

Parental Willingness and Factors Influencing COVID-19 Vaccination for Children in Saudi Arabia

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Purpose: The study aimed to examine the parents' willingness and its association with demographic factors, attitudes, and practices to vaccinate their child against COVID-19.

Patients and Methods: The study involved 2500 participants from various regions of Saudi Arabia and was conducted between July 1, 2021, and August 31, 2021. Information was gathered via an online questionnaire comprising 26 questions, distributed across social media platforms. Informed consent was obtained from all participants before the commencement of the study. A chi-square test was applied to analyze the association among variables, utilizing a subset of 2127 participants based on study inclusion criteria. A chi-square test was applied to observe the association.

Results: The willingness of parents to vaccinate their children against COVID-19 was found 61%. The main reason for taking was "Protect the child" by 1094 (51.4%) and the main reason for refusing was "Side effects/safety concerns" by 477 (22.4%). 1846 (86.8%) participants, received the COVID-19 vaccine or were planning to receive it.

Conclusion: Our study concluded that parent's willingness to vaccinate their children against COVID-19 was relatively high in our sample as about two-thirds of them accept the vaccine for their child once it is available. The use of the health belief model demonstrated the urgent requirement for awareness and education campaigns in the private and public sectors to increase awareness of parents not only related to COVID-19 but also to cater to any unexpected or suspected pandemic of infectious disease in the future full capacity.

Keywords: attitude, immunization, practices, vaccination, well-being

Introduction

The outbreak of COVID-19, caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), was first reported in December 2019. By January 12, 2020, the virus had affected millions of people globally.^{1,2} Many concerns developed as the infection was transmitted predominantly among individuals who were in close contact. Therefore, public health authorities worldwide took initiatives to reduce the spread of the virus by encouraging social distancing, wearing masks in public, and washing hands frequently.^{3,4}

As of September 2022, COVID-19 caused 813,986 confirmed cases and 9309 fatalities in Saudi Arabia.⁵ Due to changes in the virus genome, new SARS-CoV-2 variants jeopardized the vaccine's effectiveness.⁶ Total of 66,700,629 vaccination doses were administered throughout the Kingdom,⁷ before returning to work, traveling abroad, or attending healthcare facilities and shopping centers. Saudi Arabia began administering of COVID-19 vaccine to children aged 12–18 years and 5–11 years in June and December 2021.^{8,9}

Vaccinations are widely considered the most successful therapies to aid the prevention and control of infectious diseases and effectively build herd immunity. Parental refusal or postponement of vaccinations for children increased during the past ten years, and poor vaccination rates have contributed to the recurrence of numerous diseases that can be prevented by vaccination.¹⁰ Global acceptance of parents towards COVID-19 vaccination for their children aged between 0 and 18 years (mean age: 8.45) showed parental adoptability prevalence pooled estimate of 57% [95% Confidence Interval: 52–62%, I²: 99.92%].¹¹ A cross-sectional study that interviewed parents visiting outpatient clinics in Saudi Arabia reported that 20% of parents had skeptical beliefs about

children's immunization.¹² The assessment of parents' intention to vaccinate offspring against COVID-19 reported lower willingness among Arab parents to vaccinate their children. Other factors included misconceptions about the severity of COVID-19 [73%; 95% CI: 73–79], efficacy and safety of vaccines [53%; 95% CI: 50–56], parents' young age [AOR:2.40; CI: 1.50–3.83], vaccination history [AOR: 16.47; CI: 8.39–32.33] and high fear among family members [AOR: 2.35; CI: 1.38–4.02].^{13,14} Misinformation leading to vaccination reluctance could endanger public health and make dealing with the current situation more difficult.¹⁵ Studies also reported the potential role of healthcare providers (HCPs) to ensure evidence-based effective communication with parents about focused health education strategies to change their perception towards vaccination.^{16–18} The self-perception of HCPs about COVID-19 vaccination also influences their convincing power to satisfy parents. The evaluation of HCPs' attitudes towards the administration of COVID-19 vaccination showed 57.2% of HCPs confident while getting vaccinated and hesitancy was observed in 32% of HCPs ($p < 0.05$) based on perception of COVID-19, clinical and demographic characteristics of HCPs.¹⁹

According to the Saudi Ministry of Health, the majority of vaccines' side effects are mild to moderate, manifest within three days of vaccination, and resolve on their own.⁹ Similarly, as per World Health Organization, COVID-19 vaccinations demonstrated minor or moderate side effects and subsided on their own after a few days.²⁰ Recent studies reported population threshold for establishing COVID-19 herd immunity ranges between 55% and 82%, depending on the biological, environmental, and socio-behavioral factors.²¹ Evidence has suggested improved safety and effectivity of the COVID-19 vaccine, as a study in Taiwan reported improved physical and mental quality of life in patients with COVID-19 and flu vaccination in comparison to participants who remained unvaccinated.²² The willingness to vaccinate could be studied through different potential theoretical models including the Health Belief Model (HBM),²³ theory of planned behavior,²⁴ protection motivation theory,²⁵ and trust in the healthcare system.²⁶ Our study used HBM to estimate parents' intention to get their child vaccinated as their health behavior. HBM evaluate individual beliefs and perception in terms of the perceived risk versus benefit ratio of vaccine, susceptibility, perceived barriers, efficacy, and severity and these factors influence a person's action.^{27,28}

Considering parent's apprehension about their children's well-being, allowing a child to participate in a vaccination study was a difficult decision, especially for children below the age of 18; since parents were usually the guardians responsible for them. As a result, it's critical to comprehend parents' acceptance of their children's COVID-19 immunization. Few studies conducted in 2020 showed more than half of parents' willingness to have their children vaccinated against COVID-19.^{29,30} While earlier studies indicated considerable parental willingness, there is a need for updated insights regarding the attitudes of parents in the distinct regions. This study aims to address this gap by assessing parental willingness across five regions in Saudi Arabia, considering demographic factors, attitudes, and vaccination practices concerning COVID-19 for children.

