MEDICAL SCIENCE

Evaluate acceptability of Saudi Arabian parents to vaccinate their children against COVID-19

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ABSTRACT

Background: Health and infection control measures, as well as immunization, are critical elements in containing the global COVID-19 pandemic. Saudi Arabia has legalized child immunization and parental consent is normally required for vaccinations for children under the age of 18. *Objectives:* The Kingdom's Vision 2030 requires a knowledgeable and healthy society. This study aims to verify parents' willingness to vaccinate their children against COVID-19 and their understanding of the disease that they regard as crucial to the nation's future. *Methods:* An online cross-sectional survey among Saudi & non-Saudi parents who have children aged 12–18 and accessed between July to September 2022. *Results:* 260 of 666 parents completed the survey. 88% of parents agreed to vaccinate their children under-18 children. 19.2% of Saudis authorized their child's immunization, compared to 6.7% of non-Saudis (P=.049). 31.7% of parents with COVID-19-related family member loss had a positive attitude, compared to 16.1% of those without (P=.048). *Conclusion:* The Ministry of Health's social media and education level determine whether COVID-19 vaccination education campaigns should focus on the pandemic and community danger rather than vaccine safety and efficacy.

Keywords: Vaccine, children, COVID-19, Saudi Arabia, parental acceptability

1. INTRODUCTION

Humans have practiced behaviors comparable to vaccination in modern times for hundreds of years. For example, Edward Jenner develops a technique to immunize against smallpox in the late 18th century, marking the beginning of contemporary vaccination history. This monumental move aided in preventing infectious illnesses such as typhoid, plague, cholera and other infections (Hsu, 2013). Nowadays, SARS- CoV (COVID-19) is one of the most

dangerous illnesses. Therefore, the most crucial step in containing this global epidemic, in addition to necessary health and infection control measures, is vaccination, which will help protect populations worldwide from the SARS-CoV-2 illness.

"Coronaviruses (SARS-CoV-2) are a group of highly diverse, enveloped, positive-sense and single-stranded RNA viruses", they trigger a wide variety of diseases in people and animals that involve the respiratory, gastrointestinal, hepatic and neurological systems (He et al., 2020). In early December 2019, the first cases of pneumonia with an unknown cause were discovered in Wuhan, the capital of Hubei Province (Zhu et al., 2020). SARS-CoV-2, the virus that causes COVID-19, spread quickly and easily from person to person and the WHO declared a pandemic when it became clear that the virus was out of control (WHO, 2020).

Since then, strict measures have been implemented, including masks, social distancing and quarantine, all of which have proven to be effective in slowing the spread of COVID-19. Regrettably, these efforts came at a high cost on the economic, social and educational fronts (Kamidani et al., 2021). Because of the significant morbidity and mortality, the COVID-19 pandemic is expected to place further burdens on communities and economies (Lazarus et al., 2021).

Although older individuals account for most deaths, children experience significant illness and mortality (Kamidani et al., 2021). As a result, developing a safe and effective vaccination was critical to protect people's lives. As a result, the pandemic's spread will be limited and beneficial clinical and socioeconomic effects will be promoted (Alfageeh et al., 2021). Accepting a vaccine is a crucial step in immunization program effectiveness in achieving high vaccination rates in the general population (Al-Mohaithef et al., 2021).

People have been hesitant to take the vaccine since the trials began, mainly because it was set to be given quickly. The term "vaccine hesitancy" refers to a delay in accepting or refusing immunization, notwithstanding the availability of vaccination services (Sallam, 2021). It is one of the significant hurdles to world public health as the COVID-19 vaccination is believed to be the most effective public health strategy for containing the pandemic (WHO, 2020). Vaccine refusal has a double impact on the individual and society because it increases the likelihood of contracting the infection (Freeman et al., 2022). Society's immunity must reach at least 75% of the entire population to decrease the widespread of COVID-19 disease. Therefore, widespread adoption of these vaccinations is required to ensure their efficacy in containing the pandemic (Edwards and Orenstein, 2020; Skjefte et al., 2021).

