

Original Article

Public Willingness to Receive COVID-19 Vaccines in Saudi Arabia

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Abstract

Background: COVID-19 vaccination is a crucial public health intervention to stem the pandemic, however, there is a public hesitation to take the vaccine all over the world because of concerns about safety.

Objective(s): To assess the intention to take COVID-19 vaccines among adults in Saudi Arabia, and to explore determinants of this intention and causes of refusal of COVID-19 vaccines.

Methods: A cross-sectional study was conducted among 1345 adults in all provinces of Saudi Arabia using a questionnaire that was distributed via all social media channels. Stepwise binary logistic regression analysis was performed to identify the predictors to accept COVID-19 vaccination.

Results: About 48% of respondents intend to receive COVID-19 vaccines. The predictors of COVID-19 vaccines acceptance were perception of strong possibility of getting COVID-19 infection, high risk perception of the COVID-19, adherence to protective measures during the pandemic, receiving flu vaccines and high level of knowledge. The three most common causes of refusal to receive COVID-19 vaccines were fear from side effects of vaccines (76.8%), absence of trust that it will prevent COVID-19 infection (44%) and being in good health (28.7%).

Conclusion and recommendations: The willingness of adults to receive COVID-19 vaccines is suboptimal. There is a need for targeted health education messages using a multidisciplinary team capable of good communication with the public and dissemination of accurate messages via all social media platforms to correct misconceptions about the vaccines especially that related to public confidence in vaccine safety.

Keywords: COVID-19 vaccines, Saudi Arabia, willingness

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INTRODUCTION

As COVID-19 spreads across the world, multiple vaccines were developed against this new pandemic which show different degrees of safety and effectiveness.⁽¹⁾ Although many governments implemented strict preventive measures including lockdown, closing borders and quarantine, still uptake of the vaccine is crucial to stem the pandemic. There is no need to emphasize the importance and efficacy of COVID-19 vaccination as a public health intervention to mitigate the spread of the disease.⁽²⁾

However, it is one thing to make a vaccine available, and it is quite another to convince the public to take the vaccine. The world had a previous experience in 2009 regarding the H1N1 flu vaccine as the vaccine was made available in a large quantity before the epidemic reached its peak but while governments spent so much money to buy the vaccine,

they did not obtain high vaccination coverage in the public. In most countries, this vaccination campaign failed, even in developed countries, the highest vaccination coverage was only 20%.^(3, 4)

Willingness to be vaccinated against a given infectious agent is recognized as a major issue affecting the success of vaccination programs and has been extensively investigated in several literatures. Researchers found that personal factors may influence but not drive personal interest in getting an immunization.^(5, 6) The perceived probability of exposure, susceptibility to and severity of a disease are significantly associated with vaccination uptake. In addition to risk, trust of the public in the safety and effectiveness of the vaccine is vital in increasing the likelihood to get covid-19 vaccines as soon as they are available.⁽⁷⁻⁹⁾

In Saudi Arabia, COVID-19 epidemic became a major public health issue and was put at the top of the political agenda. The Saudi Ministry of Health

purchased a large stock of vaccines namely Pfizer/BioNtech and AstraZeneca to combat this epidemic. Although COVID-19 represents an emerging risk, we do not know how people view the threat and if their perception has an influence on their intention to receive COVID-19 vaccines. Consequently, we do not know what proportion of the population who will actually choose to be vaccinated, or the reasons that will determine their decision. So, we decided to conduct this study to assess the intention of public to take COVID-19 vaccines and its determinants among adults in Saudi Arabia, and to highlight causes of refusal of COVID-19 vaccines.

METHODS

Study design and sampling

A cross-sectional study was conducted through online questionnaires using Google forms distributed via social media all over the provinces of Kingdom of Saudi Arabia. The target population was adults (> 18 years). The sample size was calculated using Epi Info™ 7 software (Centers for Disease Control and Prevention (CDC), Atlanta, Georgia, USA) based on an assumption that the intention to be vaccinated with the COVID-19 vaccine is 50% and a margin of error of 5%, the minimum required sample at 95% confidence level was 384. Participants were recruited by convenient sampling technique. The data was collected in November 2020.