Materials and Methods

The cross-sectional study was conducted among five regions of Saudi Arabia including the southern, western, eastern, northern, and central regions—adhered to the principles of the Declaration of Helsinki. The study was approved by the Institutional Review Board (IRB) of King Abdul-Aziz University on Tuesday, July 13, 2021 under the reference number (Reference No 3B1-21).

Inclusion and Exclusion Criteria

The study included parents residing in the southern, western, eastern, northern, and central regions of Saudi Arabia, having children under the age of 12. Participation was voluntary, requiring informed consent from parents who completed the survey questionnaire distributed online via social media platforms. The survey was voluntary and anonymous, participants provided informed consent by voluntarily engaging in the survey after being explained about the study's purpose. Exclusion criteria comprised parents residing outside the specified regions, those with children over 12 years old, and individuals unwilling to provide informed consent. Incomplete survey responses or failure to comply with survey instructions led to exclusion from the analysis.

Sample Size and Participants

Samples were recruited using a purposive sampling technique and the sample size was calculated based on the minimum sample required for a prevalence study.³¹ Moreover, using the Rao soft calculator, the sample size was found to be at least 315 with a margin of error of 5% and a confidence level of 95%. Hence, a total number of 2500 participants completed the survey of which 2127 were recruited for analysis based on study inclusion criteria.

The detailed study objective was explained by an independent researcher to all study participants and upon agreement informed consent was obtained from the participants.

Study Questionnaire

The Health Belief Model (HBM) framework was used to construct the questionnaire for our study. In terms of diversity of beliefs, such as perceived susceptibility, perceived severity, perceived benefits, perceived barriers, and cues to action, the HBM is a crucial theoretical framework for predicting the preventive health behavior of an individual.³² These HBM constructions have also been widely utilized to forecast readiness to receive influenza vaccinations.³³ HBM constructions were linked to individuals' desire to receive the COVID-19 vaccine. The objective of the current study was to observe the willingness of parents to get their children vaccinated against COVID-19. In this context, perceived susceptibility refers to parents' overall perceptions of their children's sensitivity to COVID-19 while discussing their desire to let them receive the COVID-19 vaccine. Parents' perceptions of the COVID-19 adverse effects are referred to as perceived severity. Parents' perceptions of the advantages of vaccinations, such as protecting their health are referred to as perceived benefits. Parental perceptions of the risks associated with vaccinations, including their side effects, are referred to as perceived barriers. Cues to action are the factors that motivate parents to immunize their children.^{34,35} By using the HBM theoretical framework, a 26-item questionnaire was developed. HBM questionnaire was previously validated by different studies^{36,37} but our study designed a questionnaire using ten questions about demographics, eight questions about factors that would influence the caregivers' decision to vaccinate, and two were about the caregivers' plans to get the Vaccine and vaccinate their children. The HBM section of the questionnaire was graded on a Likert scale ranging from 1 (disagree) to 3 (agree), which allowed a concise and user-friendly response format. It was chosen to encourage simplicity and ease of participant engagement; although it limited the spectrum of possible attitudes compared to higher-point scales. The use of a shorter scale aimed to reduce respondent burden and potential confusion associated with more gradations that resulted in higher response rates in capturing the general attitudes of parents toward their children's COVID-19 vaccination.

The questionnaire was constructed in Arabic, the primary language spoken in Saudi Arabia. While this choice facilitated engagement with a majority of the population, it might have excluded residents who do not speak Arabic fluently.

Data Collection

The online questionnaire, being a convenient and widely accessible tool, was chosen as the mode of data collection from July 1, 2021, to August 31, 2021. This defined timeframe allowed for a focused data collection period, ensuring a specific window for participant engagement and data compilation within the specified duration. The online questionnaires were distributed as Google Forms and circulated through social media platforms, offering a convenient and accessible platform for data collection among a diverse population. There was the possibility of multiple responses from the same individual in online surveys and this issue was by implementing restrictions to limit multiple submissions from the same device or IP address. This minimized the likelihood of duplicate responses from participants.

For a detailed breakdown of the questionnaire items, see [Appendix A](#).

Statistical Analysis

The data were analyzed by an independent researcher using Microsoft Excel 2016. Data was collected for age, gender, nationality, level of education, residence, marital status, family income, and whether the caregiver's children have any medical issues were included in the demographic section. Cronbach alpha was computed for the reliability of the overall

questionnaire and it was found 0.80. The Cronbach's alpha for each subscale including perceived barrier was 0.76, perceived benefit was 0.71, perceived susceptibility was 0.85, perceived severity was 0.81, and combined indices were 0.85, respectively.