The efficiency of the vaccine, side effects, conspiracy theories, doctors' unfavorable views and the speed at which a COVID-19 vaccine was developed; were some of the factors that contributed to people in the UK refusing to take the vaccine, which was equitable to the inferred variables in the Kingdom of Saudi Arabia (Almaghaslah et al., 2021; Sallam, 2021). Other factors include vaccination conspiracy theories, a lack of vaccine and illness literacy, vaccination history, a lack of faith in the health system, the severity of the disease and whether the vaccine is offered free by the government (Noushad et al., 2021).

The growth of social media and its speed in spreading misinformation is one of the most significant hurdles; therefore, it must be utilized to counteract this impact by boosting knowledge of the vaccine's relevance and efficacy and reassuring people of its safety (Freeman et al., 2022). The approval to vaccinate children in Saudi Arabia; would help to control the COVID-19 pandemic (Almaghaslah et al., 2021). In addition, it is believed that a vaccine will have both direct and indirect benefits in minimizing the social and economic repercussions of the SARS-CoV-2 pandemic via community protection. This is because comparable outcomes have been found for other respiratory and gastrointestinal diseases (Eberhardt and Siegrist, 2021; Kao et al., 2021).

To achieve the Kingdom's Vision 2030, which will be established by access to an informed and healthy society, integration is to be encouraged across all sectors, including the health sector. The current study aims to support parents' willingness and knowledge to vaccinate their kids against COVID-19 as a foundation for the nation's future.

2. METHODS

Study design and sample

A cross-sectional online survey of Saudi Arabian parents with kids between 12 and 18 occurred from July to September 2022. The Biomedical Research Ethics Committee Internal Review Board (IRB) at Umm Al-Qura University reviewed research proposals to ensure that they are ethical and that the rights of human subjects are protected and the approval number (HAPO-02-K-012-2021-08-730).

The parents of participants were invited to complete an online survey using Google Forms Inc. Twitter and WhatsApp Inc. were just two social media sites where the survey was distributed. A parent with children aged 12 to 18 years old who is currently residing in Saudi Arabia met the eligibility criteria. A total of 666 parents with children took part in the research. Unfortunately, only 260 parents with children between 12 and 18 had completed the survey. We utilized a primary snowball sampling method in which participants were invited to share the survey's internet link with their friends and family. It took an average of 4 minutes to complete the survey.

Measures

Development of Questionnaire

The online questionnaire is adapted from (Zhang et al., 2020). Consisting of a 25-item questionnaire with the following variables included in the questionnaire:

Background characteristics

Participants' demographic information (such as age, gender, marital status, education level and monthly income) was collected, as were their children's ages, whether or not their parents had ever received a seasonal flu vaccine and whether or not anyone in their families had ever been infected with COVID-19. In addition, participants were asked whether they often used hand sanitizer after returning from public locations or after touching public equipment or installations. They were also asked how often (always, frequently, sometimes and never) they used facemasks in the preceding month when in close contact with other people in different circumstances (always, often, occasionally and never) (such as public venues and transportation). In addition, individuals indicated that they avoided eating and socializing with strangers in crowded places throughout the previous month (Zhang et al., 2020).

Acceptance by Parents of Free COVID-19 Vaccination for Children Under 18 Years

It was communicated to the attendees that "COVID-19 immunization would be available for children in 2021". Parents were then asked how likely their children under 18 would get a free government-provided COVID-19 immunization if one were made available. Response options ranged from "extremely unlikely" (1) to "likely" (5) (very likely). As a final step, we utilized the responses to predict whether parents would accept the COVID-19 vaccination.

TPB-Based Opinions on COVID-19 Vaccination

In addition to the two attitude scales, two single items were used to evaluate parents' perceptions of the subjective norm and behavioral control. The subjective norm item was "Your family member will support you in having your child receive COVID-19 vaccination". The behavioral control item was "Having your child receive COVID-19 vaccination seems to be easy for you if you want them to". Respondents could choose to agree (3), disagree (2) or be neutral (1) for each item.

