

Monitoring COVID-19 Vaccine Acceptance in Kuwait During the Pandemic: Results from a National Serial Study

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Background: With COVID-19 cases on the rise globally and two approved vaccines, determining vaccine acceptance is imperative to avoid low inoculation rates. The aim of this study was to evaluate the changes and determinants of vaccine acceptance among citizens and non-citizens, over time during the pandemic in Kuwait.

Methods: Data were obtained from the COVID-19 Snapshot Monitoring (COSMO Kuwait) study that was implemented according to the WHO tool for behavioral insights on COVID-19. Data was collected online, every two weeks throughout the pandemic. Individuals living in Kuwait during the pandemic were surveyed, representing an independent sample of the population during each data collection wave.

Results: A total of 7241 adults living in Kuwait participated. Sixty-seven percent of those participating agreed to take a vaccine if it was available and recommended. However, the proportion of vaccine acceptance drastically dropped overtime as COVID-19 related restrictions were eased, among citizens (73 to 47%) and noncitizens (80 to 60%). Some factors associated with increased odds of agreeing to take the COVID-19 vaccine, among citizens and non-citizens, included increased frequency of informing oneself about the virus (OR, 1.34–1.83; 95% confidence interval 1.16–2.55), having high versus low confidence in doctors (OR, 1.79–2.11; CI 1.17–3.80), increased agreement with containment policies (OR, 1.11–1.27; CI 1.05–1.41), expressing more fears and worries (OR, 1.05–1.12; 1.01–1.24), and the increased perceived likelihood of getting infected with influenza (OR, 1.3–1.4; CI 1.03–1.84). Decreased odds of agreement were associated with increased age (OR, 0.37–0.61; CI 0.26–0.95), being female (OR, 0.56–0.62; CI 0.43–0.73), and not taking the influenza vaccine in 2019 (OR, 0.61; CI 0.43–0.87).

Conclusion: Vaccine acceptance was multifactorial, heterogenous among citizens and non-citizens, and changed over time. While acceptance was relatively high, it decreased throughout the pandemic and as restrictions in the country loosened. This increase in vaccine hesitancy reveals a challenge in achieving high inoculation levels, and the need for effective vaccine-promotion campaigns and increased health education in the country.

Keywords: vaccine acceptance, coronavirus, Kuwait, COVID-19 vaccine

Introduction

As COVID-19 global cases continue to rise, pharmaceutical companies globally are competing to develop a vaccine rapidly. According to the World Health Organization (WHO), there are currently over 50 COVID-19 vaccine candidates in development, two of which have been approved for full use as of Dec, 18, 2020.^{1,2} However, while high-income countries such as Kuwait are securing

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agreements to obtain enough COVID-19 vaccines,^{3,4} this unprecedented and rapid development of the vaccines can raise safety concerns among people that can be a barrier to full population inoculation against COVID-19. Producing an effective vaccine may only be the beginning of a long, challenging race to gain widespread acceptance of the vaccine.⁵

Past pandemics such as Influenza A (H1N1) and SARS highlighted vaccine hesitancy in certain populations.⁶ Studies during and after these pandemics indicated that people are often concerned about the side effects of vaccines and their effectiveness.⁷ Certain groups, such as those with lower-income or no formal educational background, have shown to be more hesitant due to misconceptions, or fears of vaccines.^{8,9}

Public acceptance of vaccines varies globally, and in 2019 the WHO declared vaccine hesitancy a top ten threat.¹⁰ Between 2015 and 2019, Figueiredo et al mapped global trends in public confidence in vaccines across 149 countries. They identified that confidence in vaccines remains low in Europe when compared to other continents and countries such as India, Mexico, and Thailand. Between 2015 and 2019 vaccine confidence had increased in the aforementioned countries. Within Europe, France in 2015 had had the lowest estimated percentage of respondents agreeing that vaccines are safe (8.9%, 95% HPD interval 7.2–10.5). Vaccine acceptance was highest in Argentina, Liberia and Bangladesh and lowest in Japan. In some countries such as Indonesia, confidence in vaccines dropped between 2015 and 2019. Across three elements, Indonesia saw a 13.8% drop in vaccine safety, 14% decrease in importance, and 12.2% decrease in effectiveness. This decline was influenced by religious leaders questioning the safety of the measles, mumps, and rubella vaccine.¹¹ In 2020, a global survey on the potential acceptance of a COVID-19 vaccine was conducted in 19 countries.¹² Unfortunately, neither Kuwait nor close neighboring countries were included in this study. However, findings indicated that 71.5% of participants would be somewhat likely to take a COVID-19 vaccine, and 61.4% would accept their employer's recommendation to take the vaccine.

Therefore, amid the global pandemic, it is crucial to determine vaccine acceptance in Kuwait as a vaccine may be available in the country by the end of 2020.^{13,14} While the Kuwaiti government is keen on providing its people with a vaccine, the public's potential acceptance of taking the COVID-19 vaccine has not yet been assessed. Changes

in people's acceptance level where the epidemiology of COVID-19 and its related policies have erratically varied in the country have not yet been evaluated either. Furthermore, evaluating vaccine acceptance among citizens and non-citizens living in Kuwait is crucial to determine disparities and avoid low inoculation rates; especially if inoculation is not mandated. Understanding the level of people's vaccine acceptance and its determinates is essential as it can aid policymakers. Health officials can tailor and deliver practical and strategic vaccine-acceptance messages to minimize hesitancy and misinformation regarding the vaccine. This study aims to assess vaccine acceptance, among citizens and non-citizens, overtime during the pandemic in Kuwait. The study will also evaluate the determinants of COVID-19 vaccine acceptance among citizens and non-citizens.

Methods

Study Design and Participants

Our study used data from the "Kuwait COVID-19 Snapshot Monitoring (COSMO Kuwait)" study.¹⁵ COSMO Kuwait is a serial cross-sectional study that aims to monitor knowledge, risk perceptions, preventive behaviors, and public trust during the COVID-19 outbreak in Kuwait. All countries participating in the COSMO studies follow the WHO standard protocol,¹⁶ which ensures similar objectives, data collection method, survey tool, and data presentation and analyses methods among the eleven participating countries.

Data was collected using a 15-minute online survey, where a convenience sampling technique was utilized. The survey was administered using several social media platforms: WhatsApp, Instagram, Twitter, Snapchat, as well as emails. Data collection started at the most critical time in the country, during the complete lockdown, and continued every two weeks for 2–4 days during each wave. The political and epidemiological situation represented by each data collection wave is highlighted in [Figure 1](#).