Statistical Package for Social Science (SPSS) version 23.0 was used to analyze the data. The normality of data was not performed as there was no quantitative outcome variable in the study. Frequency and percentages were calculated for qualitative variables. The chi-square test was used to observe the association between two categorical variables and a P-value of <0.05 was considered to be statistically significant.

Results

Demographic Details

Two thousand five hundred surveys were completed online by caregivers; 2127 children less than 12 years old were included in this study. Table 1 provided demographic information that included females as the predominant gender; 1579 (74.2%), and almost two-thirds 1559 (73.3%) were from groups aged 26–35 and 36–45 years. The majority of 2055 (96.7%) were Saudi, and in 1975 (92.9%) were married. More than half, 1284 (60.4%) had bachelor's degrees, and 1313 (61.7%) had monthly income between 5001–12,000 and 12,001–20,000. Less than a fifth, of 337 (15.8%) worked in the healthcare field.

Medical History of Children

Table 2 depicts information about children's medical history. Almost four of the children, 478 (22.5%), had a chronic illness, the most common were breathing problems (37%), and obesity (34.9%). A total of 190 (8.9%) received

Table 1 Demographic Characteristics of Participants

Variable	N	%
Gender		
Female	1579	74.2
Male	548	25.8
Age of parents		
18–25	286	13.4
26–35	800	37.6
36–45	759	35.7
>45	282	13.3
Nationality		
Saudi	2055	96.7
Non- Saudi	72	3.3
Region		
Southern region	211	9.9
Eastern Region	646	30.4
Northern region	274	12.9
Western Region	554	26.0
Central Region	442	20.8

(Continued)

Table 1 (Continued).

Variable	N	%
Marital status		
Married	1975	92.9
Divorced	111	5.2
Widowed	41	1.9
Level of education		
Uneducated	12	0.6
Primary school graduate	12	0.6
Middle school graduate	42	2.0
High school graduate	299	14.1
Diploma	214	10.1
Bachelor's degree	1284	60.4
Master's or Doctoral degree	264	12.4
Family income		
<3000 SR*	136	6.4
3000–5000 SR*	311	14.6
5001–12,000 SR*	708	33.3
12,001–20,000 SR*	605	28.4
>20,000 SR*	367	17.3
Are you a healthcare worker?		
Yes	337	15.8
No	1790	84.2
If yes, please specify:		
Physician	119	35.3
Dentist	17	5.1
Nurse	89	26.4
Pharmacist	33	9.8
Others, specify:	79	23.4

Note: *SR; Saudi Riyals (1 SAR = \$0.2666)*.

medications. Most caregivers (89.2%) reported that their children were up to date on vaccinations, and 2045 (96.1%) said, “Agree with the imposition of those vaccines for the child”. Among the participants who refused the imposition of those vaccines for the child, the main reasons were “Safety concerns” by 69 (41.3%) and “A desire for more information from healthcare providers” by 63 (37.7%), only forth children 540 (25.4%) received a flu vaccination.

Table 2 Medical History of Children

Variable	N	%
Chronic illness		
Yes	478	22.5
No	1649	77.5
Specify [#]		
Heart conditions	57	11.9
Autoimmune conditions	50	10.5
Breathing problems	177	37.0
Behavior issues	69	14.4
Obesity	167	34.9
Diabetes	64	13.4
Cancer	16	3.3
Allergy	46	9.6
Anemia	19	4.0
Other	41	8.6
Children Taking Medications		
Yes	190	8.9
No	1871	88.0
Not sure	66	3.1
Up to Date on Vaccinations		
Yes	1897	89.2
No	171	8.0
Not sure	59	2.8
Parents Agree with the Imposition of Those Vaccines for the Child/Children		
Yes	2045	96.1
No	82	3.9
If not, specify the reason (n=167) [#]		
Religious reasons	14	8.4
Personal beliefs or philosophical reasons	21	12.6
Safety concerns	69	41.3
A desire for more information from healthcare providers	63	37.7
Child Receive the Yearly Flu Vaccine		
Yes	540	25.4
No	1429	67.2
Not sure	158	7.4

Note: [#]Multiple responses.

COVID-19 Vaccine Experience and Attitude

Table 3 provides information about the COVID-19 vaccine experience and attitude, most of the participants 1846 (86.8%) received the COVID-19 Vaccine or planning to receive it. More than half 1299 (61.1%) accepted giving the COVID-19 Vaccine to children; the main reasons for accepting the Vaccine were “Protect the child” by 1094 (51.4%) and “Desire to return to normal life” by 1033 (48.6%). While the main reasons for refusing the Vaccine were “Side effects/safety concerns” by 477 (22.4%) and “Perceived child not at risk to contract COVID-19” by 281 (13.2%). Third,

Table 3 Attitudes and Practices of Parents Regarding COVID-19 Vaccination

Variable	N	%
Parents Received the COVID-19 Vaccine		
Yes	1846	86.8
No	281	13.2
Parents Planned to Receive COVID-19 Vaccine		
Yes	270	96.1
No	11	3.9
Parents Accepted the Vaccine for the Child/Children		
Yes	1299	61.1
No	444	20.9
Not sure	384	18.1
If yes, specify the reason#		
Protect the child	1094	51.4
Protect others	921	43.3
General vaccine acceptance	872	41.0
Perceived pandemic severity	1013	47.6
Desire to return to normal life	1033	48.6
High-risk child or family members (has medical illness)	532	25.0
If no, specify the reason#		
Novelty	79	3.7
Perceived child not at risk of contracting COVID-19	281	13.2
Side effects/safety concerns	477	22.4
Vaccine refusal in general	157	7.4
Efficacy concerns	210	9.9
Perceived contraindications	44	2.1
Parents Had COVID-19 infection		
Yes	575	27.0
No	1484	69.8
Not sure	68	3.2

(Continued)

Table 3 (Continued).

