Acceptance of a COVID-19 vaccine and its related determinants among the general adult population in Jeddah, Saudi Arabia

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Abstract

Background: Coronavirus disease 2019 (COVID-19) is a global pandemic caused by a highly infectious respiratory virus (SARS-CoV-2). With all the consequences that threaten the health of the individual and society due to this infection, it has become necessary to have a vaccination that limits the spread of this virus.

Objectives: To assess the acceptance of COVID-19 vaccines in Saudi Arabians and to uncover the barriers associated with vaccination.

Method: This was a cross-sectional study of 518 subjects, who gave their responses through an online Google form. Data were analyzed using SPSS software version 23. The level of significance was 0.05%.

Results: The vaccine acceptance rate was 68.7%; it was significantly more common among people in Makkah city, among those with high income, and those with relatives who had the COVID-19 infection. The majority of those who accepted the vaccine were advised by health care workers (p < 0.05).

Sound knowledge, attitude and practice were significantly behind increased acceptance of the vaccination against COVID-19 infection. Health care workers have a significant role in convincing people to accept the vaccine. Web sites and smartphones are important channels to increase the acceptance of the population.

Conclusions: About one-third of the population did not accept the vaccine, particularly, those with low income. Increasing the knowledge of the people about the clinical aspects, and health impact of the virus of COVID-19 on the community are important intervention tools to increase the acceptance rate of COVID-19 vaccination among the population.

Keywords: COVID-19, KAP, clinical aspects and acceptance of COVID-19 infection.

Introduction

Coronavirus disease 2019 (COVID-19) is a global pandemic caused by a highly infectious respiratory virus (SARS-CoV-2). (1) In the spring of 2020, governments worldwide implemented precautionary measures, such as social distancing, quarantine, and mask-wearing, to control the spread of the disease (2). The COVID-19 pandemic led to more than 108 million confirmed cases of COVID-19 and over one million deaths around the world (3, 4). In the Kingdom, COVID-19 caused a total of 341,495 laboratory-confirmed cases with 5144 deaths (5). COVID-19 can cause a wide range of symptoms, from asymptomatic to mild flu-like symptoms to acute respiratory distress syndrome and death (3-5). COVID-19 has also been linked to long-term lung, cardiac and neurological conditions (6). A systematic review of 53,000 hospitalized patients indicated that 20.2% of COVID-19 cases developed severe disease with a mortality rate of ~3.1% (7). In the elderly and among those with comorbidities, such as cardiovascular disease, chronic kidney disease, and chronic obstructive pulmonary disease, mortality increases significantly (8). Covid-19 also has a negative impact on mental health. In a study conducted in Saudi Arabia during the initial phase of the COVID-19 pandemic, more than 29% of the respondents had moderate-to-severe depression, and 26.6% reported moderate-to-severe anxiety (9). With all these consequences that threaten the health of the individual and society, it has become necessary to have a vaccination that limits the spread of this virus. KSA planned early COVID-19 vaccination to the population as soon as a safe and effective vaccine became available. The same day that the Phase III trial of the Pfizer-BioNTech COVID-19 vaccine was published, the SFDA (Saudi Food and Drug Authority) imparted emergency use authorization to the vaccine. On December 16, 2020, KSA received its first two shipments of BNT162b2 then it immediately started free of charge campaigns to vaccinate KSA populations (10). KSA planned a phased approach vaccination program. The initial phase targeted the most vulnerable group as healthcare workers (HCWs), people with comorbid diseases, and the elderly. The second and third phases targeted all populations, to vaccinate at least 70% (11).

Any vaccination program's success is determined by the percentage of the population that are willing to be vaccinated. Vaccine hesitancy (delay in acceptance or refusal of vaccination) is a complex issue and the factors influencing this condition are highly variable across populations. Vaccine hesitancy has been linked to several factors, including the vaccine's side effects, misconceptions about the need for vaccination, a lack of trust in the health system and the vaccine's safety and efficacy (12). The percentage of the general populations' COVID-19 acceptance varied from one research to another. Only 45 percent of 3,100 people in a study conducted among the Saudi population said they would be willing to have the COVID-19 vaccine (13). Another public survey in Saudi Arabia with almost 1000 participants showed a 65% acceptance rate (14). In A recent national cross-sectional survey in KSA of 1512 HCWs, 70% were willing to receive a COVID-19 vaccine (15). In another cross-sectional study of 673 HCWs in KSA, 50.52 % said they would be willing to get the COVID-19 vaccination, with 49.71% saying they would get it as soon as it became available in the country and 50.29% saying they would wait until the vaccine's safety is confirmed (16).

Many factors have affected vaccine acceptability, for example, gender differences. Male gender was a positive predictor for acceptance of COVID-19 vaccination (17, 18). A study reported that those aged 45 years and above, and being married, are more likely to accept the COVID-19 vaccine than their counterparts (14). Another study demonstrated that younger participants tended to be more accepting of vaccination in contrast with older participants (19). One of the strongest factors of vaccine acceptability was whether participants thought their healthcare provider would recommend they get vaccinated against COVID-19 or not (20). Another important factor was that people who thought they were at a higher risk of catching COVID-19 were more willing to accept the vaccine, but only for the 95 percent effective vaccine. A positive attitude toward immunization is linked to a perception of danger or susceptibility to infection (21-23). Adequate vaccine coverage and high vaccine uptake rates in the population are required for COVID-19 immunization to be successful. Recent studies have documented uncertainties regarding the COVID-19 vaccine as a result of the public's mistrust of authority and the presence of scientific illiteracy regarding the virus and phases of development of the vaccine, and misinformation transmitted via social media (24). Thus, this study aimed to assess the acceptance of COVID-19 vaccines in Saudi Arabia and to uncover the barriers associated with vaccination.