Data collection

The questionnaire was constructed after thorough review of previous studies related to same topic^(10, 11). First, it was prepared in English then was translated, and back-translated (English-Arabic) by two bilingual experts and was modified according to their suggestions. A pilot study was conducted, and the needed modifications were adopted accordingly. The questionnaire consisted of four parts. The first part of the questionnaire included personal data as age, gender, marital status, education, employment status, residence, nationality, monthly household income in Saudi Riyal and smoking history. Data about medical history of participants were also collected as, self-reported rating of health condition, history of chronic diseases and whether the participant was previously infected with COVID-19. The second part was about social pressure, including whether family members or friends have been diagnosed with COVID-19, whether they had complications or died due to COVID-19. The third part was the knowledge related to COVID-19, with a total of 5 items. These items evaluated the knowledge related to the causative agent, symptoms, modes of transmission, vulnerable groups, and preventive measures. The correct answer was given score one while the wrong answer or don't know was given a score of zero. The total score was converted to

a percentage score. A percentage score below 50% was considered poor knowledge, from 50 to 75 was considered moderate knowledge and more than 75 was a good knowledge. Also, data about the main sources of their knowledge related to COVID-19 were obtained. The fourth part was about risk perception of COVID-19, including two questions about fear from infection with COVID-19 (yes, no) and seriousness of the disease (yes, no). Finally, participants were asked about their adherence to protective behaviors, if they received the influenza vaccine in the previous eight months, their compliance with children vaccination (if applicable) and if they consider COVID-19 infection as a social stigma. Regarding vaccination intention, respondents were asked whether they will agree to get vaccinated against the COVID-19 (yes, no and not sure), if they will advise others to be vaccinated with the novel vaccine and reasons for refusal of vaccination. The internal consistency of the questionnaire was tested and had accepted reliability (Cronbach's alpha was 0.88).

Statistical analysis

Data were analyzed using SPSS 25.0 (SPSS Inc. Chicago, IL. 2020). The categorical variables were presented as frequency and percentages. Normality of quantitative variables was assessed by Kolmogorov-Smirnov test. Chi-square test was used to detect associations between categorical variables. Logistic regression analysis was performed to identify the significant predictors of acceptance to receive vaccination. The model included all the significant variables in the bivariate analysis. Statistical significance was set at $p < 0.05$.

Ethical considerations

Ethical approval was obtained from the regional ethical committee (IRB Registration Number with KACST, KSA: HAP-02-T-067 approval number 404). Participants were informed about the aim of the research and their written informed consent for participation was obtained. Their informed consent was obtained via the online survey by answering the question that they agree to participate and proceed with filling the questionnaire. The researchers confirmed that participation is voluntary. Anonymity and confidentiality were assured and maintained.

RESULTS

A total of 1345 participants responded to the online questionnaire. The results revealed that the percent of adults willing to get COVID-19 vaccines in Saudi Arabia was 48.2%, while 33.2% refused vaccination and 18.6 % were not sure whether they are willing to get the vaccine or not (Figure 1). The personal characteristics of respondents were presented in table 1. The mean age of responders was 34 ± 10.5 years. More than half of them were males (55.3%), 93.5%

were Saudi, 67.7% were from Western province, 63.5 were married, 62.9% had university level of education. About half of them worked at a governmental sector. Only 24.3% were smokers. About 27.9% of them get monthly income of 9,000 to less than 15,000 SR and 25 % had monthly income less than 3000 SR. None of the personal factors had a significant association ($p > 0.05$) with vaccine acceptance. Only geographic region had a significant association with acceptance of vaccine where north and middle region had the highest percent of vaccine acceptance (67.5% and 55.3% respectively).