The study participants consisted of citizens and non-citizens aged 18–74 years, who were living in Kuwait during the COVID-19 pandemic. Participants were only able to complete the survey once, and an IP-based duplicate protection system was used to ensure validity. A brief introduction to the study and its objective were provided to the participants. Following the introduction, participants were requested to provide consent in order to begin

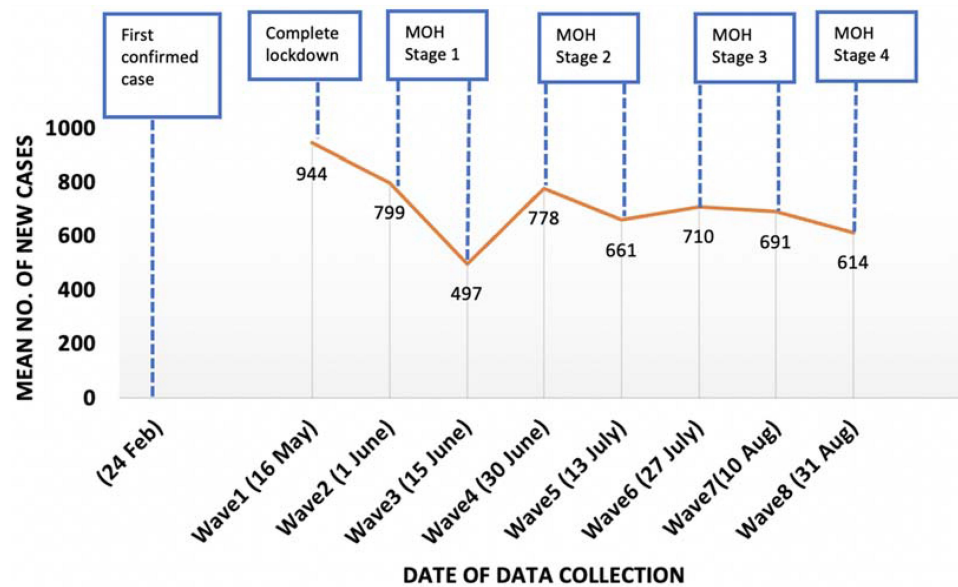


Figure 1 National epidemic trend of new COVID-19 cases and political situation in Kuwait, May–August 2020.

Notes: Complete lockdown, closure of the entire country's facilities and institutions, with exception to supermarkets, and full curfew with a maximum of 2 hours per day for exercise; Ministry of Health (MOH) stage 1 of the government's restoration to normality plan, with partial curfew from 6:00 p.m. to 6:00 a.m., and some reopening of industrial activities, public services, and home delivery for restaurants and retail shops; MOH Stage 2, with partial curfew from 8:00 p.m. to 6:00 a.m., and further openings including workplaces (less than 30%), finance and banking, commercial complexes, retail shops, restaurants (take away only), gardens and public parks; MOH Stage 3, with partial curfew from 9:00 p.m. to 05:00 a.m., and opening of workplaces (less than 50%), social welfare home visits, hotels, resorts, and hotel apartments, taxis, mosques to allow group Friday prayers; MOH Stage 4, with no curfew, and opening of workplace (more than 50%), restaurants and cafes (with social distancing), public transportations, personal care shops (salons, shaving, spa), and public and private sports courts.

completing the survey. This was done similarly to the original WHO questionnaire.

Data Measurement Tool

The survey tool used by the COSMO studies was developed by the University of Erfurt Germany and the COSMO group.¹⁶ The survey included previously validated questions; however, it was further modified through 3 rounds of validation.¹⁶ The English questionnaire was translated and back-translated to Arabic, in order to be administered in both languages.

The data used in this study were obtained from the following sections of COSMO Kuwait's survey: sociodemographic, knowledge about COVID-19, risk perceptions, preparedness and perceived self-efficacy, preventive measures, information and trust, policies, panic and fears, and influenza. The primary outcome of this study was based on a policy question that assessed vaccine acceptance among participants: If a vaccine becomes available and is recommended for me, I would get it. It was measured using a 7-point Likert scale from 1 (strongly disagree) to 7 (strongly agree). Values from 1–4 indicated disagreement or less likely to agree (Disagree), while 5–7 indicated agreement or more likely to take the vaccine (Agree).

Predictors included sociodemographic characteristics (Table 1), knowledge about COVID-19, risk perceptions, preparedness and perceived self-efficacy, preventive measures, information and trust, policies, panic and fear, and influenza (Table 2). All numeric predictors were all measured using a Likert scale from 1–7. To assess real knowledge, responses to the five questions on treatment, transmission, transmission route, incubation and immunity for each participant were summed and then scaled to 1–7 (Cronbach α 0.6). Participants' knowledge relating to preventative measures was assessed using 14 questions (Cronbach α 0.7). Correct preventative measures included washing hands, avoiding touching eyes, nose and mouth, using sanitizers, staying home when sick, covering mouth when coughing, wearing a face mask and social distancing. Misinformation regarding preventative measures included taking herbal supplements, food supplements, avoiding meat, getting flu shot, using antibiotics, drinking giber tea, and using homoeopathic remedies). A score of 1 was assigned if the participant responded to preventative measure with a "yes", and 0 if otherwise. Taking preventative measures was assessed by calculating how many of the 14 preventative measures the participant took (Cronbach α 0.8), of which only the seven correct

Table 1 Participant Characteristics and the Association with Agreement Towards Taking the COVID-19 Vaccination, Kuwait, May–Aug, 2020