The TPB is a well-established theory that has been used to predict a variety of behaviors, including vaccination. The results of this study suggest that the TPB can be used to assess opinions on COVID-19 vaccination. The Positive Attitude Scale and the Negative Attitude Scale were both found to be reliable and valid measures of parents' attitudes towards COVID-19 vaccination. The subjective norm and behavioral control items were also found to be reliable and valid measures of parents' perceptions of the social pressure to vaccinate and the perceived ease of vaccinating their child, respectively. These findings suggest that the TPB can be a useful tool for understanding and predicting parents' intentions to vaccinate their children against COVID-19.

Influence of social media

Respondents were asked how often they saw COVID-19 vaccination news on social media, with the following response options:

Almost none (1)

Seldom (2)

Sometimes (3)

Always (4)

The types of information collected included:

Encouraging information about COVID-19 vaccination (e.g., new vaccines entering clinical trials)

Misleading information about COVID-19 immunization (e.g., concerns regarding vaccine efficacy, supply and adverse effects, as well as receipt of COVID-19 vaccines)

Information about vaccine incidents in Saudi Arabia (e.g., having problematic vaccines and severe adverse effects).

Statistical analysis

After data was retrieved, it was validated, coded and analyzed using IBM SPSS version 22 (SPSS, Inc. Chicago, IL). All statistical tests were run using a significance threshold with two tails. A result was deemed statistically significant if its P value was 0.05 or less. The total score for each scale was calculated by adding the scores of all discrete items and inverting the values for negative statements; the composite mean score, which ranges from 1-3, was then calculated. It was believed that negative sentiments existed

among parents whose mean total score was less than 2. A score of 2 or 2.5 suggested a neutral perspective, while a score of 2.5 or above indicated a positive outlook.

Demographic data, family and children's medical and infection history, stance on covid-19 vaccination for children, preparedness to vaccinate children aged 12-18 years and frequency of exposure to covid-19 vaccines-related information in social media were all subjected to frequency and percent distribution-based descriptive analysis. Using bio-demographic data, cross-tabulation was performed to assess the dispersion of parents' viewpoints on their children's vaccination coverage. Utilizing Pearson chi-square and exact probability tests for small frequency distributions, statistical significance in associations was determined.

3. RESULTS

Two hundred sixty parents met the eligibility criteria regarding the questionnaire. The participants' ages ranged from 18 to over 40, with a mean age of 40.2 ± 11.9. Exact 137 (52.7%) were males and most participants were Saudis (94.2%). A total of 240 (92.3%) were married. Regarding education, 167 people (64.2%) had a college degree and 10.4% had only secondary education. Exactly 117 (45%) participants were employed in the governmental sector, while 63 (24.2%) were unemployed. As for residence, 191 (73.5%) participants were from urban areas (Table 1).

Table 1 Socio-demographic data of study parents, Saudi Arabia

Socio-demographic data	No	%
Age in years		
18-30	34	13.1%
31-40	71	27.3%
> 40	155	59.6%
Gender		
Male	137	52.7%
Female	123	47.3%
Nationality		
Saudi	245	94.2%
Non-Saudi	15	5.8%
Marital status		
Married	240	92.3%
Divorced / widow	20	7.7%
Educational level		
Below secondary	27	10.4%
Secondary	66	25.4%
University / more	167	64.2%
Partner education		
Below secondary	37	14.2%
Secondary	55	21.2%
University / more	168	64.6%
Occupation		
Not working	63	24.2%
Governmental sector	117	45.0%
Private sector	31	11.9%
Military sector	28	10.8%
Others	21	8.1%
Residence		
Urban	191	73.5%
Rural	69	26.5%

Approximately 163 (62.7%) participants reported having a family member infected with COVID-19 and 41 (15.8%) had lost a family member due to covid-19 infection. As for the study parents' children, 56 (21.5%) reported that their children aged 12-18 had

chronic health problems. Respiratory diseases were the most reported (34.5%), DM (30.9%), while (34.5%) had other chronic health problems (hypothyroidism, renal diseases, cancer, infections) (Table 2).