Methodology

It was a cross-sectional study; the sampling method was a non-probability convenient one. Data were collected, through an online Google form, on residents of Saudi Arabia. Sample size was determined using G*power software, where α = 0.05, Power = 0.95 effect size = 0.3, and degree of freedom= 5 (25). The minimal sample size required was 277 subjects; thus, 518 subjects were enrolled in the present study. Data were collected using a structured questionnaire that provided information on socio-demographic and personal characteristics, and detailed information on COVID-19 infection and vaccination. The questionnaire included questions about COVID-19 infection, and its clinical aspects, its impact on health, life style and the community. It also included questions on the knowledge, attitude and practice (KAP) towards the acceptance of the COVID-19 vaccine for its impact on health and the barriers and fake news about it. The software SPSS (IBM compatible version 23) was used to analyze the data. Chi-square test was used to analyze the data. The level of significance for the present study was 0.05%.

Availability of the data: the raw data is available at the research center of ISNC and all results of the data are included in the paper.

Results

The present study included 518 subjects (67.2% females, while 32.2% were males). The majority of the respondents were aged 18 to 29 years (65.6%), while those older than 64 years were only 1.4%. Those aged 30 to 40, or 50 to 64 years old, were 16.2% and 18.8% respectively. Table 1 shows distribution of the studied subjects by acceptance of COVID-19 vaccination and sociodemographic characteristics and factors affecting it. Gender and nationality were not significantly associated with acceptance of COVID-19 vaccination (p > 0.05). The percentage of subjects who accepted the vaccine from Makkah region (75%), was higher than those who didn't, from the same region, (p < 0.05). Educational level was not significantly associated with acceptance of COVID-19 vaccination (p > 0.05). The percentage of subjects who accepted the vaccine from those having monthly income over 15,000 SR (40.4 %), was higher than those who didn't, where p < 0.05. The percentage of subjects who accepted the vaccine from those who have a chronic condition (26.1%), was higher than those who didn't, where p < 0.05. The percentage of subjects who accepted the vaccine from people who took the COVID-19 test (64.0%), was higher than those who didn't where p < 0.05. Getting COVID-19 infection was not significantly associated with acceptance of COVID-19 vaccination (p > 0.05). The percentage of subjects who accepted the vaccine from people who have relatives infected with COVID-19 (91.9%), was higher than those who didn't where p < 0.05. The percentage of subjects who accepted the vaccine from those who think that health care providers will advise them to get the COVID-19 vaccine (96.3%), was higher than those who didn't where p < 0.05. Knowledge level about COVID-19 was not significantly associated with acceptance of COVID-19 vaccination (p > 0.05).

Table 2 shows the distribution of studied subjects by acceptance of COVID-19 vaccination and their knowledge about it and factors affecting it. The percentage of subjects who accepted the vaccine from those who believe that COVID-19 in 65 years old subjects is dangerous (88.2%), was higher than those who didn't where p < 0.05. The percentage of subjects who accepted the vaccine among those who believe that COVID-19 spread among subjects (98.3%), was higher than those who didn't where p < 0.05.
The percentage of subjects who accepted the vaccine from those who don't believe that COVID-19 is caused by the Flu virus (65.4%), was higher than those who didn't where p < 0.05. The percentage of subjects who accepted the vaccine from those who don't know if COVID-19 is caused by the Flu virus (22.8%), was higher than those who didn't where p < 0.05. The percentage of subjects who accepted the vaccine from those who don't think that COVID-19 always show signs and symptoms of being sick (86.2%), was higher than those who didn't, where p < 0.05. The idea that people who get COVID-19 only have mild symptoms was not significantly associated with acceptance of COVID-19 vaccination (p > 0.05). The idea that people who get COVID-19 will have fever, cough,

shortness of breath, runny nose, headache, fatigue, diarrhea, rash on face, blurry vision, earache, and hair loss, was not significantly associated with acceptance of COVID-19 vaccination (p > 0.05). The percentage of subjects who accepted the vaccine among those who believe that COVID-19 can cause muscles or body ache (79.8%), was higher than those who didn't, where p < 0.05. The percentage of subjects who accepted the vaccine among those who believe that COVID-19 can cause loss of smell or taste (92.7%), was higher than those who didn't, where p < 0.05.

Table 3 shows distribution of studied subjects by Acceptance of COVID-19 Vaccination and knowledge about COVID-19 infection and factors affecting it. The percentage of subjects who accepted the vaccine from those who stated that they can't get the infection again (87.4%), was higher than those who didn't admit that (78.4%), where p < 0.05. The amount of information about COVID-19 and sources of information about COVID-19 were not significantly associated with acceptance of COVID-19 vaccination (p > 0.05).

The percentage of subjects who accepted the vaccine from those who trust national news as a source of information about COVID-19, (42.1%), was significantly higher than those who didn't where the p < 0.05. The percentage of subjects who accepted the vaccine from those who received the same information on COVID-19 across different courses, (69.1%), was higher than those who didn't, (p < 0.05). The percentage of subjects who accepted the vaccine from those who received a little fake information about COVID-19, (36.2%), was higher than those who didn't (p < 0.05).

The percentage of subjects who accepted the vaccine from those who received moderate fake information about COVID-19, (36.8%), was higher than those who didn't p < 0.05. The percentage of subjects who accepted the vaccine from those who think that COVID-19 comes from animals, (42.1%), was higher than those who didn't (p < 0.05). The percentage of subjects who accepted the vaccine from those who tested to see if they have COVID-19 (61.2%), was higher than those who didn't, t (p < 0.05).