Variables	Total			Kuwaiti			Non-Kuwaiti			p-value			
	n	%/Mean	Agree %/Mean	n	%/Mean	Agree %/Mean	n	%/Mean	Agree %/Mean				
Total	7241	100.00	32.65	67.35	5651	100.00	34.79	65.21	1,590	100.00	25.03	74.97	
MOH Stage€													
Complete lockdown	1,846	25.49	19.04	28.62	1,243	22.00	16.84	24.75	603	37.92	29.90	40.60	<0.001***
Stage 1	2,144	29.61	26.95	30.90	1,643	29.07	25.64	30.91	501	31.51	33.42	30.87	
Stage 2	1,607	22.19	20.98	22.78	1,336	23.64	21.36	24.86	271	17.04	19.10	16.36	
Stage 3	894	12.35	16.62	10.27	746	13.20	17.80	10.75	148	9.31	10.80	8.81	
Stage 4	750	10.36	16.41	7.42	683	12.09	18.36	8.74	67	4.21	6.78	3.36	
Gender													
Male	1,978	27.32	21.83	29.98	1,321	23.38	19.68	25.35	657	41.32	32.41	44.30	<0.001***
Female	5,263	72.68	78.17	70.02	4,330	76.62	80.32	74.65	933	58.68	67.59	55.70	
Age (years)													
Age (continuous)	7,241	38.03	39.82	37.16	5,651	38.25	40.13	37.25	1,590	37.24	38.29	36.89	0.040*
18–29	2,063	28.49	23.14	31.08	1,593	28.19	22.08	31.45	470	29.56	28.39	29.95	0.541
30–44	2,968	40.99	42.30	40.35	2,279	40.33	42.42	39.21	689	43.33	41.71	43.88	
45–59	1,762	24.33	26.69	23.19	1,397	24.72	27.01	23.50	365	22.96	25.13	22.23	
60–74	448	6.19	7.87	5.37	382	6.76	8.49	5.83	66	4.15	4.77	3.94	
Governorate													
Capital	1,396	19.28	21.02	18.43	1,257	22.24	23.60	21.52	139	8.74	8.29	8.89	0.565
Ahmadi	927	12.80	11.84	13.27	729	12.90	12.21	13.27	198	12.45	10.05	13.26	
Farwaniya	851	11.75	10.83	12.20	674	11.93	10.83	12.51	177	11.13	10.80	11.24	
Hawalli	2,512	34.69	35.07	34.50	1,628	28.81	30.21	28.06	884	55.60	59.05	54.45	
Jahra	396	5.47	4.30	6.03	278	4.92	3.76	5.54	118	7.42	7.04	7.55	
Mubarak Alkabeer	1,159	16.01	16.92	15.56	1,085	19.20	19.38	19.10	74	4.65	4.77	4.61	
Education													
No formal education	21	0.29	0.34	0.27	12	0.21	0.25	0.19	9	0.57	0.75	0.50	0.050*
High school or less	660	9.11	7.02	10.13	425	7.52	6.31	8.17	235	14.78	10.55	16.19	
University	5,204	71.87	72.55	71.54	4,213	74.55	73.96	74.87	991	62.33	65.58	61.24	
Post-graduate	1,356	18.73	20.09	18.06	1,001	17.71	19.48	16.77	355	22.33	23.12	22.06	

Table 1 (Continued).

Variables	Total			Kuwaiti			Non-Kuwaiti			p-value
	n	%/ Mean	Agree %/Mean	n	%/ Mean	Disagree %/Mean	Agree %/Mean	Disagree %/Mean	Agree %/Mean	
Know others infected with COVID-19	3,490	48.20	51.02	2,951	52.22	53.41	51.59	39.20	32.13	0.006**
	163	2.25	2.37	105	1.86	1.78	1.90	5.28	3.10	
	3,315	45.78	42.85	2,406	42.58	41.30	43.26	50.50	59.40	
	273	3.77	3.76	189	3.34	3.51	3.26	5.03	5.37	

Notes: Acceptance was measured using a Likert scale ranging from 1 to 7; 1–4 indicated disagreement or less likely to agree (Disagree), while 5–7 indicated agreement or more likely to take the vaccine (Agree). © Ministry of Health return to normality stages a P-value for agreement (disagree vs agree); *P-value <0.05, **p-value<0.01, ***P-value<0.001; values in bold are statistically significant. P-values for categorical variables were obtained by Chi-squared test, and for continuous variables by the t-test.

preventive measures were assigned a score of 1 each. Panic was measured using three questions on panic buying (bought extra medications, food and disinfectants on a larger scale) and five questions on behaviors (avoided people from certain countries, social events, visited family, asked the family not to visit and decided child could not meet with friends) (Cronbach α 0.7). Participants who responded with “already did that” or “plan to do that” were assigned a score of 1. Mean scores within each predictor category were averaged for each participant and then scaled up to 1–7, to ease comparisons, as per the COSMO protocol.¹⁶ Seven questions on fears (Cronbach α 0.7) were also included (worrying about losing someone, Health System overloading, small companies running out of business, recession, restricted food supplies, egoism, and becoming unemployed). Questions were measured on a scale from 1–7, where 1 indicated “don’t worry at all” and 7 “worry a lot”. The mean of the 7 responses was calculated to reflect the participants’ overall fears and worries. The complete survey questions used have been published elsewhere.¹⁶

Analysis

The chi-square test, chi-square test for trend and t-test were used to assess the statistical significance of the COVID-19 vaccine acceptance (disagree vs agree) with categorical, ordinal and continuous variables, respectively. Two multivariable logistic regression models were performed by nationality (Kuwaiti/non-Kuwaiti), using the backward elimination method to identify factors related to people agreeing to take the vaccine (dependent variable). Univariate analyses were used to assess the magnitudes of the associations between the independent and dependent variables. Only independent predictors with p-value <0.01 were included in the model. All logistic regression models adhered to the goodness-of-fit test (p-value>0.05) and analyses were conducted using STATA software (StataCorp LP, Texas, USA).

Results

A total of 7241 adults participated in this study, of which 72.7% were female, and 78% were Kuwaiti (Table 1). Kuwaitis and non-Kuwaitis (non-citizens) had relatively the same age (38.3 vs 37.2 years). The majority of the participants were 30–44 years old (41%), lived in the Hawalli governorate (35%), attained a university degree (72%), had lower-middle income

Table 2 Association Between Knowledge, Risk Perceptions, Preparedness and Perceived Self-Efficacy, Precautionary Measures, Information and Trust, Policies, Panic Behaviours and Fear, and the Seasonal Influenza on Agreement Towards Taking the COVID-19 Vaccination, Kuwait, May–Aug, 2020

Variables	Total n=(7241)			Kuwaiti n=(5651)			Non-Kuwaiti n=(1590)			p-value
	n	%	Mean	n	%	Mean	n	%	mean	
Knowledge about COVID-19										
Perceived knowledge †	7,241	5.45	5.41	5.47	5.45	5.41	5.46	5.48	5.42	0.182
Real knowledge †	7,241	6.18	6.11	6.21	6.16	6.09	6.19	6.24	6.21	<0.001***
Risk perceptions										
Probability of getting COVID-19 infection										
Extremely unlikely	2,514	34.72	34.26	34.94	1,885	33.36	33.57	39.56	37.69	0.218
Partly likely	1,832	25.30	26.82	24.56	1,466	25.94	27.11	23.02	25.38	
Extremely likely	2,895	39.98	38.92	40.50	2,300	40.70	39.32	37.42	36.93	
Susceptibility of getting infected with COVID-19										
Not/less susceptible	2,830	39.08	38.32	39.45	2,131	37.71	37.23	43.96	43.72	0.277
Partly susceptible	1,959	27.05	28.93	26.14	1,574	27.85	29.15	24.21	27.89	
More/very susceptible	2,452	33.86	32.74	34.41	1,946	34.44	33.62	31.82	28.39	
Severity of COVID-19, if infected										
Not/less severe	2,086	28.81	26.95	29.71	1,523	26.95	25.84	35.41	32.41	0.295
Partly severely	2,355	32.52	33.84	31.88	1,899	33.60	34.69	28.68	29.65	
More/very severe	2,800	38.67	39.21	38.40	2,229	39.44	39.47	35.91	37.94	
Preparedness and perceived self-efficacy										
Preparedness towards COVID-19										
Not at all	285	3.94	4.74	3.55	239	4.23	4.88	46	4.02	0.002**
Somewhat	658	9.09	11.13	8.10	556	9.84	11.44	102	9.55	
Very much so	6,298	86.98	84.14	88.35	4,856	85.93	83.67	1,442	86.43	

(Continued)

Table 2 (Continued).