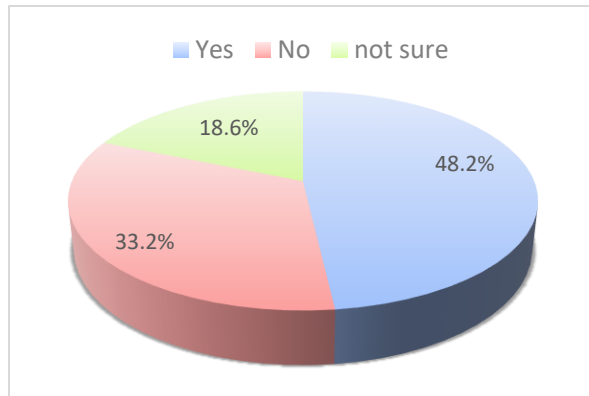


Figure 1: Willingness of adults to get COVID-19 vaccines in Saudi Arabia

The medical history of participants is presented in Table 2. The majority of participants (63.2%) perceived their health status as excellent., 18.7% had chronic diseases, 12% had positive history of COVID-19 infection, 43.8% had history of contact with COVID-19 patient and 81.3% of them had a relative or friend infected with COVID-19. About 63% knew anyone who developed serious complications or died due to COVID-19 and they were more significantly willing to get the vaccines ($p = 0.024$). Those who stated that there is an intermediate possibility of being infected with COVID-19 constituted 42% while 17.8% stated that there is a strong possibility and there was a significant association between the possibility of catch infection and the willingness to be vaccinated ($p < 0.001$).

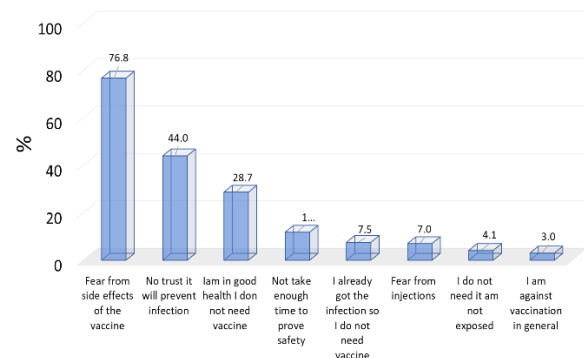
Respondents had good knowledge related to COVID-19 (44.3% of them). About 98% of participants responded correctly to items related to mode of transmission and symptoms, 57.2% gave correct answer in relation to vulnerable groups and 82% correctly identify the preventive measures against COVID-19 infection. The average percentage score of knowledge was 74.8 ± 16.1 (Table 3). There is significant effect of knowledge level on acceptance of vaccines ($p = 0.045$). The main source of COVID-19 related knowledge was social media (63.1%) followed by T.V (41.9%) and doctors (40.5%). More than half

(52.6%) of respondents stated that persons who got COVID-19 infection will not have social stigma.

Table 4 showed the study participants' risk perception related to COVID-19. About 37% of them were afraid of COVID-19 infection and the presence of fear was significantly associated with vaccine acceptance ($p < 0.001$), 63.6% considered COVID-19 as a serious disease and this was significantly associated with vaccine acceptance ($p < 0.001$). Regarding the adherence to protective behaviors, about 40% were most of the time adherent while 36.9% were almost always adherent and this was significantly associated with vaccine acceptance ($p < 0.001$). More than half got flu vaccine (52.4%) was significantly associated with vaccine acceptance ($p < 0.001$). About 61% of them advice others to get COVID-19 vaccines and this was significantly associated with vaccine acceptance ($p < 0.001$).

Stepwise binary logistic regression analysis of significant predictors of COVID-19 vaccine acceptance is illustrated in table 5. Participants who perceived that they had a strong possibility of getting COVID-19 infection were 2.4 times more liable to accept vaccine, those who had high risk perception of the COVID-19 and considered it as dangerous were 1.8 times more liable to accept vaccine. Persons who were almost always adherent to protective measures and those who received flu vaccines were 2 and 1.6 times respectively more likely to accept COVID-19 vaccines. Every 1 point increase in knowledge score led to 1.2 increase in acceptance of vaccine. The area under ROC curve was 0.663 (95% CI : 0.663 – 0.693). The chi-square test of model was significant, p -value of Hosmer-Lemeshow test was not significant indicating good discrimination and calibration ability of the model.

Figure 2 shows the causes of refusal of COVID-19 vaccines. The three most common causes were fear from side effects of vaccines (76.8%), no trust that it will prevent COVID-9 infection (44%) and 28.7% thought that no need for vaccine because of being in good health.