Table 2 Family & child medical and infection history among study parents, Saudi Arabia

Family & child data	No	%
Had family member infected with covid-19		
Yes	163	62.7%
No	94	36.2%
Don't know	3	1.2%
Family member loss due to COVID-19		
Yes	41	15.8%
No	218	83.8%
Don't know	1	.4%
Child had chronic health problem		
Yes	56	21.5%
No	204	78.5%
Diseases (n=56)		
DM	17	30.9%
Respiratory disease	19	34.5%
Others	19	34.5%

The distribution of parental adherence to infection control measures was observed during the COVID-19 pandemic. It was clear that 98.8% of the research participants had worn a face mask in public places/transportation other than their employment in the previous month, either occasionally or constantly. In addition, 96.5% of respondents wore a face mask when in close contact with other people at work. Additionally, 98.8% of respondents sterilized their hands after returning from public locations or touching public facilities. These findings suggest that a large majority of people are taking steps to protect themselves and others from COVID-19 (Table 3).

Table 3 Distribution of parents' adherence for infection control measures during covid-19 pandemic, Saudi Arabia

Infection control measures	No	%
How many times did you wear a face mask in public places/transportation other than workplaces?		
Never	3	1.2%
Sometimes	12	4.6%
Most times	63	24.2%
All times	182	70.0%
How often do you wear a face mask in the workplace?		
Never	9	3.5%
Sometimes	25	9.6%
Most times	80	30.8%
All times	146	56.2%
How often do you sterilize your hands after returning from public places or touching public facilities?		
Never	3	1.2%
Sometimes	37	14.2%
Most times	98	37.7%
All times	122	46.9%

The present investigation seeks to determine the frequency with which users of social media sites have seen COVID-19 vaccination-related posts during the last 30 days. Approximately 97.3% of the population has been supplied with good information regarding the COVID-19 vaccination at some time in their life. In contrast, 91.5% of persons in the United States were exposed to negative information about the COVID-19 vaccination, while only 62.7% of people in Saudi Arabia were exposed to such information. In addition, 78.1% of respondents reported seeing social media posts, including comments from persons who had participated in COVID-19 vaccination clinical trials (Table 4).

Table 4 Distribution of COVID-19 vaccination-related information on social media platforms

Online resources about the COVID-19 vaccination	Never		Rarely		Sometimes		Always	
	No	%	No	%	No	%	No	%
Positive information about vaccination against COVID-19	7	2.7%	31	11.9%	107	41.2%	115	44.2%
Negative information about vaccination against COVID-19	22	8.5%	50	19.2%	130	50.0%	58	22.3%
Testimonials from participants in clinical trials of the COVID-19 vaccine	57	21.9%	49	18.8%	100	38.5%	54	20.8%
Negative information about other vaccines in the Kingdom of Saudi Arabia	97	37.3%	77	29.6%	62	23.8%	24	9.2%

19.2% of the Saudi parents had a positive attitude towards their child's vaccination compared to 6.7% of non-Saudis with recorded statistical significance (P=.049). Also, a positive attitude was detected among 31.7% of parents with a history of family member loss due to COVID-19 compared to 16.1% of others without (P=.048) (Table 5).