Variables	Total n=(7241)			Kuwaiti n=(5651)			p-value			Kuwaiti n=(5651)			p-value			Non-Kuwaiti n=(1590)			p-value							
	n	%	Mean	Disagree %/Mean	Agree %/Mean	n	%	Mean	Disagree %/Mean	Agree %/Mean	n	%	mean	Disagree %/mean	Agree %/mean	n	%	mean	Disagree %/mean	Agree %/mean	n	%	mean			
Self-efficacy in avoiding COVID-19 infection																										
Extremely difficult/difficult	1,554	21.46	20.47	21.94	21.94	1,230	21.77	21.01	22.17	22.17	324	20.38	17.84	21.22	21.22	324	20.38	17.84	21.22	21.22	324	20.38	17.84	21.22	0.281	
Somewhat easy	1,861	25.70	26.65	25.24	25.24	1,484	26.26	26.86	25.94	25.94	377	23.71	25.63	23.07	23.07	377	23.71	25.63	23.07	23.07	377	23.71	25.63	23.07		
Easy/extremely easy	3,826	52.84	52.88	52.82	52.82	2,937	51.97	52.14	51.89	51.89	889	55.91	56.53	55.70	55.70	889	55.91	56.53	55.70	55.70	889	55.91	56.53	55.70		
Follow recommendations from authorities in my country ₪																										
	7,241	6.50	6.37	6.56	6.56	5,651	6.48	6.36	6.54	6.54	1,590	6.57	6.45	6.61	6.61	1,590	6.57	6.45	6.61	6.61	1,590	6.57	6.45	6.61	0.002**	
Preventive measures																										
Correctly identifying protective measures ₪																										
	7,241	6.89	6.85	6.90	6.90	5,651	6.89	6.85	6.91	6.91	1,590	6.88	6.85	6.89	6.89	1,590	6.88	6.85	6.85	6.85	1,590	6.88	6.85	6.89	0.103	
Misinformation about preventive measures ₪																										
	7,241	2.88	2.82	2.90	2.90	5,651	2.77	2.77	2.76	2.76	1,590	3.28	3.07	3.35	3.35	1,590	3.28	3.07	3.07	3.07	1,590	3.28	3.07	3.35	0.007**	
Taking protective measures ₪																										
	7,241	6.81	6.76	6.84	6.84	5,651	6.80	6.75	6.83	6.83	1,147	6.86	6.80	6.88	6.88	1,147	6.86	6.80	6.80	6.80	1,147	6.86	6.80	6.88	0.006**	
Information and trust																										
Frequency of informing oneself about the coronavirus																										
Never/rarely	1,648	22.76	29.48	19.50	19.50	1,411	24.97	30.57	21.98	21.98	237	14.91	24.12	11.83	11.83	237	14.91	24.12	24.12	24.12	237	14.91	24.12	11.83	<0.001***	
Sometimes	1,258	17.37	21.57	15.34	15.34	1,052	18.62	22.38	16.61	16.61	206	12.96	17.59	11.41	11.41	206	12.96	17.59	17.59	17.59	206	12.96	17.59	11.41		
Often/very often	4,335	59.87	48.94	65.16	65.16	3,188	56.41	47.05	61.41	61.41	1,147	72.14	58.29	76.76	76.76	1,147	72.14	58.29	58.29	58.29	1,147	72.14	58.29	76.76		
Trust in media ₪																										
Very low/low confidence	1,671	29.10	20.16	23.08	23.08	1,360	24.07	29.6	21.11	21.11	311	19.56	26.63	17.2	17.2	311	19.56	26.63	26.63	26.63	311	19.56	26.63	17.2	<0.001***	
Partial confidence	1,514	25.51	18.68	20.91	20.91	1,184	20.95	25.84	18.34	18.34	330	20.75	23.87	19.71	19.71	330	20.75	23.87	23.87	23.87	330	20.75	23.87	19.71		
High/very high confidence	4,056	45.39	61.16	56.01	56.01	3,107	54.98	44.56	60.54	60.54	949	59.69	49.5	63.09	63.09	949	59.69	49.5	49.5	49.5	949	59.69	49.5	63.09		

Trust in doctors ₪	Very low/low confidence	512	4.78	7.07	11.8	426	7.54	11.8	5.26	<0.00 ***	86	5.41	11.81	3.27	<0.00 ***
	Partial confidence	785	8.76	10.84	15.14	614	10.87	15.36	8.47		171	10.75	14.07	9.65	
	High/very high confidence	5,944	86.47	82.09	73.05	4,611	81.6	72.84	86.27		1,333	83.84	74.12	87.08	
Trust in hospitals ₪	Very low/low confidence	1,090	15.05	20.69	12.32	901	15.94	20.6	13.46	<0.00 ***	189	11.89	21.11	8.81	<0.00 ***
	Partial confidence	1,196	16.52	20.98	14.35	958	16.95	21.72	14.41		238	14.97	17.34	14.18	
	High/very high confidence	4,955	68.43	58.33	73.32	3,792	67.1	57.68	72.13		1,163	73.14	61.56	77.01	
Trust in Ministry of Health ₪	Very low/low confidence	1,024	14.14	19.46	11.56	866	15.32	19.68	13.00	<0.00 ***	158	9.94	18.34	7.13	<0.00 ***
	Partial confidence	1,048	14.47	19.8	11.89	858	15.18	20.75	12.21		190	11.95	15.08	10.91	
	High/very high confidence	5,169	71.39	60.74	76.54	3,927	69.49	59.56	74.79		1,242	78.11	66.58	81.96	
Policies															
Think measures currently taken greatly exaggerated ₪		7,241	2.61	2.92	2.46	5,651	2.54	2.89	2.36	<0.00 ***	1,590	2.87	3.11	2.78	<0.00 ***
		7,241	5.17	4.88	5.30	5,651	5.12	4.88	5.25	<0.00 ***	1,590	5.32	4.89	5.46	<0.00 ***
Would convince others that the decisions are right ₪		7,241	5.05	4.61	5.26	5,651	4.97	4.58	5.18	<0.00 ***	1,590	5.31	4.76	5.50	<0.00 ***
		7,241	4.47	4.29	4.56	5,651	4.63	4.43	4.74	<0.00 ***	1,590	3.91	3.60	4.01	<0.00 ***
Discriminatory policies ₪		7,241	4.42	4.15	4.55	5,651	4.43	4.18	4.56	<0.00 ***	1,590	4.39	4.00	4.52	<0.00 ***
		7,241	4.42	4.15	4.55	5,651	4.43	4.18	4.56	<0.00 ***	1,590	4.39	4.00	4.52	<0.00 ***
Panic and Fear															
Panic buying ₪		7,241	3.00	2.94	3.03	5,651	2.97	2.97	2.97	0.948	1,590	3.11	2.76	3.22	<0.00 ***
		7,241	6.06	5.96	6.11	5,651	6.07	5.98	6.11	0.00 **	1,590	6.04	5.87	6.09	0.006**