Variable	N	%
The child Had a COVID-19 infection		
Yes	428	20.1
No	1603	75.4
Not sure	96	4.5
Parents Know Someone Who Had/Has COVID-19		
Yes	1709	80.3
No	381	17.9
Not sure	37	1.7
Parents Know Someone Who Had/Has Been Hospitalized with COVID-19		
Yes	1468	69.0
No	628	29.5
Not sure	31	1.5
"The Age of Your Children Influence Your Decision to Allow Them to Receive a COVID-19 Vaccine when Available"		
Yes	840	39.5
No	909	42.7
Not sure	378	17.8
Parents Worry that the Child Will Get Sick or Have Side Effects from a COVID-19 Vaccine.		
Agree	1141	53.6
Neutral	659	31.0
Disagree	327	15.4
The Development of a COVID-19 Vaccine is too Rushed to Test its Safety Properly, "and" I Am Concerned about the Side Effects of a Future COVID-19 Vaccination.		
Agree	1170	55.0
Neutral	620	29.1
Disagree	337	15.8
"If the Doctor Recommends That the Child Receives the COVID-19 Vaccine, Then the Child Will be Vaccinated".		
Agree	1273	59.8
Neutral	556	26.1
Disagree	298	14.0
Parents concerned about post-vaccination safety		
Agree	1189	55.9
Neutral	361	17.0
Disagree	577	27.1

(Continued)

Table 3 (Continued).

Variable	N	%
COVID-19 relapse will be life-threatening		
Agree	1301	61.2
Neutral	402	18.9
Disagree	424	19.9
If WHO recommends then I will vaccinate my child only		
Agree	589	27.7
Neutral	900	42.3
Disagree	638	30.0
I am not aware of and concerned about vaccine efficacy		
Agree	1369	64.4
Neutral	386	18.1
Disagree	372	17.5
I am not aware of potential adverse effects		
Agree	1411	66.3
Neutral	386	18.1
Disagree	330	15.5
Parents' Agreement with the Imposition of COVID-19 Vaccine for Children as a Requirement to Attend School as a Precautionary Measure for Student Safety		
Agree	1077	50.6
Disagree	543	25.5
Neutral	507	23.8
I am concerned about my child and family's data safety		
Agree	1159	54.5
Disagree	534	25.1
Neutral	434	20.4
COVID-19 vaccine will be protective for my child		
Agree	853	40.1
Disagree	571	26.8
Neutral	703	33.1
Children after vaccination can safely return to school in normal health status		
Agree	500	23.5
Disagree	1100	51.7
Neutral	527	24.8

Note: #Multiple responses.

the participants confirmed that the child’s age influenced their decision to give them the COVID-19 Vaccine. More than half agree with the following statements: “If the Doctor Recommends That the Child Receive the COVID-19 Vaccine, Then the Child Will be Vaccinated.” by 1273 (59.8%). Followed by “The development of a COVID-19 vaccine is too rushed to properly test its safety” by 1170 (55.0%), then “Worry that the child Will Get Sick or Have Side Effects from a COVID-19 Vaccine” by 1141 (53.6%), and “the imposition of COVID-19 vaccine for children as a requirement to attend school as a precautionary measure for student safety” by 1077 (50.6%). The results of our study also showed a lack of awareness and certainty towards action post-vaccination of their child, as 51.7% had no idea about the safe return of child after vaccination to school in normal health status. 42.3% were neutral and 30% disagreed due to unawareness that even if WHO recommend they will not get their child vaccinated.

The analysis of medical records of children, attitudes, and awareness of parents concerning gender, age, and level of education has been illustrated in Figures 1–3.

Association of Demographics with COVID-19 Vaccination Acceptance

Table 4 provides the association of demographic characteristics with the willingness for COVID-19 vaccination for their children. It revealed a significant association between “Accepting the Vaccine for the child/children” and gender, nationality, educational level, and region ($p = 0.002$, $p = 0.016$, $p = 0.001$, and $p < 0.0001$) respectively”. In addition,