Table 5 Distribution of parents' attitude towards covid-19 vaccination of their children by their bio-demographic data, Saudi Arabia

Factors		Attitude level						p-value
		Negative		Neutral		Positive		
		No	%	No	%	No	%	
Age in years	18-30	2	5.9%	27	79.4%	5	14.7%	.939$
	31-40	6	8.5%	52	73.2%	13	18.3%	
	> 40	10	6.5%	115	74.2%	30	19.4%	
Gender	Male	10	7.3%	102	74.5%	25	18.2%	.967
	Female	8	6.5%	92	74.8%	23	18.7%	
Nationality	Saudi	15	6.1%	183	74.7%	47	19.2%	.049*$
	Non-Saudi	3	20.0%	11	73.3%	1	6.7%	
Marital status	Married	16	6.7%	178	74.2%	46	19.2%	.543$
	Divorced / widow	2	10.0%	16	80.0%	2	10.0%	
Educational level	Below secondary	0	0.0%	19	70.4%	8	29.6%	.347$
	Secondary	6	9.1%	49	74.2%	11	16.7%	
	University / more	12	7.2%	126	75.4%	29	17.4%	
Partner education	Below secondary	1	2.7%	26	70.3%	10	27.0%	.364
	Secondary	6	10.9%	41	74.5%	8	14.5%	
	University / more	11	6.5%	127	75.6%	30	17.9%	
Occupation	Not working	3	4.8%	48	76.2%	12	19.0%	.251$
	Governmental sector	6	5.1%	91	77.8%	20	17.1%	
	Private sector	3	9.7%	23	74.2%	5	16.1%	
	Military sector	5	17.9%	15	53.6%	8	28.6%	
	Others	1	4.8%	17	81.0%	3	14.3%	
Residence	Urban	12	6.3%	147	77.0%	32	16.8%	.351
	Rural	6	8.7%	47	68.1%	16	23.2%	

Had family member infected with covid-19	Yes	9	5.5%	120	73.6%	34	20.9%	.228$
	No	8	8.5%	72	76.6%	14	14.9%	
	Don't know	1	33.3%	2	66.7%	0	0.0%	
Family member loss due to COVID-19	Yes	3	7.3%	25	61.0%	13	31.7%	.048*$
	No	15	6.9%	168	77.1%	35	16.1%	
	Don't know	0	0.0%	1	100.0%	0	0.0%	
Child had chronic health problem	Yes	5	8.9%	36	64.3%	15	26.8%	.128
	No	13	6.4%	158	77.5%	33	16.2%	

P: Pearson X^2 test *$: Exact probability test* ** P < 0.05 (significant)*

The possibility of a child under 18 years receiving free COVID-19 vaccination from the government is based on the parent's likelihood of having a child under the age of 18 years receive free COVID-19 immunization from the government. Among the study group members, 139 (53.5%) highly agreed that their children under 18 would receive the vaccine, 71 (27.3%) strongly agreed, 8.1 percent strongly disagreed and 11.2 percent were undecided.

According to the current survey, 88.8% of parents agreed that Saudi Arabia would have enough COVID-19 vaccine supplies, and 78.1% agreed that taking a COVID-19 vaccine can help control the pandemic in Saudi Arabia. 71.9% agreed that taking a COVID-19 vaccine can help prevent the worldwide pandemic. Only 15.8% of parents believe that their child will have serious side effects from the COVID-19 vaccination; 29.6% think the vaccine's results won't last long and 29.6% have a child who is terrified of the shot. 12.3% of parents said they didn't have time to get their children vaccinated against COVID-19. 71.2 percent of study participants said their families supported their child getting the covid-19 vaccine (Table 6).

Table 6 Parental Attitudes toward COVID-19 Vaccination for Children in Saudi Arabia

