.75 (1.25)
	When the fourth dose of coronavirus vaccination becomes available to you, how likely is it you will have one? (0=very unlikely, 4=very likely)	2.91 (1.25)

Table 3: Descriptive statistics for categorical and ordinal items measuring beliefs and attitudes about COVID-19 and the fourth dose of COVID-19 vaccination.

Item	Level	N (%)
To what extent do you think coronavirus poses a risk to people in Saudi Arabia?	No risk at all	64 (6.9)
	Minor risk	190 (20.3)
	Moderate risk	368 (39.4)
	Significant risk	202 (21.6)
	Major risk	110 (11.8)
To what extent do you think coronavirus poses a risk to you personally?	No risk at all	120 (12.8)
	Minor risk	282 (30.2)
	Moderate risk	348 (37.3)
	Significant risk	112 (12.0)
	Major risk	72 (7.7)
Do you believe you have had, or currently have, coronavirus?	Definitely not	420 (45.0)
	Probably not	186 (19.9)
	Probably	148 (15.8)
	Definitely	52 (5.6)
	Don't know	128 (13.7)
Do you personally know anyone (excluding yourself) who has had coronavirus?	Yes	628 (67.2)
	No	166(17.8)
	Don't know	140 (15.0)
As far as you know, would your employer want you to have the fourth dose of coronavirus vaccination?	Yes	634 (67.9)
	No	86 (1.0)
	Don't know	214 (22.9)
As far as you know, is there currently a widely available the fourth dose of coronavirus vaccination to protect against coronavirus?	Yes	616 (66.0)
	No	106 (11.3)
	Don't know	212 (22.7)

of individuals who intended to get a COVID-19 vaccine was 91.3% in China [21], 79.0% in the United Kingdom [22], 76.5% in Australia [23] and 53.6%–62.2% in the United States [24, 25]. Similarly, systematic reviews and meta-analyses have illustrated that rates of acceptance of COVID-19 vaccines were high in South Asia and China and low in some European countries, such as Russia and Italy, and distinct Arab countries (Kuwait and Jordan) [26,27]. In Saudi Arabia, Al-Mohaithef, et al. conducted a survey of 992 participants residing in four major cities, and the authors showed that 62.2% of participants were extremely likely or likely to get vaccinated [28]. The higher rate of vaccine acceptance in this study indicates an increasing trend in the participants' intentions.

On the other hand, Daly and Robinson found a significant decrease in vaccine acceptance, from 71% to 53.6%, in the period from April to October 2020 in the United States. Interestingly, Loomba, et al. found that in a large web-based study, 54.1% and 42.5% of individuals from the United States and the United Kingdom, respectively, would 'definitely' get the COVID-19 vaccine, but those proportions declined by 6.2% and 6.4%, respectively, after exposure to online misinformation regarding the vaccine [29]. This shows that the significant temporal drop in COVID-19 vaccine uptake may be explained by exposure to misleading information and the spread of false reports online via social media platforms. There is a clear influence of online anti-vaccine sentiment on public perceptions and attitudes towards COVID-19 vaccines in the United States [30]. Nevertheless, little information is known about these impacts in the Saudi community. Thus, the determinants of the effects of misleading information on people's perceptions and attitudes should be investigated in the future to reduce rates of vaccine refusal.

Vaccine refusal was predicted by several distinct demographic groups. In this study, males and females had nearly the same rate of refusing a fourth dose of the COVID-19 vaccine, and these findings are not in agreement with other studies [31–33]. Callaghan and his group [32] found that the main reason for females refusing to get a COVID-19 vaccine was concern about the effectiveness and safety of the vaccine. On the other hand, males were hesitant to get the vaccine due to financial concerns (the cost of the vaccine). People in Baljurashi province were likelier to accept a fourth dose of the COVID-19 vaccine than those living in Al-Makhwah and Qilwah.

The present study used a sample of the Al-Baha population. This helps to address the demand for relevant studies to assess the attitudes of the public in the Middle East [27]. Moreover, it provides insight into the intentions of the participants following the official approval of several COVID-19 vaccines, which may fill the knowledge gap regarding the real response of the community to COVID-19 vaccines already in place and the temporal changes in the attitudes of individuals. In contrast, the limitations of a cross-sectional survey are problematic, as bias may have influenced the outcomes.

Furthermore, using a web-based method may result in different responses than those that could be received using a face-to-face method. Additionally, there was not equal representation from all seven provinces.

CONCLUSION

In conclusion, more than two-thirds of the Al-Baha population was willing to receive a fourth dose of the COVID-19 vaccine. Specific demographic groups were likelier to get a fourth dose, such as individuals with post-graduate degrees, participants over 46 years old and those residing in Baljurashi. Males and females had roughly the same proportion of refusing a fourth dose of the COVID-19 vaccine. Understanding the reasons that lead to hesitancy to receive the COVID-19 vaccine is a crucial factor for decision-makers and stakeholders designing targeted programmers in national health care systems.

AUTHOR CONTRIBUTIONS

All authors made a significant contribution to the work reported, whether it be in the conception, study design, execution, acquisition of data, analysis, and interpretation or in all these areas. They all took part in drafting, revising, or critically reviewing the article; gave final approval of the version to be published; agreed on the journal to which the article has been submitted; and agreed to be accountable for all aspects of the work.

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