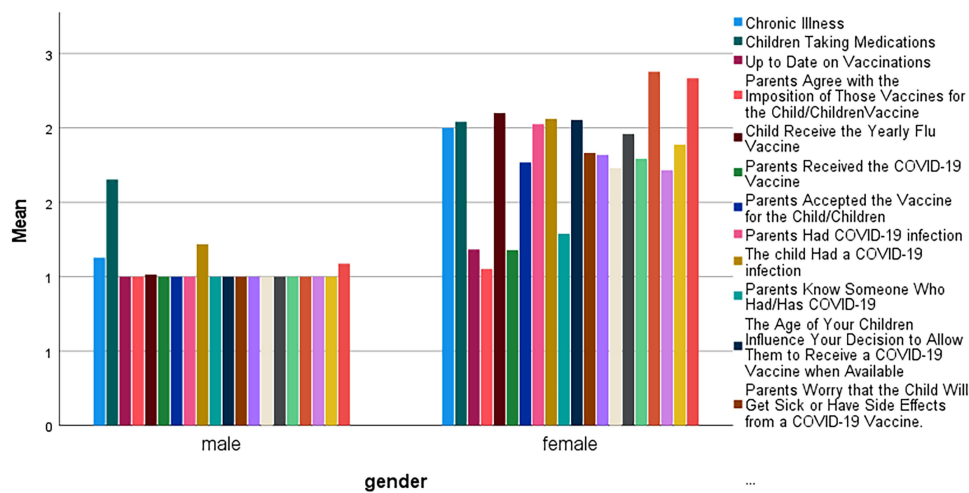


Figure 1 Analyzing medical records of children, attitudes, and awareness of parents concerning gender.

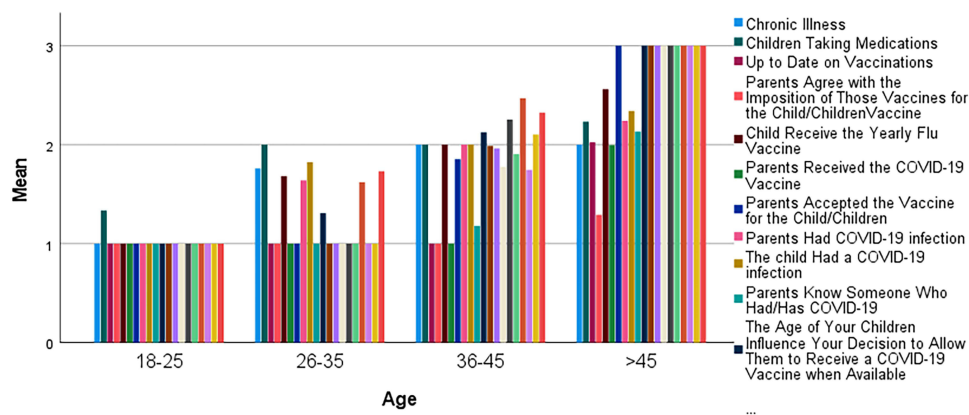


Figure 2 Analyzing medical records of children, attitudes, and awareness of parents concerning age.

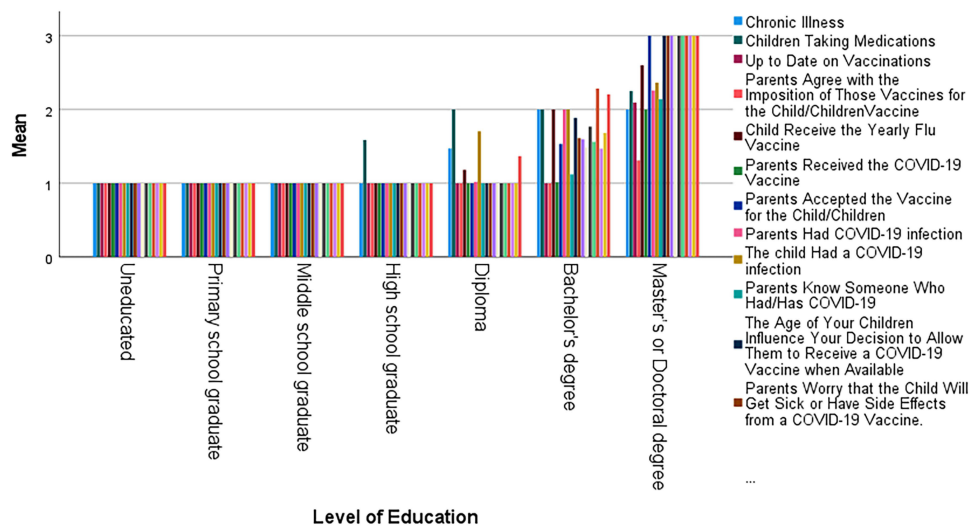


Figure 3 Analyzing medical records of children, attitudes, and awareness of parents concerning level of education.

there was no significant association between” Accepting the Vaccine for the child/children” and age, marital status, family income, and being healthcare workers.

Parents’ Attitudes and Practices Towards COVID-19 Vaccination

Table 5 shows the association of parents’ attitudes and practices towards COVID-19 vaccination with the willingness to COVID-19 vaccination for their children. The results revealed a significant association in the group who received the COVID-19 Vaccine, those who had children, who did not suffer from COVID-19, those who knew someone hospitalized with COVID-19, those who reported that the age of the child did not influence their decision to give them COVID-19

Table 4 Association of Demographic Characteristics with the Willingness to COVID-19 Vaccination for Their Children

Variable	Parents Accepting the Vaccine for the Child/Children			p-value
	No	Not Sure	Yes	
Gender				
Female	345 77.7%	304 79.2%	930 71.6%	0.002*
Male	99 22.3%	80 20.8%	369 28.4%	
Age of parents				
18–25	52 11.7%	38 9.9%	196 15.1%	0.068
26–35	176 39.6%	156 40.6%	468 36.0%	
36–45	160 36.0%	145 37.8%	454 34.9%	
>45	56 12.6%	45 11.7%	181 13.9%	

(Continued)

Table 4 (Continued).