Multiple answers were allowed

Figure 2: Causes of refusal of COVID-19 vaccine intake

Table 1: Personal characteristics of studied Saudi adults

Characteristics	COVID-19 vaccine acceptance			TEST
	Total	No/ Not sure	Yes	
	(n = 1345)	(n= 697)	(n= 648)	
	No. (%)	No. (%)	No. (%)	
Age in years				
18-	259 (19.3)	139 (53.7)	120 (46.3)	$\chi^2 = 3.7$ $p = 0.449$
25-	507 (37.7)	273 (53.8)	234 (46.2)	
35-	353 (26.2)	175 (49.6)	178 (50.4)	
45-	164 (12.2)	83 (50.6)	81 (49.4)	
55+	62 (4.6)	27 (43.5)	35 (56.5)	
Mean $\pm$ SD		34 $\pm$ 10.5		
Gender				
Female	601 (44.7)	297 (49.4)	304 (50.6)	$\chi^2 = 2.5$
Male	744 (55.3)	400 (53.8)	344 (46.2)	$p = 0.113$
Nationality				
Non-Saudi	88 (6.5)	41 (46.6)	47 (53.4)	$\chi^2 = 1.03$
Saudi	1257 (93.5)	656 (52.2)	601 (47.8)	$p = 0.310$
Region				
Eastern	71 (5.3)	42 (59.2)	29 (40.8)	$\chi^2 = 10.4$ $p = 0.035^*$
South	209 (15.5)	113 (54.1)	96 (45.9)	
North	40 (3.0)	13 (32.5)	27 (67.5)	
Middle	114 (8.5)	51 (44.7)	63 (55.3)	
West	911 (67.7)	478 (52.5)	433 (47.5)	
Marital status				
Single	444 (33.0)	226 (50.9)	218 (49.1)	$\chi^2 = 0.254$ $p = 0.881$
Married	854 (63.5)	447 (52.3)	407 (47.7)	
Divorced or widow	47 (3.5)	24 (51.1)	23 (48.9)	
Educational level				
Primary or intermediate	39 (2.9)	17 (43.6)	22 (56.4)	$\chi^2 = 5.9$ $p = 0.117$
Secondary	261 (19.4)	123 (47.1)	138 (52.9)	
University	846 (62.9)	459 (54.3%)	387 (45.7)	
Above university	199 (14.8)	98 (49.2)	101 (50.8)	
Employment status				
Unemployed or housewife	377 (28.0)	197 (52.3)	180 (47.7)	$\chi^2 = 2.9$ $p = 0.718$
Governmental sector	673 (50.0)	350 (52.0)	323 (48.0)	
Private sector	122 (9.1)	67 (54.9)	55 (45.1)	
Freelance	27 (2.0)	14 (51.9)	13 (48.1)	
Student	95 (7.1)	48 (50.5)	47 (49.5)	
Retired	51 (3.8)	21 (41.2)	30 (58.8)	
Smoking				
No	1018 (75.7)	537 (52.8)	481 (47.2)	$\chi^2 = 1.4$
Yes	327 (24.3)	160 (48.9)	167 (51.1)	$p = 0.229$
Income in SR (n = 1020)^a				
< 3000	255 (25.0)	130 (51.0)	125 (49.0)	$\chi^2 = 3.2$ $p = 0.520$
3000-	92 (9.0)	50 (54.3)	42 (45.7)	
6000-	138 (13.5)	77 (55.8)	61 (44.2)	
9000-	285 (28.0)	142 (49.8)	143 (50.2)	
15000+	250 (24.5)	141 (56.4)	109 (43.6)	

*Significant (p value ≤ 0.05)

