

Parental Willingness to Vaccinate Their Children Against SARS-CoV-2 in Jordan: An Explanatory Cross-Sectional Study

Jomana W Alsulaiman¹, Mai Mazin¹, Tariq N Al-Shatanawi², Khalid A Kheirallah³,
Mohammed Z Allouh⁴

¹Department of Pediatrics, Faculty of Medicine, Yarmouk University, Irbid, Jordan; ²Department of Public Health, Faculty of Medicine, Al-Balqa Applied University, Salt, Jordan; ³Department of Public Health and Community Medicine, Faculty of Medicine, Jordan University of Science and Technology, Irbid, Jordan; ⁴Department of Anatomy, College of Medicine and Health Sciences, United Arab Emirates University, Al Ain, United Arab Emirates

Correspondence: Mohammed Z Allouh, Department of Anatomy, College of Medicine and Health Sciences, United Arab Emirates University, Al Ain, 15551, United Arab Emirates, Tel +971 3713 7551, Email m_allouh@uaeu.ac.ae

Background: Successful control of the COVID-19 pandemic is largely dependent on vaccine administration to epidemiologically influential groups, including children. Considering that pediatric population comprises a significant portion on the population in developing countries, and their risk of infection and spreading the disease has been underestimated, it is crucial to investigate parental willingness to administer SARS-CoV-2 vaccine to their children between 5 and 11 years old. This study investigates the prevalence and determinants of parental willingness towards vaccinating their children (5–12 years old) against COVID-19 in a developing country setting, Jordan.

Methods: A cross-sectional study, conducted between October and November 2021, utilized online Google Forms to collect data on parents' background characteristics, willingness to vaccinate their children, SARS-CoV-2, infection and vaccine, risk perception, and factors affecting decision to vaccinate.

Results: A total of 564 parents completed the questionnaire; 82.8% were mothers, 85.3% were 30 years of age or older, and 75.9% had bachelor's degrees or higher. Only 25.4% of parents reported willingness to vaccinate their 5–12 years old children against SARS-CoV-2. Lower parental age, higher income, and having health insurance coverage increased parental willingness. Among participants vaccinated against COVID-19, only 29.0% were willing to vaccinate their children. Healthcare providers' trust and vaccine recommendations by pediatricians increased parental willingness. COVID-19 risk perception seems to have negative effects on parental willingness.

Conclusion: A significant proportion of parents in Jordan indicated hesitancy towards administering COVID-19 vaccine for their children. Concerns about vaccine safety and trust in the healthcare system appear to be the most important predictors of parents' hesitancy. Effective vaccine campaigns should focus on risk perception and communication and should consider parental socio-demographic characteristics.

Keywords: SARS-CoV-2, COVID-19, vaccine hesitancy, willingness, children, Jordan, risk perception

Introduction

The ongoing COVID-19 pandemic continues to be a major global public health threat.¹ With newly evolving variants of concern, SARS-CoV-2 seems to introduce a surge in numbers of reported cases, hospitalization and deaths. Epidemiologically influential groups affected by the pandemic include children of all ages, among others. This group was initially believed to be immune to the pandemic and recent reopening of schools have shown the critical impact of children in spreading the infection at the community levels.^{2–4} On November 2021, COVID-19 vaccines have been authorized for use in children above 5 years old as COVID-19 mRNA vaccine was declared safe and effective for this age groups by the CDC.⁵ Immunization of children and adults will be a cornerstone in combating the spread of COVID-19.⁶

In Jordan, more than one million of COVID-19 cases have been reported as of March 2022 along with more than 12 thousand COVID-19 related deaths.⁷ About 20% of the total reported cases were below 18 years of age, with an incidence rate for younger age groups (below age of 18) being 8.2%. These rates were comparable to those of in other age groups.⁸ Jordan engaged the global efforts to fight COVID-19 crisis and launched the national vaccination campaign in January 2021 targeting people above 18 years, initially, then, on July 25, 2021, children above 12 years old.⁷ Today, four different COVID-19 vaccines are approved in Jordan, with about 40% of the total population being fully vaccinated, and about 60% of adults.⁸ Regardless, Jordan mandated, early on during the epidemic, mask wearing in public places and limited gatherings. As of 2022, Jordan also enforced the second COVID-19 vaccination for any public-related event or business.⁸

While children and adults can be affected by COVID-19, reports suggested that children typically have less severe COVID-19 illness with fewer cases, and deaths, as compared to adults (children below 14 years were 8.1% of global cases and 0.2% of global deaths).⁹ Yet, serious complications following COVID-19 infection have been observed among children, such as multisystem inflammatory syndrome (MIS-C).⁷ Children, as well, are an influential group for disease transmission within community settings.²⁻⁴ Furthermore, children are considered a major source for transmitting the disease in the community, which would jeopardize successful control.⁷