(Continued)

Table 2 (Continued).

Variables	Total n=(7241)			Kuwaiti n=(5651)			Non-Kuwaiti n=(1590)			p-value
	n	%	Mean	n	%	Mean	n	%	Mean	
Fears and worries †	7,241	4.86	4.69	5,651	4.72	4.60	1,590	5.13	5.44	<0.001***
Influenza										
Probability of getting infected with influenza										
Extremely unlikely	1,741	24.04	25.21	1,267	22.42	23.86	474	29.81	31.91	<0.001***
Partly likely	1,708	23.59	25.97	1,317	23.31	25.58	391	24.59	27.89	0.038*
Extremely likely	3,792	52.37	48.82	3,067	54.27	50.56	725	45.60	40.20	
Susceptibility to getting infected with influenza										
Not/less susceptible	2,360	32.59	33.80	1,770	31.32	32.71	590	37.11	39.20	<0.001***
Partly susceptible	2,019	27.88	29.95	1,577	27.91	30.32	442	27.80	28.14	0.463
More/very susceptible	2,862	39.52	36.25	2,304	40.77	36.98	558	35.09	32.66	
Severity of influenza, if infected										
Not/less severe	4,078	56.32	57.53	3,182	56.31	57.27	896	56.35	58.79	0.051
Partly severely	1,512	20.88	22.00	1,179	20.86	21.82	333	20.94	22.86	0.035*
More/very severe	1,651	22.80	20.47	1,290	22.83	20.91	361	22.70	18.34	
Taken the Influenza vaccine in 2019										
Yes	1,199	16.56	12.10	917	16.23	11.90	282	17.74	13.07	<0.001***
No	6,042	83.44	87.90	4,734	83.77	88.10	1,308	82.26	86.93	0.005**

Notes: Acceptance was measured using a Likert scale ranging from 1 to 7; 1-4 indicated disagreement or less likely to agree (Disagree), while 5-7 indicated agreement or more likely to take the vaccine (Agree). P-value for agreement (disagree vs agree). *P-value <0.05, **p-value<0.01, ***p-value<0.001; values in bold are statistically significant. P-values for categorical variables were obtained by Chi-squared test, and for continuous variables by the t-test; †, on a 1-7 point scale.

level (32.7%), lived in a household with six people or more (62%), were married (62%), with children under 18 years of age (62%), did not have any chronic illnesses (71%), were not front-line workers (85%), and were infected with COVID-19 (89%). About half, however, reported knowing others that were confirmed as having COVID-19 (48.2%).

There was a significant decline over time, in the population's mean level of COVID-19 vaccine acceptance between the stage of complete lockdown to stage 4 of the MOH return to normality plan; mean acceptance decreased from 5.9 to 4.9 and 5.5 to 4.1 among Kuwaitis and non-Kuwaitis, respectively (Figure 2). The proportion of agreement to take the vaccine dropped from 73% to 47% among Kuwaitis, and 80% to 60% among non-Kuwaitis, between complete lockdown and stage 4 (Figure 3). Across all stages, more non-Kuwaitis agreed to take the vaccine than Kuwaitis; however, differences were only statistically significant during the complete lockdown stage, stage 3, and stage 4.

A total of 67% agreed to take the COVID-19 vaccine if it was available and recommended in the country; 75% non-Kuwaitis and 65% Kuwaitis (Table 1). Sociodemographic characteristics related to significantly greater agreement than disagreement ($p < 0.05$) included being male (30 vs 22%), ages 18–29 years (31 vs 23%),

an education level of high school or less (10 vs 7%), a very low (22 vs 16%) and low (11 vs 9%) income, being single (33 vs 26%), front-line workers (16 vs 13%), not having had an infection with the coronavirus (88 vs 87%), and not knowing others infected (47 vs 43%).

Among the total population, other predictors (Table 2) that were statistically higher ($p < 0.001$) among participants who agreed to take the vaccine included knowledge of COVID-19, the perception of being prepared to protect oneself, following recommendations from authorities, correctly identifying protective measures, taking protective measures, informing oneself about the coronavirus, having high confidence in the media, doctors, hospitals or the Ministry of Health, believing that the government decisions are fair, the likelihood of convincing others that the decisions are right, agreeing with discriminatory and containment policies, engaging in more panic behaviors, expressing fears and worries, perceiving the probability and susceptibility to the season influenza infection as extremely likely, and taking the influenza vaccine in 2019.