a = missing data

Table 2: Medical history of studied Saudi adults

Characteristics	Total (n = 1345) No. (%)	COVID-19 vaccine acceptance		TEST
		No/ Not sure (n= 697) No. (%)	Yes (n= 648) No. (%)	
		No. (%)	No. (%)	
Self - reported health status				
Fair	53 (3.9)	24 (45.3)	29 (54.7)	$\chi^2 = 3.01$
Good	442 (32.9)	218 (49.3)	224 (50.7)	$p = 0.220$
Excellent	850 (63.2)	455 (53.5)	395 (46.5)	
History of chronic diseases				
No	1094 (81.3)	560 (51.2)	534 (48.8)	$\chi^2 = 0.942$
Yes	251 (18.7)	137 (54.6)	114 (45.4)	$p = 0.332$
Presence of chronic diseases (n = 251)				
Hypertension	44 (3.3)	23 (52.3)	21 (47.7)	$\chi^2 = 0.004, p = 0.951$
Diabetes	67 (5.0)	37 (55.2)	30 (44.8)	$\chi^2 = 0.327, p = 0.567$
Bronchial asthma	66 (4.9)	34 (51.5)	32 (48.5)	$\chi^2 = 0.003, p = 0.959$
Coronary diseases	5 (0.4)	1 (20.0)	4 (80.0)	$\chi^2 = 2.03, p = 0.154$
Renal diseases	8 (0.6)	6 (75)	2 (25)	$\chi^2 = 1.7, p = 0.188$
History of past infection with COVID-19				
No	1184 (88.0)	610 (51.5)	574 (48.5)	$\chi^2 = 0.360$
Yes	161 (12.0)	87 (54.0)	74 (46.0)	$p = 0.549$
History of contact with COVID-19 patient				
No	756 (56.2)	396 (52.4)	360 (47.6)	$\chi^2 = 0.216$
Yes	589 (43.8)	301 (51.1)	288 (48.9)	$p = 0.642$
Have a relative or friend infected with COVID-19				
No	252 (18.7)	119 (47.2)	133 (52.8)	$\chi^2 = 2.6$
Yes	1093 (81.3)	578 (52.9)	515 (47.1)	$p = 0.105$
Know anyone who develop serious complications or died from COVID-19				
No	496 (36.9)	277 (55.8%)	219 (44.2)	$\chi^2 = 5.1$
Yes	849 (63.1)	420 (49.5)	429 (50.5)	$p = 0.024^*$
Possibility of getting COVID-19 (n = 1232)*				
Never	183 (14.9)	126 (68.9)	57 (31.1)	
Little	312 (25.3)	169 (54.2)	143 (45.8)	$\chi^2 = 35.8$
Intermediate	518 (42)	257 (49.6)	261 (50.4)	$p < 0.001^*$
Strong	219 (17.8)	87 (39.7)	132 (60.3)	

*Significant (p value ≤ 0.05)

a= missing data

Table 3: Adults' knowledge related to COVID-19, Saudi Arabia

Item	Total (n = 1345) No. (%)	COVID-19 vaccine acceptance		TEST
		No/ Not sure (n = 697) No. (%)	Yes (n = 648) No. (%)	
		No. (%)	No. (%)	
Knowledge score				
Poor knowledge (<50% score)	95 (7.1)	55 (57.9)	40 (42.1%)	$\chi^2 = 6.1$
Moderate knowledge (50-75% score)	654 (48.6)	355 (54.3)	299 (45.7)	$p = 0.045^*$
Good knowledge (>75% score)	596 (44.3)	287 (48.2)	309 (51.8%)	
Total knowledge percent score (Mean $\pm$ SD)		74.8 $\pm$ 16.1		
Source of knowledge#				
Social media	849 (63.1)	448 (52.8)	401 (47.2)	$\chi^2 = 0.826, p = 0.363$
Doctors	545 (40.5)	276 (50.6)	269 (49.4)	$\chi^2 = 0.510, p = 0.475$
T.V	564 (41.9)	298 (52.8)	266 (47.2)	$\chi^2 = 0.401, p = 0.527$
Friends	335 (24.9)	174 (51.9)	161 (48.1)	$\chi^2 = 0.003, p = 0.960$
Self -assessment of level of knowledge				
Little	80 (5.9)	49 (61.3)	31 (38.8)	
Moderate	659 (49.0)	330 (50.1)	329 (49.9)	$\chi^2 = 3.7$
Very good	606 (45.1)	318 (52.5)	288 (47.5)	$p = 0.153$
Stigma of COVID-19 infection				
No	707 (52.6)	379 (53.6)	328 (46.4)	
Sometimes	378 (28.1)	187 (49.5)	191 (50.5)	$\chi^2 = 1.9$
Yes	260 (19.3)	131 (50.4)	129 (49.6)	$p = 0.376$

*Significant (p value ≤ 0.05)