Table 4 shows the distribution of studied subjects by Acceptance of COVID-19 Vaccination and knowledge about COVID-19 infection and factors affecting it. The amount of information told by the doctor that you have COVID-19, and a relative diagnosed with COVID-19 was not significantly associated with acceptance of COVID-19 vaccination (p > 0.05).

The percentage of subjects who accepted the vaccine from those who did not think that they had COVID-19 because of symptoms but they had never tested (74.7%), was higher than those who didn't the p < 0.05. The percentage of subjects who accepted the vaccine among those who moderately think that COVID-19 is a threat to physical health (36.5%), was higher than those who didn't the p < 0.05. COVID-19 as a threat to mental health and financial safety was not significantly associated with acceptance

of COVID-19 vaccination (p > 0.05). The percentage of subjects who accepted the vaccine from those who had a major thought that COVID-19 is a threat to the health of Saudi Arabia's population (33.1%), was higher than those who didn't the p < 0.05. The percentage of subjects who accepted the vaccine among those who moderately think that COVID-19 is a threat to the local community (42.7%), was higher than those who didn't the p < 0.05. The percentage of subjects who accepted the vaccine among those who majorly think that COVID 19 is a threat to the local community (23.6), was higher than those who didn't the p < 0.05.

Table 5 shows the distribution of studied subjects by Acceptance of COVID-19 Vaccination and Practice and factors affecting it. Fear of getting COVID-19 was not significantly associated with acceptance of COVID-19 vaccination (p > 0.05). The percentage of subjects who accepted the vaccine from those who stated that they worry about friends and family due to COVID-19 (78.4 %), was higher than those who didn't where p < 0.05. Experiencing boredom, frustration, anxiety, depression, sleeping trouble, increased or decreased sexual activity, loneliness, and confusion due to COVID-19 were not significantly associated with acceptance of COVID-19 vaccination (p > 0.05). Table 6 reveals the distribution of studied subjects by Acceptance of COVID-19 Vaccination and attitude and factors affecting it. The chance of getting COVID-19 in the future was not significantly associated with acceptance of COVID-19 vaccination (p > 0.05). The percentage of subjects who accepted the vaccine from those who stated that it would be moderately serious if they got COVID-19 (37.1%), was higher than those who didn't and the percentage of subjects who accepted the vaccine from those who stated that it would be very serious if they got COVID-19 (13.5%), was higher than those who didn't the p < 0.05. Needing normal routines instead of worrying about protective behavior was not significantly associated with acceptance of COVID-19 vaccination (p > 0.05). The percentage of subjects who accepted the vaccine from those who strongly agree that It's a crime if people know they have COVID-19 and don't do protective behaviors (78.9%), was higher than those who didn't admit that the p < 0.05. The percentage of subjects who accepted the vaccine among those who strongly agree that people who test positive for COVID-19 should be isolated (84.3%), was higher than those who didn't admit that the p < 0.05. The percentage of subjects who accepted the vaccine from those who stated that they would be willing to get the COVID-19 vaccine if it was free (100.0%), was higher than those who didn't admit that; the p < 0.05. The percentage of subjects who accepted the vaccine from those who stated that Doctors would recommend taking the COVID-19 vaccine (97.5%), was higher than those who didn't admit p < 0.05. The percentage of subjects who accepted the vaccine from those who stated that they disagree with If they decided to get the COVID-19 vaccine it would be hard to find a provider or clinic (32.9%), was higher than those who didn't and the percentage of subjects who accepted the vaccine from those who stated that they strongly disagree with If they decided to get the COVID-19

vaccine it would be hard to find a provider or clinic (24.7%), was higher than those who didn't where p < 0.05.

Table 7 shows the Distribution of studied subjects by Acceptance of COVID-19 Vaccination and attitude and factors affecting it. The percentage of subjects who accepted the vaccine from those who strongly agree that the COVID-19 vaccine might have side effects, like fever or soreness in the arm (55.9%), was higher than those who didn't the p < 0.05. The percentage of subjects who accepted the vaccine of those who agree that COVID-19 might have side effects, like fever or soreness in the arm (38.8%), was higher than those who didn't the p < 0.05. The percentage of subjects who accepted the vaccine from those who think that COVID-19 vaccine effectiveness is moderate (59.0%), was higher than those who didn't the p < 0.05. The percentage of subjects who accepted the vaccine from those who think that COVID-19 vaccine effectiveness is high (27.8%), was higher than those who didn't; the p < 0.05. The percentage of subjects who accepted the vaccine of those who think that age is an important factor to decide whether or not to get the COVID-19 vaccine (14.3%), was higher than those who didn't the p < 0.05. The percentage of subjects who accepted the vaccine of those who think that health history is an important factor to decide whether or not to get the COVID-19 vaccine (28.9%), was higher than those who didn't the p < 0.05. The percentage of subjects who accepted the vaccine according to the vaccines protection period (13.2%), was higher than those who didn't; the p < 0.05. The percentage of subjects who accepted the vaccine from those who think it's extremely important for them that getting the COVID-19 vaccine would protect their health (60.7%), was higher than those who didn't the p < 0.05. The percentage of subjects who accepted the vaccine from those who think it's very important for them that getting the COVID-19 vaccine would protect their health (21.1%), was higher than those who didn't the p < 0.05. The percentage of subjects who accepted the vaccine from those who think it's extremely important for them that getting the COVID-19 vaccine would protect the health of their relatives (72.8%), was higher than those who didn't the p < 0.05. The percentage of subjects who accepted the vaccine from those who think it's very important for them that getting the COVID-19 vaccine would protect the health of their relatives (18.5%), was higher than those who didn't); the p < 0.05.