Variable	Parents Accepting the Vaccine for the Child/Children			p-value
	No	Not Sure	Yes	
Nationality				
Saudi	419 94.4%	370 96.4%	1266 97.5%	0.016*
Non- Saudi	25 5.6%	14 3.6%	33 2.5%	
Region				
Southern region	29 6.5%	29 7.6%	153 11.8%	0.0001**
Eastern Region	107 24.1%	108 28.1%	431 33.2%	
Northern region	56 12.6%	42 10.9%	176 13.5%	
Western Region	146 32.9%	121 31.5%	287 22.1%	
Central Region	106 23.9%	84 21.9%	252 19.4%	
Marital status				
Married	414 93.2%	353 91.9%	1208 93.0%	0.132
Divorced	26 5.9%	25 6.5%	60 4.6%	
Widowed	4 0.9%	6 1.6%	31 2.4%	
Level of education				
Uneducated	3 0.7%	2 0.5%	7 0.5%	0.001*
Primary school graduate	3 0.7%	3 0.8%	6 0.5%	
Middle school graduate	10 2.3%	0 0.0%	32 2.5%	
High school graduate	50 11.3%	42 10.9%	207 15.9%	
Diploma	35 7.9%	51 13.3%	128 9.9%	
Bachelor's degree	287 64.6%	237 61.7%	760 58.5%	
Master's or Doctoral degree	56 12.6%	49 12.8%	159 12.2%	

(Continued)

Table 4 (Continued).

Variable	Parents Accepting the Vaccine for the Child/Children			p-value
	No	Not Sure	Yes	
Family income				
<3000 SR	32 7.2%	23 6.0%	81 6.2%	0.117
3000–5000 SR	67 15.1%	67 17.4%	177 13.6%	
5001–12,000 SR	154 34.7%	135 35.2%	419 32.3%	
12,001–20,000 SR	106 23.9%	103 26.8%	396 30.5%	
>20,000 SR	85 19.1%	56 14.6%	226 17.4%	
Are you a healthcare worker?				
No	385 86.7%	331 86.2%	1074 82.7%	0.061
Yes	59 13.3%	53 13.8%	225 17.3%	

Notes: *Significant value. **Highly significant value.

Vaccine: those who agreed “If the Doctor Recommends That the Child Receive the COVID-19 Vaccine, Then the Child Will be Vaccinated”. “The development of a COVID-19 vaccine is too rushed to test its safety properly”, and “Worry that the child Will Get Sick or Have Side Effects from a COVID-19 Vaccine” ($p < 0.0001$).

Table 5 Association of Parents' Attitudes and Practices Towards COVID-19 Vaccination with the Willingness to COVID-19 Vaccination for Their Children

Variable	Parents Accepting the Vaccine for the Child/Children			p-value
	No	Not Sure	Yes	
Parents Received the COVID-19 Vaccine				
No	131 29.5%	65 16.9%	85 6.5%	0.0001**
Yes	313 70.5%	319 83.1%	1214 93.5%	
Parents Had COVID-19				
Yes	106 23.9%	108 28.1%	361 27.8%	0.388
No	322 72.5%	261 68.0%	901 69.4%	
Not sure	16 3.6%	15 3.9%	37 2.8%	

(Continued)

Table 5 (Continued).

Variable	Parents Accepting the Vaccine for the Child/ Children			p-value
	No	Not Sure	Yes	
Child Had COVID-19				
Yes	67 15.1%	77 20.1%	284 21.9%	0.016*
No	358 80.6%	284 74.0%	961 74.0%	
Not sure	19 4.3%	23 6.0%	54 4.2%	
Parents Know Someone Who Has COVID-19				
Yes	357 80.4%	299 77.9%	1053 81.1%	0.400
No	81 18.2%	74 19.3%	226 17.4%	
Not sure	6 1.4%	11 2.9%	20 1.5%	
Parents Know Someone Who Has Been Hospitalized with COVID-19				
Yes	281 63.3%	257 66.9%	930 71.6%	0.0001**
No	156 35.1%	113 29.4%	359 27.6%	
Not sure	7 1.6%	14 3.6%	10 0.8%	
"The Age of Your Children Influence Your Decision to Allow Them to Receive a COVID-19 Vaccine when Available"				
Yes	284 64.0%	229 59.6%	327 25.2%	0.0001**
No	113 25.5%	39 10.2%	757 58.3%	
Not sure	47 10.6%	116 30.2%	215 16.6%	
Parents Worry that the Child Will Get Sick or Have Side Effects from a COVID-19 Vaccine.				
Agree	309 69.6%	267 69.5%	565 43.5%	0.0001**
Disagree	46 10.4%	14 3.6%	267 20.6%	
Neutral	89 20.0%	103 26.8%	467 36.0%	

(Continued)

Table 5 (Continued).