Stratified univariate analyses indicated that risk perceptions towards the coronavirus (the probability, susceptibility and perceived severity of the coronavirus infection) were not statistically associated to vaccine acceptance among Kuwaitis or non-Kuwaitis (Table 2). The analyses also indicated that factors associated with vaccine

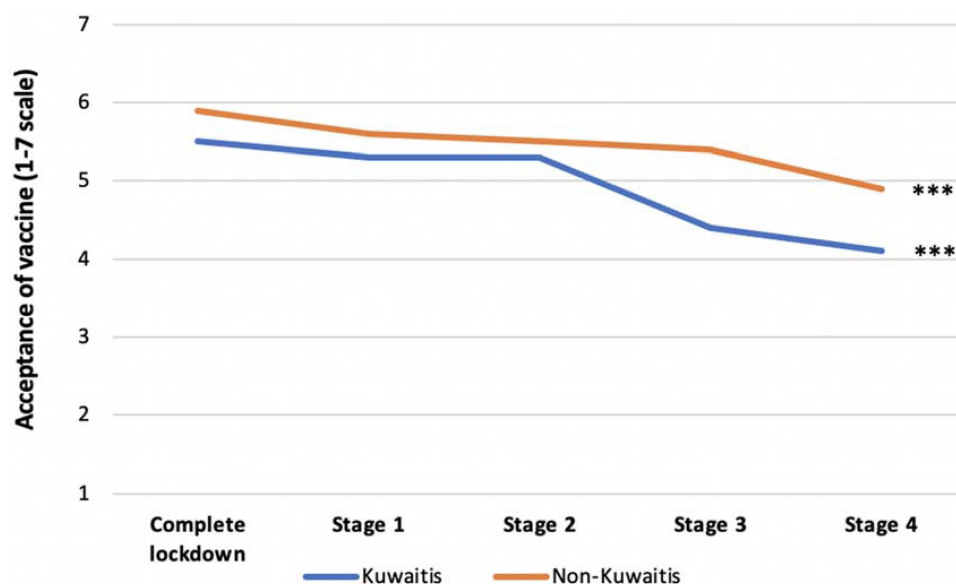


Figure 2 The mean level of acceptance to taking the COVID-19 vaccine if it becomes available and recommended, by nationality (Kuwaiti, non-Kuwaiti), during the Ministry of Health's "Return to Normality" stages, Kuwait, May–Aug 2020.

Notes: Acceptance measured using a Likert scale ranging from 1 to 7, with 1 indicating strongly disagree and 7 strongly agree; ***indicates a significant ($p < 0.001$) trend observed in the mean acceptance level overtime time (stages).

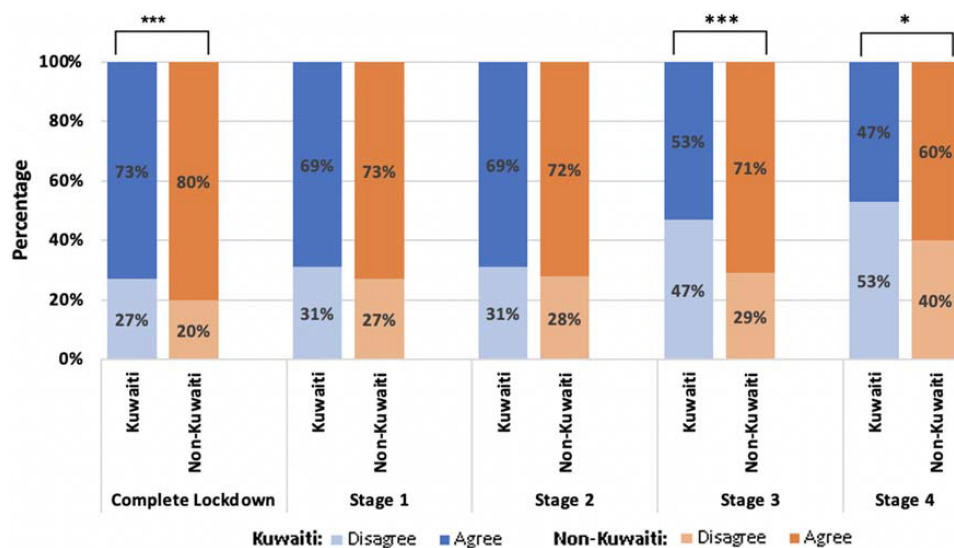


Figure 3 The proportion of agreement and disagreement towards taking the COVID-19 vaccine across the Ministry's "Return to normality" stages, by nationality (Kuwaiti, non-Kuwaiti), Kuwait, May–Aug 2020.

Notes: Acceptance was measured using a Likert scale ranging from 1 to 7; 1–4 indicated disagreement or less likely to agree (Disagree), while 5–7 indicated agreement or more likely to take the vaccine (Agree). Vaccine acceptance (disagree/agree) was statistically significantly associated across stages, in Kuwaitis and non-Kuwaitis ($P_{\text{trend}} < 0.001$); P-values for statistical association between vaccine acceptance and nationality (Kuwaiti/non-Kuwaiti) obtained by Chi-squared test. *p-value < 0.05, **p-value < 0.01, ***p-value < 0.001

acceptance were generally similar among Kuwaitis and non-Kuwaitis; However, among non-Kuwaitis, engaging in more panic buying behaviors was associated with vaccine agreement, as was having greater misinformation about the coronavirus protective measures ($p < 0.001$ and $p < 0.01$, respectively).

Multivariable regression analyses (Table 3) indicated that factors significantly associated with increased odds of agreeing to take the COVID-19 vaccine among Kuwaitis and non-Kuwaitis, included informing oneself about the coronavirus (OR, 1.34–1.83; 95% CI 1.16–2.55), having high or very high confidence in doctors (OR, 1.79–2.11; 95% CI 1.17–3.80), having a higher agreement with containment policies (OR, 1.11–1.27, 95% CI 1.05–1.41), expressing more fears and worries (OR, 1.05–1.12; 95% CI 1.01–1.24), and perceiving the probability of getting infected with seasonal influenza as extremely likely (OR, 1.33–1.38; 95% CI 1.03–1.84). Contrarily, factors associated with decreased odds of vaccine agreement were increased age (OR, 0.37–0.61; 95% CI 0.26–0.95), being female (OR, 0.56–0.62; 95% CI 0.43–0.73), an increased belief that the measures taken are greatly exaggerated (OR, 0.91–0.95; 95% CI 0.86–0.98), and not taking the seasonal influenza vaccine in 2019 (OR, 0.61; 95% CI 0.43–0.87).

Among Kuwaitis, increased odds of vaccine agreement were also associated with higher levels of real knowledge

regarding COVID-19 (OR, 1.12; 95% CI 1.05–1.20), greater adherence to recommendations from authorities (OR, 1.08; 95% CI 1.01–1.16), correctly identifying more protective measures (OR, 1.26; 95% CI 1.09–1.47), having high/very high confidence in the media compared to those with low/very low confidence (OR, 1.32; 95% CI 1.12–1.56), increased likelihood of convincing others that the decisions taken by the country are right (OR, 1.09; 95% CI 1.06–1.13), and increased agreement with discriminatory policies (OR, 1.09; 95% CI 1.04–1.14) (Table 3). However, being married or divorced/widowed was associated with lower odds of agreement (OR, 0.77; 95% CI 0.60–0.92). Among non-Kuwaitis, additional factors associated with increased agreement included the perception of being very well protected towards COVID-19 compared to not being prepared at all (OR, 1.78; 95% CI 0.90–3.53), having high/very high confidence in the country's hospitals compared to those with low or very low confidence (OR, 1.76; 95% CI 1.13–2.72), and higher engagement in panic-buying behaviors during the pandemic (OR, 1.09; 95% CI 1.03–1.16).