Table 8 shows the distribution of studied subjects by Acceptance of COVID-19 Vaccination and attitude and factors affecting it. The percentage of subjects who accepted the vaccine from those who think it's extremely important for them that getting the COVID-19 vaccine would protect the health of their community (71.3%), was higher than those who didn't the p < 0.05. The percentage of subjects who accepted the vaccine from those who think it's very important for them that getting the COVID-19 vaccine would protect the health of their community (19.7%), was higher than those who didn't (p < 0.05).

The percentage of subjects who accepted the vaccine from those who think that people their age want to receive information about COVID-19 through the website (24.7%), was higher than those who didn't the $p < 0.05$. The percentage of subjects who accepted the vaccine from those who think that people their age want to receive information about COVID-19 through a smartphone app (36.0%), was higher than those who didn't the $p < 0.05$. The percentage of subjects who accepted the vaccine from those who think prevalence is important information about COVID-19 (46.9%), was higher than those who didn't the $p < 0.05$. The percentage of subjects who accepted the vaccine from those who think symptoms are important information about COVID-19 (75.3%), was higher than those who didn't; the $p < 0.05$. The percentage of subjects who accepted the vaccine from those who think transmission mode is important information about COVID-19 (68.3%), was higher than those who didn't the $p < 0.05$. The importance of avoidance information is not significantly associated with acceptance of COVID-19 vaccination ($p > 0.05$). The percentage of subjects who accepted the vaccine from those who think how to get tested is important information about COVID-19 (39.0%), was higher than those who didn't the $p < 0.05$. The importance of treatment information is not significantly associated with acceptance of COVID-19 vaccination ($p > 0.05$). The percentage of subjects who accepted the vaccine from those who think that management is important information about COVID-19 (68.8%), was higher than those who didn't; the $p < 0.05$.

Table 1: Distribution of studied subjects according to acceptance of COVID-19 vaccination and sociodemographic characteristics.

Variable	Categories	Acceptance of COVID-19 Vaccination				Total		X² (p-value)
		No		Yes				
		N	%	N	%	N	%	
Gender	Male	53	32.7	117	32.9	170	32.8	.001
	Female	109	67,3	239	67.1	348	67.2	(.973)
Nationality	Saudi	118	72.8	267	75.0	385	74.3	.272
	Non-Saudi	44	27.2	89	25.0	133	25.7	(.602)
Region of residency	Riyadh	26	16	22	6.2	48	9.3	25.738
	Makkah	101	62.3	270	75.8	371	71.6	(.001)
	Eastern	21	13.0	22	6.2	43	8.3	
	Madinah	12	7.4	26	7.3	38	7.3	
	Tabuk	0	0.0	6	1.7	6	1.2	
	Aseer	2	1.2	5	1.4	7	1.4	
	Najran	0	0.0	1	0.3	1	0.2	
	Albaha	0	0.0	4	1.1	4	0.8	
Educational Level	< High school	9	5.6	10	2.8	19	3.7	4.537
	High school	59	36.4	112	31.5	171	33.0	(.209)
	University	73	45.1	174	48.9	247	47.7	
	>University	21	13.0	60	16.9	81	15.6	
Income/ month SR	<5,000	48	29.6	65	18.3	113	21.8	14.118
	5,000 -	73	45.1	147	41.3	220	42.5	(.001)
	> 15,000	41	25.3	144	40.4	185	35.7	
Chronic condition	Yes	34	21.0	93	26.1	127	24.5	1.587
	No	128	79.0	263	73.9	391	75.5	(.208)
Tested for COVID-19	Yes	82	50.6	228	64.0	310	59.8	8.354
	No	80	49.4	128	36.0	208	40.2	(.004)
Diagnosed with COVID-19 infection	Yes	31	19.1	64	18.0	95	18.3	.100
	No	131	80.9	292	82.0	423	81.7	(.752)
Relatives infected	Yes	136	84.0	327	91.9	463	89.4	7.328
	No	26	16.0	29	8.1	55	10.6	(.007)
Healthcare providers advice on the COVID-19 vaccine	Yes	125	77.2	343	96.3	468	90.3	47.004
	No	37	22.8	13	3.7	50	9.7	(.000)
Knowledge level about covid19	None	2	1.2	3	0.8	5	1.0	3.194
	A little	13	8.0	31	8.7	44	8.5	(.363)
	Moderate	95	58.6	181	5.8	267	53.3	
	A lot	52	32.1	141	39.6	193	37.3	

Table 2: Distribution of studied subjects by Acceptance of COVID-19 Vaccination and their knowledge about it.