Attitude items	Disagree		Neutral		Agree	
	No	%	No	%	No	%
COVID-19 vaccines are safe and effective for children of all ages	15	5.8%	58	22.3%	187	71.9%
Taking a COVID-19 vaccine can contribute to controlling the pandemic in Saudi Arabia	14	5.4%	43	16.5%	203	78.1%
Saudi Arabia will have sufficient supplies of COVID-19 vaccine	3	1.2%	26	10.0%	231	88.8%
Your child will have serious side effects after receiving the COVID-19 vaccine	113	43.5%	106	40.8%	41	15.8%
COVID-19 vaccine protection may not last forever	81	31.2%	102	39.2%	77	29.6%
Your child is scared about getting vaccinated	141	54.2%	42	16.2%	77	29.6%
You are not able to make time to take your child for the COVID-19 vaccination	201	77.3%	27	10.4%	32	12.3%
Your family member is supportive of your decision to get your child vaccinated against COVID-19	32	12.3%	43	16.5%	185	71.2%
You can easily get your child vaccinated against COVID-19 if you want to	10	3.8%	42	16.2%	208	80.0%

4. DISCUSSION

In August of 2021, many immunizations were being widely distributed and used by adults and children worldwide (O'Hara, 2021). Therefore, the study's overarching goal was to ascertain whether or not parents were willing to voluntarily vaccinate their children, especially in light of the vaccine's availability and the vigorous promotions launched by the Ministry of Health. In addition, the significance, efficacy and safety of the vaccination and the need for children to obtain it from institutional settings need to be publicized. The questionnaire was distributed among all regions in the Kingdom of Saudi Arabia. Vaccination is a widely accepted practice among parents, with 80.8% of parents reporting that they would vaccinate their children.

This percentage was higher than another study by Altulaihi et al., (2021) whose results demonstrated that 53.7% of parents agreed to permit their children under 18 to get a free COVID-19 immunization versus 27% who would not. In contrast, in another study by Skjefte et al., (2021); Mothers in India, Mexico, Brazil and Colombia were more likely to support COVID-19 vaccination for their children than mothers in Australia, the United States and Russia. In India, Mexico, Brazil and Colombia, more than 85% of mothers said they would vaccinate their children against COVID-19, while in Australia, the United States and Russia, less than 52% of mothers said they would vaccinate their children. There are a number of possible reasons for this difference in opinion.

One possibility is that mothers in India, Mexico, Brazil and Colombia are more aware of the dangers of COVID-19. Another possibility is that they have more trust in the safety and efficacy of the COVID-19 vaccine. Finally, it is also possible that mothers in these countries are more motivated to protect their children from COVID-19. Whatever the reason, there is a significant difference in opinion among mothers about COVID-19 vaccination. This difference is likely to have a major impact on the overall vaccination rate in each country. After adjusting for key demographic variables such as age, education, income and marital status, this country-variable pattern persisted this was close to the past study also done in Saudi Arabia (Altulaihi et al., 2021; Skjefte et al., 2021).

There is a noticeable difference between the two studies, all conducted in the Kingdom of Saudi Arabia. It is thought that this may be due to the increased level of parents' awareness about the vaccine or the need to take it for children to return to school and back to their everyday life activities. Regarding parents' attitudes toward vaccination, it was found that 48 (18.5%) parents had a positive attitude towards covid-19 immunization of their children aged 12-18 years old and 18 (6.9%) had a negative attitude towards the vaccine. In comparison, 194 (74.6%) were in a neutral position. Regarding nationality, 19.2% of Saudi parents had a positive attitude toward COVID-19 vaccination for their children, compared to 6.7% of non-Saudis, with statistical significance. In addition, 31.7% of parents with a history of family member loss due to COVID-19 had a positive attitude.

Skjefte et al., (2021) reported that middle-income countries are more likely to accept COVID-19 vaccines than low-income countries. Previous infectious disease loads may have influenced the increased perception of COVID-19 risk and the more positive vaccination attitude (Altulaihi et al., 2021). At the same time, Skjefte et al., (2021) stated that most participants had a general understanding and acceptance of the virus's attitudes and practices regarding vaccination. A lack of knowledge in various areas, including the virus's transmission route, clinical symptoms, vulnerable populations, re-infections and the incubation period (Skjefte et al., 2021).