Variable	Parents Accepting the Vaccine for the Child/Children			p-value
	No	Not Sure	Yes	
The Development of a COVID-19 Vaccine is too Rushed to Test its Safety Properly, "and" I Am Concerned about the Side Effects of a Future COVID-19 Vaccination.				
Agree	376 84.7%	283 73.7%	511 39.3%	0.0001**
Disagree	25 5.6%	11 2.9%	301 23.2%	
Neutral	43 9.7%	90 23.4%	487 37.5%	
If the Doctor Recommends That the Child Receive the COVID-19 Vaccine, then the Child Will be Vaccinated.				
Agree	45 10.1%	142 37.0%	1086 83.6%	0.0001**
Disagree	239 53.8%	24 6.3%	35 2.7%	
Neutral	160 36.0%	218 56.8%	178 13.7%	
Parents' Agreement with the Imposition of COVID-19 Vaccine for Children as a Requirement to Attend School as a Precautionary Measure for Student Safety				
Agree	40 9.0%	81 21.1%	956 73.6%	0.0001**
Disagree	316 71.2%	130 33.9%	97 7.5%	
Neutral	88 19.8%	173 45.1%	246 18.9%	

Notes: *Significant value. **Highly significant value.

Multivariate Analysis

Table 6 presents the results of a multivariate analysis examining the effects of different variables on vaccination willingness among the surveyed population. The Wilks' Lambda values in the multivariate analysis table signify the extent of variance in the willingness to vaccinate attributed to each variable. Higher Wilks' Lambda values near 1 suggest a more substantial association between the variable and vaccination willingness. In this context, gender exhibits a Wilks' Lambda of 0.556, indicating that gender accounts for approximately 44.4% of the variance in vaccination willingness, implying a notable but not exclusive influence. On the other hand, age demonstrates a markedly higher Wilks' Lambda of 0.008, suggesting that age plays a more dominant role, accounting for around 80.2% of the variance in vaccination willingness among the surveyed population. Similarly, the level of education presents a Wilks' Lambda of 0.122, signifying that education level contributes to about 29.6% of the variance in vaccination willingness, indicating a moderate impact compared to other variables assessed in the analysis.

Table 6 Multivariate Analysis

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Gender	Pillai's Trace	0.444	83.754b	20.000	2097.000	0.000	0.444
	Wilks' Lambda	0.556	83.754b	20.000	2097.000	0.000	0.444
	Hotelling's Trace	0.799	83.754b	20.000	2097.000	0.000	0.444
	Roy's Largest Root	0.799	83.754b	20.000	2097.000	0.000	0.444
Age	Pillai's Trace	1.997	209.031	60.000	6297.000	0.000	0.666
	Wilks' Lambda	0.008	425.898	60.000	6257.135	0.000	0.802
	Hotelling's Trace	22.013	768.859	60.000	6287.000	0.000	0.880
	Roy's Largest Root	17.429	1829.222c	20.000	2099.000	0.000	0.946
Level of Education	Pillai's Trace	1.438	33.129	120.000	12,612.000	0.000	0.240
	Wilks' Lambda	0.122	44.446	120.000	12,126.852	0.000	0.296
	Hotelling's Trace	3.543	61.867	120.000	12,572.000	0.000	0.371
	Roy's Largest Root	2.556	268.686c	20.000	2102.000	0.000	0.719

Abbreviations: SARS-CoV-2, severe acute respiratory syndrome coronavirus 2; HCPs, healthcare providers; HBM, health belief model; IRB, institutional review board; SPSS, statistical package for social science; WHO, world health organization.

Discussion

The study aimed to assess whether parents were willing to vaccinate their children against COVID-19 and the association of demographic characteristics, attitudes, and practices of parents with the willingness to vaccinate their children. Our results demonstrated that 61% of parents were willing to vaccinate their children against COVID-19, where most caregivers were females. The key option for mitigating the effects of COVID-19 is immunization. Children under the age of 14 account for around 25% of the global population³⁸ and account for approximately 10% of total COVID-19 cases.³⁹ Vaccinating children is an important step in achieving more comprehensive herd immunity against COVID-19. One of the most critical variables influencing how many children will be covered by the COVID-19 immunization campaign is parents' willingness to allow their children to receive the vaccines. In Saudi Arabia, cultural and religious beliefs often intersect with healthcare decisions, including vaccination. Additionally, government policies, public health campaigns, and access to healthcare services contribute to the overall vaccination landscape. However, Saudi Arabia's efforts in promoting healthcare, vaccination campaigns, and initiatives play a crucial role in shaping parental attitudes. The government's support and endorsement of vaccinations, including COVID-19 vaccines significantly influence parental willingness to vaccinate their children.

A meta-analysis, however, discovered that only about 57% of parents intend to vaccinate their children, and this rate varies substantially across nations.⁴⁰ A survey based on a small sample of Hong Kong parents discovered that only 21% of parents would vaccinate their children if COVID-19 vaccines were formally authorized for use.⁴¹ This rate is nearly the lowest among those found in other countries.^{42–44} In contrast to our study, a recent study in Saudi Arabia reported that only 28% of 1000 caregivers were ready to vaccinate their children.⁴⁵