Variable	Categories	Acceptance of COVID-19 Vaccination				Total		X² (p-value)
		No		Yes				
		N	%	N	%	N	%	
Covid-19 is dangerous in subjects 65+ years	Yes	128	79.0	314	88.2	442	85.3	9.437 (.009)
	No	18	11.1	16	4.5	34	6.6	
	DN	16	9.9	26	7.3	42	8.1	
Covid-19 is infectious	Yes	148	91.4	350	98.3	498	96.1	22.890 (.000)
	No	10	6.2	0	0.0	10	1.9	
	DN	4	2.5	6	1.7	10	1.9	
COVID-19 is caused by the Flu virus	Yes	35	21.6	42	11.8	77	14.9	8.504 (.014)
	No	93	57.4	233	65.4	326	62.9	
	DN	34	1.0	81	22.8	115	22.2	
COV-19 always show S&S of being sick	Yes	31	19.1	33	9.3	64	12.4	10.637 (.005)
	No	122	75.3	307	86.2	429	82.8	
	DN	9	5.6	16	4.6	25	4.8	
People who get COVID-19 only have mild symptoms	Yes	82	50.6	140	39.3	222	42.9	5.823 (.054)
	No	66	40.7	180	50.6	246	47.5	
	DN	14	8.6	36	10.1	50	9.7	
Fever can be S&S of COVID-19	Yes	146	90.1	316	88.8	462	89.2	.213 (.644)
	No	16	9.9	40	11.2	56	10.8	
Cough can be a Sign of COVID-19	Yes	127	78.4	279	78.4	406	78.4	.000 (.995)
	No	35	21.6	77	21.6	112	21.6	
SOB/sore throat can be signs of Covid19	Yes	143	88.3	329	92.4	472	91.1	2.363 (.124)
	No	19	11.7	27	7.6	46	8.9	
A runny nose can be a Sign of COVID-19	Yes	69	42.6	153	43.0	222	42.9	.007 (.0935)
	No	93	57.4	203	57.0	296	57.1	
Muscle pain can be a Sign of COVID-19	Yes	111	68.5	284	79.8	395	76.3	7.791 (.005)
	No	51	31.5	72	20.0	123	23.7	
Headaches can be a Sign of COVID-19	Yes	140	86.4	307	86.2	447	68.3	.003 (.955)
	No	22	13.6	49	13.8	71	13.7	
Fatigue can be a Sign of COVID-19	Yes	68	42.0	175	49.2	243	46.9	2.306 (.129)
	No	94	58.0	181	50.8	275	53.1	
Diarrhoea can be a Sign of COVID-19	Yes	84	51.9	217	61.0	301	58.1	3.790 (.052)
	No	78	48.1	139	39.0	217	41.9	
Loss of smell/taste is a Sign of Covid-19	Yes	137	84.6	330	92.7	467	90.2	8.288 (.004)
	No	25	15.4	26	7.3	51	9.8	
Rash on the face can be a Sign of COVID-19	Yes	18	11.1	37	10.4	55	10.6	.606 (.806)
	No	144	88.9	319	89.6	463	89.4	
Blurry vision can be a Sign of COVID-19	Yes	10	6.2	28	7.9	38	7.3	.469 (.493)
	No	152	93.8	328	92.1	480	92.7	
Earache is a Sign of Covid-19	Yes	14	8.6	42	11.8	56	10.8	1.150 (.284)
	No	148	91.4	314	88.2	462	89.2	
Hair loss can be a Sign of COVID-19	Yes	14	8.6	35	9.8	49	9.5	.184 (.668)
	No	148	91.4	321	90.2	469	90.5	

Table 3: Distribution of studied subjects by Acceptance of COVID-19 Vaccination and knowledge about COVID-19 infection

Variable	categories	Acceptance of COVID-19 Vaccination				Total		X² (p-value)
		No		Yes				
		N	%	N	%	N	%	
COVID-19 after a person has recovered from it	Can't get it again	127	78.4	311	87.4	438	84.6	7.620 (.022)
	Can get it again	18	11.1	19	5.3	37	7.1	
	I don't know	17	10.5	26	7.3	43	8.3	
The amount of information about COVID-19	A little	14	8.6	23	6.5	37	7.1	1.339 (.512)
	A moderate	59	36.4	121	34.0	180	34.7	
	A lot	89	54.9	212	59.6	301	58.1	
Sources from which I received information on COVID-19	Newspaper	0	0.0	1	0.3	1	0.2	1.066 (.957)
	Magazines	1	0.6	2	0.6	3	0.6	
	Radio	19	11.7	44	12.4	63	12.2	
	Local news	17	10.5	31	8.7	48	9.3	
	National news	99	61.1	215	60.4	314	60.6	
	Social media	26	16.0	63	17.7	89	17.2	
Sources you would trust the most for news and information about COVID-19	Magazines	1	0.6	3	0.8	4	0.8	26.331 (.000)
	Radio	2	1.2	5	1.4	7	1.4	
	Local news	16	9.9	67	18.8	83	16.0	
	National news	48	29.6	150	42.1	198	38.2	
	Social media	42	25.9	58	16.3	100	19.3	
	Internet	46	28.4	70	19.7	116	22.4	
	Newspaper	7	4.3	3	0.8	10	1.9	
The information on COVID-19 across different sources	the same	94	58.0	246	69.1	340	65.6	6.056 (.014)
	conflicting	68	42.0	110	30.9	178	34.4	
Fake news about the COVID-19 vaccine	None at all	12	7.4	6	1.7	18	3.5	12.289 (.006)
	A little	54	33.3	129	36.2	183	35.3	
	A moderate	50	30.9	131	36.8	181	34.9	
	A lot	46	28.4	90	25.3	136	26.3	
Information about Covid-19	Came from animals	43	26.5	150	42.1	193	37.3	30.980 (.000)
	Was made on purpose in a lab	101	62.3	131	36.8	232	44.8	
	Made accidentally in a lab	12	7.4	61	17.1	73	14.1	
	Does not exist	6	3.7	14	3.9	20	3.9	
Tested by PCR for COVID-19	Yes	79	48.8	218	61.2	297	57.3	7.078 (.008)
	No	83	51.2	138	38.8	221	42.7	
Places you went to get tested for COVID-19	A drive-thru	52	32.1	139	39.0	191	36.9	3.713 (.156)
	A test was mailed to my home	9	5.6	27	7.6	36	6.9%	
	Other	101	62.3	190	53.4	291	56.2	

Table 4: Distribution of studied subjects by Acceptance of COVID-19 Vaccination and knowledge about COVID-19 infection