Level of education plays a vast difference regarding the acceptance of children's vaccination against COVID-19 as it was obvious that 167 (64.2%) were university graduates and 10.4% had below the secondary level of education. Also, 168 (64.6%) of the partners were university graduates. These findings are consistent with those reported by Altulaihi et al., (2021) who stated that those with higher educational degrees were more knowledgeable when compared to other groups. In the current study, it was clear that 115 individuals said they were constantly exposed to encouraging information about the COVID-19 vaccine to varying degrees. In contrast, only 58 said they were constantly exposed to negative information about COVID-19 vaccination.

As mentioned earlier, it is believed that the increased efforts by all the responsible authorities played a significant role in increasing the percentage of parents' acceptance of their children getting vaccinated. In addition, campaigns to raise awareness and public confidence in the direction of vaccination play a significant role in increasing the acceptance of vaccination. There has previously been a positive experience in Nigeria in increasing acceptance of polio vaccination, confirming the part of misconceptions or lack of awareness in influencing parental decisions and demonstrating that efforts to eliminate these misconceptions will raise the parents' acceptance rate (Nasiru et al., 2012; Wang et al., 2021; Solís-Arce et al., 2021).

Although other studies concluded that vaccine acceptance varies with age, our study was similar to another study conducted in Brazil, which concluded no significant difference in vaccination acceptance based on factors such as age and gender (Bagateli et al., 2021; Solís-Arce et al., 2021). The fact that women participated less than men was the only limitation of the research. Although the authors intended to distribute the survey to a representative sample of their professional and personal social networks, research has shown that gender influences how individuals react to online surveys.

Limitations

This study's quality could have been improved by incorporating numerous variables. This includes a collection of data from a larger number of parents, particularly in considering the World Health Organization's announcement that the severity of disease is decreasing over time, which may reduce the response to COVID-19 vaccination programs. Using a data collection method other than the questionnaire that permits direct contact with parents and having a reliable source to verify the accuracy of parental responses.

5. CONCLUSIONS AND RECOMMENDATIONS

On March 12, 2020, it was declared a global pandemic due to the spread of the COVID-19 virus. Because the etiological agent of SARS-CoV-2 is so infectious, public education is crucial to containing the epidemic. Based on these findings, efforts to educate the public about COVID-19 should focus on correcting specific misconceptions and reaching particular demographics. We expected that higher levels of education and excellent information gleaned from Ministry of Health programs through social media were connected to improved knowledge of preventative hygiene methods such as regular hand washing and stringent personal hygiene practices.

The results of this population-based survey might help the government formulate effective strategies for preventing future pandemics. COVID-19 vaccination education should stress the pandemic and what is at risk for communities rather than only the safety and efficacy of the vaccine. When more accurate data for these susceptible groups becomes accessible, we will have more possibilities to impact the crucial predictors we uncovered and boost public trust in the precise overview of upcoming vaccinations.

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Author Contributions

Abeer Shaker Elmoursy Ali: Design of the study, clinical selection, diagnosis and classification of the cases, interpreted biochemical laboratory investigations, preparing tables and figures, editing, styling, writing and revising of the main manuscript text; Naif M Alshaeri: Design of the study, writing and interpretation of results, writing manuscript; Hind Ameen M Al-Shankiti: Design of the study, writing and interpretation of results, writing manuscript; Norah Hassan H Alsifsafi: Design of the study, writing and interpretation of results, writing manuscript; Abdullah Mishal A Alderhami: Design of the study, writing and interpretation of results, writing manuscript; Abutaleb Mari M Alsayed: Design of the study, writing and interpretation of results, writing manuscript; Ahmed Ibrahim M Algabishi: Design of the study, writing and interpretation of results, writing manuscript.

Ethical approval

This study approved by institutional review board (IRB) of MOH, Makkah, Saudi Arabia and Umm Al-Qura University (UQU) under approval NO (HAPO-02-K-012-2021-08-730).

Informed consent

Not applicable.

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Conflict of interest

The authors declare that there is no conflict of interests.

Data and materials availability

All data sets collected during this study are available upon reasonable request from the corresponding author.

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