In a study, the income of parents affected the decision to have the vaccination for their child which was contrary to our findings and was not found significant.¹⁰ Our sample's predominant motivation for COVID-19 vaccination was fear of the pandemic's severity, like previous parental plans to protect their children against seasonal influenza.⁴⁶ "Protection of the child" was the most common reason for vaccine acceptance in our study which was in concordance with other previous studies, followed by "desire to return to normal life" and "perceived pandemic severity". Nevertheless, the main reason for rejecting the vaccine in our study was the vaccine's side effects. The second most common reason for rejection was the child was not at risk of having COVID-19. The World Health Organization (WHO) suggests that only 8.5% of children under 18 years got

infected with COVID-19 or are thought to be asymptomatic.⁴⁷ Therefore, they are the least likely to contract the disease. Our study showed that caregivers with a bachelor's degree are more willing to vaccinate their children. Similar findings were reported by a study in which a higher academic level correlates to much better health and grasping of information related to vaccines.⁴⁸ Our study results also showed that due to lack of awareness and training sessions, 51.7% had no idea about the safe return of children after vaccination to school in normal health status. 42.3% were neutral, and 30% were unwilling due to unawareness that even if WHO recommend they will not get their child vaccinated. The increase in parental willingness could be attained through different aspects, such as using Zoom-focused education and minimizing the pay for the vaccine.⁴⁹ An introduction of ZOOM sessions and empowerment of parents to ask their concerns related to vaccines to HCPs during these sessions reported 65% improved vaccination compliance in Hong Kong preschoolers.⁵⁰ Clear and appropriate communication with caregivers and parents related to the benefits of vaccination and awareness related to safety precautions help improve the rate of vaccination among children.⁵¹

In a recent survey in Saudi Arabia,⁵² 65% of adults revealed that they would plan to get vaccinated against COVID-19.⁵³ Similar findings were reported from three-quarters of an online sample from France,⁵⁴ and 69% in the United Kingdom.⁵⁵ The Ministry of Health recorded that more than 23 million individuals in Saudi Arabia had received the COVID-19 Vaccine. Therefore, of 2127, 1846 received the COVID-19 Vaccine, and 1214 were willing to give their children the COVID-19 Vaccine. The severity of the pandemic and the complications associated with the contraction of COVID-19 instilled concerns in the general population and motivated them to opt for vaccination which also enhanced the parents' willingness to immunize their children.^{9,56} Thus, parents who vaccinated themselves against COVID-19 were more willing to vaccinate their children probably due to their previous experience in vaccination and confidence in accepting the idea of vaccination and considered it as the most effective measure in preventing infections.

Parents may be more likely to vaccinate their children against COVID-19 if they have social legitimacy⁵⁷ following large groups getting vaccinated and hearing recommendations from healthcare practitioners.¹⁹ Same as our study, which showed that caregivers are more intent to give their child the Vaccine if the doctor recommends it. During the COVID-19 pandemic, a global epidemic of misinformation emerged through social media, posing obstacles to future COVID-19 immunization initiatives.^{58,59} Thus, public health authorities should modify misinformation about the COVID-19 vaccine and create a positive perception of the vaccine.

It has been shown that a significant portion (approximately two-thirds) of parents having children affected by kidney disease or hypertension expressed reluctance when vaccinating their child against COVID-19.⁶⁰ Interestingly, a similar level of hesitancy was observed towards routine childhood vaccinations and the influenza vaccine among the same group of parents. This link between hesitation towards different vaccines suggests a potential connection in attitudes. Another study by Del Giudice et al⁶¹ showed that parents exhibiting worrisome attitudes regarding the safety of COVID-19 vaccines, postponed at least one dose of a recommended vaccine for their child, and did not receive a minimum of three doses of the SARS-CoV-2 vaccine were prone to displaying increased levels of hesitancy towards vaccination in Italy. The findings of a study by Zhou et al⁶² revealed a considerable delay in vaccination among both parents and their children, irrespective of eligibility for the booster dose. This highlighted the need for increased awareness regarding the scientific evidence backing the efficacy and safety of all the vaccines not just COVID-19, particularly among individuals with poor health conditions and parents having young children. Moreover, a study showed concern for parents' readiness to vaccinate children aged 5 to 11 years.⁶³ This highlighted the need to guide policymakers across nations to formulate effective strategies to promote childhood vaccination.

The strengths include the large sample size which was conducted in five regions of Saudi Arabia. However, this study has some limitations. Firstly, the sample may not fully represent all caregiver perspectives in Saudi Arabia, potentially introducing selection bias. Being a cross-sectional study, it captured a snapshot of attitudes at a specific time, limiting the ability to draw causal relationships or generalize findings beyond the study period. The survey being exclusively in Arabic posed a language barrier, excluding individuals unable to read Arabic, possibly introducing language bias and limiting the inclusivity of diverse linguistic groups. Moreover, the survey's distribution via social media might have excluded caregivers without access to smart devices, potentially leading to socioeconomic bias. Importantly, this study was conducted in 2021, and as vaccination approval for children might have changed since then, the findings might not reflect the current landscape. However, it serves as a valuable baseline for understanding initial perspectives before vaccine authorization for children. The findings provide a foundational insight into parental willingness, offering a starting point for monitoring shifts in attitudes post-authorization

and guiding future research and public health strategies. Additionally, the questionnaire, while based on the Health Belief Model, underwent pilot testing but lacked full validation before implementation, possibly affecting the accuracy and reliability of responses.

Conclusion

In conclusion, the study revealed a notably high prevalence of parental acceptance of COVID-19 vaccination for their children, with approximately two-thirds expressing willingness once the vaccine became available. The Health Belief Model highlighted the need for robust awareness and education campaigns across public and private sectors, emphasizing not only COVID-19 but also preparedness for potential future infectious disease pandemics. However, future research employing in-person interviews and stringent eligibility criteria is recommended to investigate parents' perspectives deeply and further refine the understanding of parental attitudes toward childhood vaccinations.

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Disclosure

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