Variable	Categories	Acceptance of COVID-19 Vaccination				Total		X² (p-value)
		No		Yes				
		N	%	N	%	N	%	
Have been told that you have COVID-19 by a doctor	Yes	23	14.2	46	12.9	69	13.3	.157 (.692)
	No	139	85.8	310	87.1	449	86.7	
Thought you had COVID-19 due to symptoms only	Yes	60	37.0	90	25.3	150	29.0	7.480 (.006)
	No	102	63.0	266	74.7	368	71.0	
Relatives diagnosed with COVID-19	Yes	106	65.4	248	69.7	354	68.3	.921 (.337)
	No	56	34.6	108	30.3	164	31.7	
COVID-19 is a threat to your physical health	Not a threat	43	26.5	51	14.3	94	18.1	16.122 (.001)
	Minor	47	29.0	108	30.3	155	29.9	
	Moderate	37	22.8	130	36.5	167	32.2	
	Major	35	21.6	67	18.8	102	19.7	
COVID-19 is a threat to your mental health	Not a threat	93	57.4	206	57.9	299	57.7	1.472 (.689)
	Minor	37	22.8	71	19.9	108	20.8	
	Moderate	23	14.2	50	14.0	73	14.1	
	Major	9	5.6	29	8.1	38	7.3	
COVID-19 is a threat to the health of Saudi Arabia's population	Not threat	14	8.6	19	5.3	33	6.4	16.642 (.001)
	Minor	47	29.0	62	17.4	109	21.0	
	Moderate	70	43.2	157	44.1	227	43.8	
	Major	31	19.1	118	33.1	149	28.8	
COVID-19 is a threat to your financial safety	Not a threat	45	27.8	106	29.8	151	29.2	2.213 (.529)
	Minor	31	19.1	80	22.5	111	21.4	
	Moderate	45	27.8	99	27.8	144	27.8	
	Major	41	25.3	71	19.9	112	21.6	
COVID-19 is a threat to your local community	Not a threat	30	18.5	41	11.5	71	13.7	14.621 (.002)
	Minor	52	32.1	79	22.2	131	25.3	
	Moderate	57	35.2	152	42.7	209	40.3	
	Major	23	14.2	84	23.6	107	20.7	

Table 5: Distribution of studied subjects by Acceptance of COVID-19 Vaccination and Practice

Variable	Categories	Acceptance of COVID-19 Vaccination				Total		X² (p-value)
		No		Yes				
		N	%	N	%	N	%	
Fear of getting COVID-19	Yes	67	41.4	178	50.0	245	47.3	3.336
	No	95	58.6	178	50.0	273	52.7	(.068)
Worry about friends and family due to COVID-19	Yes	101	62.3	279	78.4	380	73.4	14.630
	No	61	37.7	77	21.6	138	26.6	(.000)
Experienced Boredom due to COVID-19	Yes	70	43.2	151	42.2	221	42.7	.029
	No	92	56.8	205	57.6	297	57.3	(.865)
Experienced frustration due to COVID-19	Yes	57	35.2	108	30.3	165	31.9	1.206
	No	105	64.8	248	69.7	353	68.1	(.272)
Experienced anxiety due to COVID-19	Yes	61	37.7	150	42.1	211	40.7	.926
	No	101	62.3	206	57.9	307	59.3	(.336)
Experienced depression due to COVID-19	Yes	58	35.8	123	34.6	181	34.9	.077
	No	104	64.2	233	65.4	337	65.1	(.782)
Experienced sleeping trouble due to COVID-19	Yes	35	21.6	66	18.5	101	19.5	.667
	No	127	78.4	290	81.5	417	80.5	(.414)
Experienced increased sexual activity due to COVID-19	Yes	6	3.7	10	2.8	16	3.1	.298
	No	156	96.3	346	97.2	502	96.9	(.585)
Experienced decreased sexual activity due to COVID 19	Yes	6	3.7	20	5.6	26	5.0	.856
	No	156	96.3	336	94.4	492	95.0	(.355)
Experienced loneliness due to COVID-19	Yes	41	52.3	118	33.1	159	30.7	3.215
	No	121	74.7	238	66.9	359	69.3	(.073)
Experienced confusion due to COVID-19	Yes	33	20.4	76	21.3	109	21.0	.064
	No	129	79.6	280	78.7	409	79.0	(.800)

Table 6: Distribution of studied subjects by Acceptance of COVID-19 Vaccination and attitude