Multiple answers are allowed

Table 4: Adults' Risk perception related to COVID-19, Saudi Arabia

Item	Total (n = 1335)	COVID-19 Vaccine Acceptance		TEST
		No/ Not sure (n = 697)	Yes (n = 648)	
		No. (%)	No. (%)	
Fear from infection with COVID-19				
No	844 (62.7)	470 (55.7)	374 (44.3)	$\chi^2 = 13.5$ $p < 0.001^*$
Yes	501 (37.3)	227 (45.3)	274 (54.7)	
Serious of COVID-19				
No	490 (36.4)	314 (64.1)	176 (35.9)	$\chi^2 = 46.4$ $p < 0.001^*$
Yes	855 (63.6)	383 (44.8)	472 (55.2)	
Self- reported adherence to protective behaviors				
Rarely (10%)	114 (8.5)	76 (66.7)	38 (33.3)	$\chi^2 = 39.5$ $p < 0.001^*$
Sometimes (25%)	202 (15.0)	132 (65.3)	70 (34.7)	
Mostly (50%)	532 (39.6)	274 (51.5)	258 (48.5)	
Almost always (90%)	497 (36.9)	215 (43.3)	282 (56.7)	
Flu vaccine				
No	640 (47.6)	389 (60.8)	251 (39.2)	$\chi^2 = 39.2$ $p < 0.001^*$
Yes	705 (52.4)	308 (43.7)	397 (56.3)	
Compliance with children vaccine (n=845)				
No	60 (7.1)	39 (65.0)	21 (35.0)	$\chi^2 = 2.9$ $p = 0.088$
Yes	785 (92.9)	421 (53.6)	364 (46.4)	
Advice others to take COVID vaccine				
No	521 (38.7)	513 (98.5)	8 (1.5)	$\chi^2 = 74.1$ $p = 0.001^*$
Yes	824 (61.3)	184 (22.3)	640 (77.7)	

*Significant (p value ≤ 0.05)**Table (5): Binary logistic regression analysis of predictors of COVID-19 vaccine acceptance**

	β	p value	Adjusted OR	95% CI
Possibility of getting COVID-19				
Never			1.0	
Little	0.539	0.008*	1.7	1.2 – 2.6
Intermediate	0.679	<0.001*	1.9	1.4 – 2.9
Strong	0.879	<0.001*	2.4	1.6 – 3.7
Knowledge score	0.120	0.024*	1.2	1.1 – 1.3
Serious of COVID-19				
No			1.0	
Yes	0.584	<0.001*	1.8	1.4 – 2.3
Self- reported adherence to protective behaviors				
Rarely (10%)			1.0	
Sometimes (25%)	0.87	0.755	1.1	0.6 – 1.8
Mostly (50%)	0.372	0.135	1.4	0.8 – 2.3
Almost always (90%)	0.698	0.005*	2.0	1.2 – 3.3
Flu vaccine				
No			1.0	
Yes	0.457	<0.001*	1.6	1.2 – 2.00

*Significant (p value ≤ 0.05)

DISCUSSION

There is no doubt that the break of transmission dynamic of COVID- 19 pandemic depends on the implementation of successful COVID19 vaccination programs globally. This would only be achieved if there was a wide acceptance of intake of the launched vaccines among the general public to reach a broad immunological protection.⁽¹²⁾ If there is a vaccine hesitancy, the minimal required herd immunity (55 to 82% of community) will not be achieved. Hence, some individuals will not be eligible to receive

COVID-19 vaccine because of age, pregnancy, immune-compromised or any other contraindicated conditions, the refusal of vaccine intake should not exceed 10% in the community.⁽¹³⁾ The estimation of willingness to receive vaccines in the community is very crucial for reaching the required immunization level. Also, gaining insight about the causes to vaccine uptake is very essential. Hence, this study aimed to understand the extent and causes of hesitancy or refusal of vaccine intake and thus will help decision makers to start promoting COVID-19 vaccine uptake. The results of the current study revealed that the acceptance level for the COVID-19 vaccination

among adults across Saudi Arabia was 48% which is low to achieve the required herd immunity. There was a geographic variation in the level of vaccine acceptance where the lowest percent (40.8%) was in the eastern region followed by south region (45.9%) and west region (47.5%). Also, this percent was lower than that reported in study conducted in USA (67%), France (74%) and Australia (85.8%) this difference may be attributed to cultural differences.^(4, 14, 15)