Discussion

To our knowledge, this is the only study that has monitored and quantified the potential COVID-19 vaccination acceptance overtime during the pandemic in Kuwait using a large sample size of citizens and non-citizens. Understanding

Table 3 Multivariable analysis: Factors Related to Increased Agreement Towards Taking the COVID Vaccine, by Nationality (Kuwaiti/ Non-Kuwaiti), Kuwait, May–September, 2020

Characteristic	Agree to Take the COVID Vaccine					
	Kuwaiti (n=5651)			Non-Kuwaiti (n=1590)		
	OR	(95% CI)	p-value	OR	(95% CI)	p-value
Stage						
Complete lockdown	[reference]					
Stage 1	0.80	(0.67-0.95)	0.010*			
Stage 2	0.80	(0.67-0.96)	0.017*			
Stage 3	0.50	(0.40-0.61)	0.000**			
Stage 4	0.35	(0.28-0.43)	<0.001***			
Age (years)						
18–29	[reference]			[reference]		
30–44	0.62	(0.52-0.74)	<0.001***	0.79	(0.59-1.06)	0.120
45–59	0.52	(0.42-0.64)	<0.001***	0.61	(0.44-0.87)	0.005**
60–74	0.37	(0.28-0.49)	<0.001***	0.50	(0.26-0.95)	0.034*
Gender						
Male	[reference]			[reference]		
Female	0.62	(0.53-0.72)	<0.001***	0.56	(0.43-0.73)	<0.001***
Marital						
Single	[reference]					
Married	0.77	(0.65-0.92)	0.004**			
Divorced/widowed	0.77	(0.60-0.99)	0.043*			
Real knowledge ¥	1.12	(1.05-1.20)	0.001**			
Follow recommendations from authorities in my country ¥	1.08	(1.01-1.16)	0.029 *			
Preparedness towards COVID-19						
Not at all				[reference]		
Somewhat				1.11	(0.50-2.47)	0.807
Very much so				1.78	(0.90-3.53)	0.099
Correctly identifying protective measures ¥	1.26	(1.09-1.47)	0.002**			
Frequency of informing oneself about the coronavirus						
Never/rarely	[reference]			[reference]		
Sometimes	0.99	(0.83-1.18)	0.925	1.11	(0.73-1.68)	0.637***
Often/very often	1.34	(1.16-1.55)	<0.001	1.83	(1.32-2.55)	<0.001
Trust in media ¥						
Very low/low confidence				[reference]		
Partial confidence	0.87	(0.73-1.04)	0.123			
High/very high confidence	1.32	(1.12-1.56)	0.001**			
Trust in doctors ¥						
Very low/low confidence	[reference]			[reference]		
Partial confidence	1.20	(0.91-1.59)	0.192	1.76	(0.93-3.34)	0.085*
High/very high confidence	1.79	(1.41-2.27)	0.000**	2.11	(1.17-3.80)	0.013

(Continued)

Table 3 (Continued).

Characteristic	Agree to Take the COVID Vaccine					
	Kuwaiti (n=5651)			Non-Kuwaiti (n=1590)		
	OR	(95% CI)	p-value	OR	(95% CI)	p-value
Trust in hospitals ¥ Very low/low confidence Partial confidence High/very high confidence				[reference] 1.58 1.76	 (0.97-2.58) (1.13-2.72)	 0.066* 0.012
Think measures currently taken greatly exaggerated ¥	0.95	(0.92-0.98)	0.001	0.91	(0.86-0.97)	0.003**
Think the decisions are fair ¥				1.08	(1.01-1.16)	0.032*
Would convince others that the decisions are right ¥	1.09	(1.06-1.13)	<0.001***			
Discriminatory policies ¥	1.09	(1.04-1.14)	<0.001***			
Containment policies ¥	1.11	(1.05-1.17)	<0.001***	1.27	(1.15-1.41)	<0.001***
Panic buying ¥				1.09	(1.03-1.16)	0.003**
Panic Behaviours ¥	0.94	(0.90-1.00)	0.004**			**
Fears and worries ¥	1.05	(1.00-1.10)	0.039*	1.12	(1.01-1.24)	0.034*
Probability of getting infected with influenza Extremely unlikely Partly likely Extremely likely	[reference] 1.09 1.33	 (0.91-1.29) (1.15-1.55)	 0.343 <0.001***	[reference] 1.03 1.38	 (0.75-1.43) (1.03-1.84)	 0.839 0.032*
Taken the Influenza vaccine in 2019 Yes No	[reference] 0.61	 (0.51-0.72)	 <0.001***	[reference] 0.61	 (0.43-0.87)	 0.006**

Notes: *p-value<0.05, **p-value<0.01, ***p-value<0.001; values in bold are statistically significant.

vaccine acceptance is crucial given that Kuwait has authorized emergency use of the Pfizer-BioNTech COVID-19 vaccine¹⁷ and that return to normal life activities in the country is dependent on it. Since non-citizens in the country comprise about 70% of the population, stratification of results was necessary, allowing for more valid and representative results. Our study used data from the COSMO Kuwait study that was implemented according to the WHO tool for behavioral insights on COVID-19.¹⁶ COSMO studies were officially implemented in over ten countries, thus allowing more valid comparisons of global results to be made.

The overall acceptance of taking the vaccine in Kuwait was 67%. A study conducted in 2020 to assess the COVID-19 vaccine acceptance in 19 countries,¹² indicated that China had the highest acceptance (89%), while Russia had the lowest (55%). Compared to our results, vaccine acceptance in Kuwait was relatively similar to that in Singapore (68%) and Indonesia (67%)^{12,18} but higher than in Sweden (65%), Nigeria (65%), France (56%), Poland (56%) and Russia (55%).¹² Acceptance in Kuwait was, however, lower than in many countries such as Germany, Canada, Italy, UK, Spain, India, US, Mexico, South Korea, South Africa, Brazil, and China where it

ranged from 68–89%.¹² In countries for which the COSMO study was implemented, and results were published, vaccine acceptance was higher in Kuwait (71%) than in Canada (65%) during similar data collection periods in June. Results from COSMO Turkey indicated the mean vaccine acceptance level, on a scale from 1–7, ranged from 5.3–5.1 during July–August. Vaccine acceptance was similar to that among non-citizens during comparative dates (5.4–4.9) but higher than that among Kuwaitis (4.1–4.4).¹⁹