| Variable | Categories | Acceptance of COVID-19 Vaccination | | | | Total | | X² (p-value) |
| | | No | | Yes | | | | |
		N	%	N	%	N	%	
The chance that you will get COVID-19 in the future	No chance	23	14.2	33	9.3	56	10.8	4.962 (.175)
	A little	94	58.0	198	55.6	292	56.4	
	Moderate	32	19.8	96	27.0	128	24.7	
	High	13	8.0	29	8.1	42	8.1	
It would be serious if you got COVID-19	Not at all	30	18.5	40	11.2	70	13.5	9.267 (.026)
	A little	71	43.8	136	38.2	207	40.0	
	Moderately	44	27.2	132	37.1	176	34.0	
	Very	17	10.5	48	13.5	65	12.5	
We need our normal routines instead of worrying about protective behaviours	Strongly agree	56	34.6	117	32.9	173	33.4	6.996 (.136)
	Agree	38	23.5	56	15.7	94	18.1	
	Not sure	20	12.3	67	18.8	87	16.8	
	Disagree	35	21.6	81	22.8	116	22.4	
	Strongly disagree	13	8.0	35	9.8	48	9.3	
It's a crime if people know they have COVID-19 and don't do protective behaviours.	Strongly agree	83	51.2	281	78.9	364	70.3	50.862 (.000)
	Agree	40	24.7	51	14.3	91	17.6	
	Not sure	18	11.1	17	4.8	35	6.8	
	Disagree	12	7.4	3	0.8	15	2.9	
	Strongly disagree	9	5.6	4	1.1	13	2.5	
People who test positive for COVID-19 should be isolated	Strongly agree	91	56.2	300	84.3	391	75.5	58.988 (.000)
	Agree	48	29.6	50	14.0	98	18.9	
	Not sure	11	6.8	5	1.4	16	3.1	
	Disagree	10	6.2	1	0.3	11	2.1	
	Strongly disagree	2	1.2	0	0.0	2	0.4	
You're willing to get the COVID-19 vaccine if it was free	Definitely	0	0.0	356	100.0	356	68.7	518.000 (.000)
	Probably	44	27.2	0	0.0	44	8.5	
	Not sure	40	24.7	0	0.0	40	7.7	
	Probably not	29	17.9	0	0.0	29	5.6	
	Not	49	30.2	0	0.0	49	9.5	
Doctors would recommend taking the COVID-19 vaccine	YES	120	74.1	347	97.5	467	90.2	68.669 (.000)
	NO	42	25.9	9	2.5	51	9.8	
If I decided to get the COVID-19 vaccine, it would be hard to find a provider or clinic	Strongly agree	16	9.9	33	9.3	49	9.5	15.175 (.004)
	Agree	27	16.7	37	10.4	64	12.4	
	Not sure	53	32.7	81	22.8	134	25.9	
	Disagree	32	19.8	117	32.9	149	28.8	
	Strongly disagree	34	21.0	88	24.7	122	23.6	

Table 7: Distribution of studied subjects by Acceptance of COVID-19 Vaccination and attitude

Variable	Categories	Acceptance of COVID-19 Vaccination				Total		X² (p-value)
		No		Yes				
		N	%	N	%	N	%	
The COVID-19 vaccine might have side effects, like fever or soreness in the arm.	Strongly agree	76	46.9	199	55.9	275	53.1	37.890 (.000)
	Agree	50	30.9	138	38.8	188	36.3	
	Not sure	26	16.0	18	5.1	44	8.5	
	Disagree	6	3.7	1	0.3	7	1.4	
	Strongly disagree	4	2.5	0	0.0	4	0.8	
Your opinion on the effectiveness of the COVID-19 vaccine	Not at all	60	37.0	12	3.4	72	13.9	159.437 (.000)
	A little	42	25.9	35	9.8	77	14.9	
	A Moderate	53	32.7	210	59.0	263	50.8	
	High	6	3.7	99	27.8	105	20.3	
	Other	1	0.6	0	0.0	1	0.2	
Factors would matter to you in deciding whether or not to get the COVID-19 vaccine	My age	9	5.6	51	14.3	60	11.6	28.245 (.002)
	My ethnicity	1	0.6	1	0.3	2	0.4	
	My health state	38	23.5	103	28.9	141	27.2	
	If I had recently travelled	15	9.3	14	3.9	29	5.6	
	Coverage by health insurance	1	0.6	4	1.1	5	1.0	
	If a doctor recommends it	6	3.7	15	4.2	21	4.1	
	Effect of vaccine	31	19.1	52	14.6	83	16.0	
	Period of vaccine protection	15	9.3	47	13.2	62	12.0	
	Side effects of the vaccine	24	14.8	22	6.2	46	8.9	
	The opinions of relatives	4	2.5	14	3.9	18	3.5	
	Magnitude of COVID-19	18	11.1	33	9.3	51	9.8	
COVID-19 vaccine protects your health	Extremely	5	3.1	216	60.7	221	42.7	276.026 (.000)
	Very	17	10.5	75	21.1	92	17.8	
	Fairly	38	23.5	50	14.0	88	17.0	
	Slightly	23	14.2	10	2.8	33	6.4	
	Not at all	79	48.8	5	1.4	84	16.2	
COVID-19 vaccine would protect the health of your relatives	Extremely	25	15.4	259	72.8	284	54.8	235.476 (.000)
	Very	21	13.0	66	18.5	87	16.8	
	Fairly	42	25.9	23	6.5	65	12.5	
	Slightly	24	14.8	4	1.1	28	5.4	
	Not at all	50	30.9	4	1.1	54	10.4	

Table 8: Distribution of studied subjects by Acceptance of COVID-19 Vaccination and attitude

Variable	Categories	Acceptance of COVID-19 Vaccination				Total		X² (p-value)
		No		Yes				
		N	%	N	%	N	%	
The importance that getting the COVID-19 vaccine would protect the health of your community	Extremely	20	12.3	254	71.3	274	52.9	246.164 (.000)
	Very	25	15.4	70	19.7	94	18.3	
	Fairly	52	32.1	25	7.0	77	14.9	
	Slightly	9	5.6	6	1.7	15	2.9	
	Not at all	56	34.6	1	0.3	57	11.0	
People your age want to receive information about COVID-19 through	Website	36	22.2	88	24.7	124	23.9	24.629 (.003)
	Smartphone app	37	22.8	128	36.0	165	31.9	
	Email	5	3.1	6	1.7	11	2.1	
	Text messages	23	14.2	54	15.2	77	14.9	
	Telephone call with a health educator	13	8.0	24	6.7	37	7.1	
	DVD sent through the mail	1	0.6	0	0.0	1	0.2	
	Brochure sent through the mail	1	0.6	5	1.4	6	1.2	
	In-person with a health educator	16	9.9	22	6.2	38	7.3	
	Video chat with a health educator	10	6.2	14	3.9	24	4.6	
	OTHER	20	12.3	15	4.2	35	6.8	
Prevalence is important information about COVID-19	YES	49	30.2	167	46.9	216	41.7	12.716 (.000)
	NO	113	69.8	189	53.1	302	58.3	
Symptoms are important information about COVID-19	YES	103	63.6	268	75.3	371	71.6	7.499 (.006)
	NO	59	36.4	88	24.7	147	28.4	
The transmission mode is important information about COVID-19	YES	81	50.0	243	68.3	324	62.5	15.844 (.000)
	NO	81	50.0	113	31.7	194	37.5	
Avoidance is important information about COVID-19	YES	88	54.3	220	61.8	308	59.5	2.582 (.108)
	NO	74	45.7	136	38.2	210	40.5	
How to get tested is important information about COVID-19	YES	41	25.3	139	39.0	180	34.7	9.265 (.002)
	NO	121	74.7	217	61.0	338	65.3	
Treatment is important information about COVID-19	YES	84	51.9	196	55.1	280	54.1	.460 (.497)
	NO	78	48.1	160	44.9	238	45.9	
Management is important information about COVID-19	YES	87	53.7	245	68.8	332	64.1	11.055 (.001)
	NO	75	46.3	111	31.2	186	35.9	