In bivariate analysis none of the personal characteristics was significantly affecting the willingness to uptake the COVID-19 vaccine which was similarly reported in a result of systematic review that was conducted to identify consistent predictors of the decision to accept or refuse any (pre)pandemic vaccine. A total of ten studies were included in this review and its results revealed that the only significant predictors were risk of infection, severity of consequence events and presence of harm from the vaccine.⁽¹⁶⁾ On the other hand, other studies reported that male gender, highly educated, high income are more willing to get the vaccine.^(17, 18)

The current study gave insight that 44.3% of adults in Saudi Arabia had good knowledge related to COVID-19 and those with high knowledge had a significantly higher percent to accept vaccine intake. The main source of knowledge was social media so dissemination of messages through this platform is critical to increase the awareness about the diseases, adherence to protective measures and importance of the vaccine in stopping the pandemic.

Only 37% of the participants are strictly adherent to protective measures against COVID-19 infection which is an alarming percent. Therefore, more governmental efforts should be directed to increase the awareness and adherence of public to preventive measures.

Results of logistic regression model revealed that the predictors of vaccine acceptance were perceived risk (strong possibility of getting COVID-19 infection and seriousness of the disease), good knowledge about the disease, receiving influenza vaccines and adherence to protective behaviors. Thus, those predictors are the targets for interventions to enhance the vaccine uptake. The explanation that intake of flu vaccine was a predictor of willingness to receive COVID-19 vaccines is that persons who got the flu vaccine were more concerned about the protective measures so they were more willing to get COVID-19 vaccines. People who are not adherent to protective behaviors are less willing to be vaccinated and this was reported in other studies.⁽¹⁹⁻²¹⁾

Regarding the causes of vaccine refusal, the main concerns of Saudi public were about side effects or bad reactions to the vaccine, lack of trust that the vaccine will prevent COVID-19 infection and also misconception that people with good health or

previously infected with COVID-19 are not in need of the vaccine. This is consistent with Pogue and colleagues finding where the majority of participants (~63%) in the USA stated that they were worried about the side effects of the COVID-19 vaccines (Pogue et al 2020)⁽²²⁾. There were no active resisters to vaccination in general among adults in Saudi Arabia and no cultural, or religious beliefs that discouraged them from being vaccinated. Another study conducted in Malaysia reported that religious beliefs were associated with diminished intake of vaccination.^(23, 24)

Health care authorities should disseminate evidence-based messages using culturally appropriate language to increase the public trust in COVID-19 vaccine and to correct the misconceptions about the safety of COVID-19 vaccines. These messages should be urgently delivered and tested to increase intent and willingness to get the vaccines. They should also emphasize the risk perception and the dangerous consequences of contracting the disease (death, complications, recurring of lockdown, economic impact, and inability to travel) and benefits of vaccine (protection of individual, family and community). Timely and continuous dissemination of disease statistics is one way to increase public awareness. There is a need to build a multi-disciplinary communication team which include experts in behavioral changes, health care practitioners, social media influencers and religious leaders.⁽²⁵⁾

Study limitations and strengths: Regarding the limitations of the study, despite that the online questionnaire is the preferred method to collect data in light of the need for social distancing during COVID-19 crisis, it may limit generalization of the results. However, the large sample size participation from all provinces of KSA are both points of strength.

The data in this study were collected using an online questionnaire, distributed through all social media platforms. This may limit the generalization of results. However, using an online questionnaire was the preferred method to collect the data considering the need for social distancing during the COVID-19 crisis and there was a large sample size and participation from all provinces of KSA.

CONCLUSION AND RECOMMENDATIONS

The willingness to receive COVID-19 vaccines is suboptimal. The study results highlight the need for targeted health education messages using a multidiscipline team capable of good communication with the public and dissemination of accurate messages via all channels as all social media platforms, healthcare workers and religious leaders to enhance the public knowledge and intension to receive COVID-19 vaccine and to correct misconceptions about the vaccines. Health care authorities should continue to promote other protective behaviors such as

hand washing and physical distancing. Also, the increase in public confidence in vaccine safety could be achieved by reporting of statistics on post marketing surveillance on vaccines and their adverse effects.

CONFLICT OF INTEREST

The authors declare no competing interest.

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