Coinciding with recent findings from Saudi Arabia,²⁰ our results indicated that non-citizens had a higher proportion of vaccine acceptance (75%) compared to citizens (65%). Results revealed that among both citizens and non-citizens, the expression of greater fears and worries related to COVID-19 was associated with an increased likelihood of vaccine acceptance; however, the average level of fear and worries was greater among non-citizens than citizens (4.8 vs 5.4 on a 1–7 scale, respectively). Specifically, non-citizens were significantly more worried about being unemployed during the pandemic than citizens (5.0 vs 3.0 on a 1–7 scale; results not published). In the USA, employed participants had higher COVID-19 acceptance than those unemployed.²¹ In Australia, business companies were lobbying for powers to sanction workers who refuse the coronavirus vaccine.²² Collectively, these findings highlight the role of employment and fear of becoming unemployed as motivators for COVID-19 vaccination. Furthermore, for non-citizens, getting vaccinated could provide immunity to an infection, possibly providing individuals with greater sense of independence and security to travel abroad. Enforcing vaccination for travel purposes could therefore also be a potential stimulus to achieving greater inoculation rates, particularly in countries where the expatriate population is high.

In Kuwait, vaccine acceptance declined overtime during the pandemic and as COVID-19 related restrictions were eased in the country. Acceptance dropped from 73% to 47% among Kuwaitis and from 80% to 60% among non-Kuwaitis, over less than four months since the country's complete lockdown. This decline in vaccine acceptance since the first wave of data collection was also observed in the COSMO Turkey, Canada and Spain studies.^{19,23,24} In Canada, the proportion of people who disagreed with taking the vaccine doubled from 6% in April (wave 1) to 12% in June (wave 5).¹⁹ In Spain, acceptance dropped from 70% in July to only 43% in September.²⁴ This could suggest that as countries globally

continue to ease their restrictions and people become more desensitized to the virus, acceptance may further decline, potentially leading to low inoculation rates. A substantial burden will, therefore, be placed on health campaigns to promote the uptake of the COVID-19 vaccine once released.

The likelihood of getting vaccinated was higher among males in Kuwait. These findings were coincident with other studies assessing the determinants of COVID-19 vaccine acceptance.^{20,21,24,25} Among citizens, being married was also significantly associated with increased odds of vaccine acceptance, as shown in China²⁵ and Saudi Arabia.²⁰ However, in Kuwait vaccine acceptance was more likely among younger than older adults. While these results were significant among both citizens and non-citizens, they contrast with recent studies relating older age with higher vaccine acceptance. This past year, social media has heavily influenced individuals' vaccine hesitancy. Puri et al demonstrate that older adults may be more vulnerable to the narrative of vaccine hesitancy.²⁶ This critical finding accentuates the need for effective and targeted vaccine-acceptance messages in Kuwait that targets older people who are more vulnerable and are at higher risk of getting severe COVID-19 disease.

Citizens and non-citizens with high trust in their doctors were two times more likely to get vaccinated. Having higher trust in the health system was shown to be associated with greater utilization of preventive health services such as the influenza vaccine,^{27,28} in addition to increased acceptance of the latent COVID-19 vaccine.^{20,25} However, our study also revealed that among citizens, higher trust in the media was associated with an increased likelihood of vaccine acceptance. The media and social media influencers can play a crucial role in the promotion of a new vaccine. For instance, in the UK, the composer Andrew Lloyd Webber, Health Secretary Matt Hancock and Chief Medical Officer Chris Witty participated in the Oxford trial for the future vaccine and encouraged people to participate via Twitter. This led to high levels of engagement and aided the continuation of posts about coronavirus vaccine in social media, with minimal (11%) negative content about the vaccine.²² Using local social media influencers and health professionals to advocate for inoculation can create a positive vaccine sentiment in the country, potentially encouraging citizens who are less likely to get vaccinated.

People's perceived risk of infection has been reported as a predictor of COVID-19 vaccine acceptance^{20,24,25,29,30}

In our study, risk perceptions towards the coronavirus infection were not significantly related to vaccine acceptance. However, participants who perceived their probability of getting infected with seasonal influenza, as partly or extremely likely, had increased odds of getting vaccinated. Vaccination against influenza in the past season (2019) was also associated with an increased likelihood of vaccination, among both citizens and non-citizens. These results were also observed in China²⁵ and could suggest that the community's past experiences regarding the attainment of vaccines could either endorse or hinder the uptake of the new COVID-19 vaccine.

During the period of the study, the government had placed numerous restrictive policies in efforts to control the spread of infection. Participants were thus asked about their agreement to containment policies that restricted their personal liberty, choice of a place of residence, internet and social media access, closures of community facilities such as schools, and prohibition of e-learning. Results indicated that people who agreed more with such containment policies had increased odds of vaccine acceptance. There was also an increased likelihood of vaccine acceptance if people agreed with discriminatory behaviors such as agreeing that anyone not from Kuwait should be quarantined or sent away, and avoiding certain people based on their country of origin. The COVID-19 pandemic has been associated with many elements of social stigma and discrimination.^{31,32} Acquiring immunity through vaccination could potentially protect against stigmatization and discrimination of being infected with COVID-19; particularly if one expresses such discriminatory behaviors himself.

One of the main limitations of our study was that it was conducted solely using a web-based survey. As with all online surveys, minority groups and older adults in the country are generally underrepresented. Due to the nature of the pandemic and its related physical distancing obligations, online data collection was the only feasible method. However, in order to increase the representativeness of the data and improve external validity, a substantially large sample was obtained. Stratification of the data was also performed since non-citizens comprised the majority of the population in Kuwait and were underrepresented. The survey was also promoted by several diverse social media influencers, during each stage of data collection, to increase the sample's representativeness; making this study one of the first of its kinds in the country to

demonstrate the people's intention to uptake the COVID-19 vaccine.

Conclusion

Our results indicated that acceptance was multifactorial, heterogeneous among citizens and non-citizens, and can change over time. While potential uptake of the COVID-19 vaccine was high during the complete lockdown in the country, it has since steadily decreased among both citizens and non-citizens. Moving forward, further continuous declines in acceptance can lead to low inoculation levels in the country that will require the implementation of vigorous and effective vaccine-promotion campaigns. Several predictors of vaccine acceptance in the country were also addressed, and recommendations for methods to increase vaccine uptake were proposed. Findings from this study can aid health-care professionals, health officials, and political stakeholders in developing policies related to the administration of the vaccine among citizens and non-citizens in the country. They can also support the tailoring of vaccine-acceptance messages to advocate, educate, and address concerns, especially among more vulnerable groups.

Disclosure

The authors report no conflicts of interest in this work.

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