Discussion

The present study aimed to assess the acceptance of a COVID-19 vaccine and its related determinants among the general adult population in Jeddah, Saudi Arabia. Previous studies found that older females display hesitation toward COVID-19 vaccination (19), while the male gender was an important determinant for acceptance of COVID-19 vaccination. This result could be due to the reportedly high rates of COVID-19-related morbidity and mortality among male infected patients (17). Furthermore, women tend to support conspiracy theories in a higher proportion than men, which may be one of the factors that can explain women's higher resistance to vaccination (19). However, in the present study gender and nationality were not significantly associated with acceptance of COVID-19 vaccination.

Vaccination is considered one of the most outstanding public health inventions in the 21st century. However, its acceptance is varied with space, time, social class, ethnicity, and contextual human behavior (26). In the present study, subjects residing in the Makkah region had the highest acceptance rate compared to other areas. Previous studies revealed that college and/or graduate degree holders (75%) compared to people with less than a college degree were more likely to accept the vaccine (27). In the present study, educational level was not significantly associated with acceptance of COVID-19 vaccination. In the present study subjects with high monthly income were more likely to accept the vaccine against COVID-19 infection. This is in line with previous studies (28-30). In the present study, the presence of self-reported health status (having chronic medication) was associated with higher acceptance of the COVID-19 vaccine. This is in line with a previous study (31). In the present study, participants who had tested negative for COVID-19 were more willing to take the COVID-19 vaccine. This is consistent with a previous study (32). On the other hand, in the present study, getting COVID-19 infection was not significantly associated with acceptance of COVID-19 vaccination, while those with relatives infected with COVID-19 were more willing to get the vaccine. In the present study, participants' trust in the health system and perceived risk of acquiring infection were found to be significantly associated with the acceptance of the COVID-19 vaccine. This is in line with a previous study (14). Higher knowledge about COVID-19 was not significantly associated with acceptance of COVID-19 vaccination. This is not in line with a previous study (32). Older age on admission to hospital with COVID-19 infection was associated with increased death (33). In the present study, those who accepted the vaccine realized that. COVID-19 spreads primarily through contact with an infected person when they cough or sneeze. It also spreads when a person touches a surface or object that has the virus on it, then touches their eyes, nose or mouth, and it is more harmful than flu (34, 35). In the present study, acceptance of the vaccine was associated with increased knowledge about clinical aspects of the COVID-19 infection. This was in line with a previous study (32). Participants who were concerned about acquiring infection with the COVID-19 virus were more likely to accept the COVID-19 vaccine compared with those who were not concerned with the infection (14). This was not in line with findings from the present study. Acceptance of the vaccine was associated with the perception that COVID-19 infection was a threat to the community. This was in line with a previous study (36). The chance of getting COVID-19 in the future was not significantly associated with acceptance of COVID-19 vaccination. This was in line with a report from a previous study (37). Acceptance of the vaccine was associated with the perception of the severity and harmful effects of getting infected with COVID-19. This was in line with a previous study (7). Acceptance of the vaccine was associated with the conception that it was a crime if one got infected and did not isolate from the public. This was in line with a previous study (38).

A previous study revealed that the majority of the participants were willing to have the COVID-19 vaccine if it was provided free by the government (16). This was similar to findings from the present study. One of the strongest correlates of vaccine acceptability was whether participants thought their healthcare provider would recommend they get vaccinated against COVID-19. Provider recommendations are a key determinant of vaccination behaviors (20). This was similar to findings from the present study. Acceptance of the vaccine was associated with the perception that the vaccine has moderate or high effectiveness. This was in line with previous studies (21, 22). Acceptance of the vaccine was associated with the perception that the vaccine is important for the elderly, and the health history and the health of their relatives and friends. These were in line with previous studies (3, 7). Acceptance of the vaccine was significantly associated with getting source information from official and government websites, mainstream news media, and social media. This was consistent with a previous study (39). Because early clinical presentations of infected patients are non-specific, testing is needed to confirm the diagnosis of COVID-19 (40). This was similar to findings from the present study, particularly among those who accepted the vaccine.

Limitations
There are some limitations to this study: as this study is cross-sectional, the causal relationship remains unknown, and we do not know if the effects of these variables on acceptance of the COVID-19 vaccine during the COVID-19 pandemic will persist in the long term. It is also a nonprobability convenient sample, and its generalization to the population may be defective; however, it is an exploratory study.

Acknowledgements

Conclusion

About one-third of the population does not accept the vaccine, particularly, those with low income. Increasing the knowledge of the people about the clinical aspects, and health impact of the virus of COVID-19 on the population and the community are important interventions to increase the acceptance rate of the population.

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