Vaccine hesitancy (VH), seems to still be a growing global challenge that might affect the effectiveness of vaccination programs.¹⁰ In Western cultures, even before the official declaration of COVID-19 vaccine use among children, caregivers' intentions toward vaccination, once available, were reported at 65%,¹¹ and the majority of parents reported to "definitely accept" or to be "unsure but leaning towards accepting a COVID-19 vaccine" for their children.¹² Novelty and rapid vaccine development were the main reasons behind caregivers' refusal to vaccinate children.^{11,12} More recent studies reported relatively positive attitude towards children vaccination against COVID-19 with an overall VH being ranging between 33%¹³ and 21%.¹⁴ In a systematic review, which included 17 studies and 45,783 parents, the overall proportion of parents who intended to vaccinate their children against COVID-19 was 56.8%.¹⁵ The main predictors of parental intentions were male gender, older age of parents and children, higher socio-economic status, white race, positive attitudes toward vaccination, higher levels of knowledge, and higher levels of perceived threat from COVID-19.¹⁵ A low rate of VH in Jordan, among adults, was reported as "alarming" with a low level reported for vaccinating children as only 20.1% of participants reporting to "agreed/strongly agreed" to vaccinate their children against COVID-19. As well, participants reported more COVID-19 acceptance for the elderly than themselves than for their children. As well, COVID-19 vaccine acceptance rate significantly differed by socio-demographic characteristics, COVID-19 risk perception, and perceived benefits and clinical barriers of the COVID-19 vaccine.¹⁶

With a proportion of more than 30%,¹⁷ children in Jordan are considered a target group for effective immunization programs. Providing COVID-19 vaccination for this influential age group is a promising step in combating the spread of COVID-19. Still, the decision to vaccinate children (above 12 years) belongs to their parents as a signed consent is needed to administer such. This allocates parents as key element in a successful vaccination campaign as children's vaccination will be largely influenced by parents' attitudes and consequently intention to consider the vaccine.¹⁸ Understanding such attitudes and intentions are then an urgent need to bridge this knowledge gap and ensure effective vaccine interventions are properly tailored and fine-tuned for the Jordanian population. This is especially true as VH is different between cultures and may be shaped by multiple factors that are then critical in shaping parents' attitude towards vaccinating their children against COVID-19.¹⁹⁻²¹ The aim of this study is to investigate the prevalence and determinants of parents' VH towards vaccinating their children against COVID-19.

Methods

Study Design and Sampling

This is a cross-sectional study that used a self-administered online questionnaire as a framework for data collection. The online questionnaire was administered via Google Forms and was distributed via public Facebook pages of parents' groups for rapid subject recruitment. Subjects were parents of children between 5 and 12 years old, who agreed to

participate in the study. The invitation link emphasized the voluntary participation, inclusion criteria (having a at least one child with the specified age group) and that the survey is not seeking any personal identifiers.

Survey Instruments

The survey was developed by the study researchers in Arabic language to investigate parents' perceptions and attitude towards COVID-19 vaccination for their children. The questionnaire was pilot-tested among 10 parents, who did not participate in the actual survey, to assess clarity and readability. Based on participants' comments, the survey was finalized. Data collection was conducted between October and November 2021.

Data collected included participants' background characteristics (gender, age, locality, educational level, employment status and monthly personal income), age of children, parental history of COVID-19 vaccination, medical history, childhood vaccination record, family history of COVID-19, general attitudes and trust toward COVID-19 vaccines (safety and efficacy), SARS-CoV-2, infection and vaccine, risk perception, factors affecting decision to vaccinate children, and parental willingness to offer the vaccine to their children. Response to parent's willingness to vaccinate his/her child question was assessed on a 5-point Likert scale (strongly agree, agree, neutral, disagree, and strongly disagree) and collapsed into yes/no accordingly.

The main outcome of the study was parental willingness to vaccinate their children with COVID-19 vaccine. Predictor variables such as SARS-CoV-2, infection and vaccine, risk perception, retrieval of COVID-19 vaccine information, trust in COVID-19 vaccine information, and confidence of effectiveness or safety of COVID-19 vaccines were explored against parental willingness.

Statistical Analysis

SPSS software application was used to analyze the data. Categorical variables were presented using numbers and percentages. Distribution of parental willingness by independent variables was assessed using Pearson's χ^2 -test, except for cells with expected values <5 . Cells with expected values <5 were assessed using Fisher's exact test. Alpha level was set at 0.05 for all statistical associations.

Ethical Consideration

Participants invited to complete the questionnaire were consented online, assured no personal data collected, and that participation was voluntary. The conduct of this study complies with the Declaration of Helsinki. This study was approved by the Ethical Committee of Al-Balqa Applied University (26.3.1.206).

Results

Participants Background Characteristics

A total of 564 parents completed the questionnaire. Of which, the majority were mothers (82.8%), 30 years of age or older (85.3%), and in the higher education category (bachelor's degrees or higher (75.9%)). Respondents were almost equally distributed by income level and one quarter reported lack of health insurance coverage for their children. About two-thirds of participants reported having more than 2 children and about one-fifth (20.9%) reported having children with chronic illnesses. As for COVID-19 vaccination, 83.9% of respondents self-reported COVID-19 vaccination (Table 1).

Willingness Estimates

While 25.4% of parents self-reported willingness to vaccinate their 5–12 years old children against SARS-CoV-2, 74.6% reported being not willing (62.4%) or undecided (12.2%). Distribution of study participants by willingness to vaccinate and background characteristics (Table 1) showed significant differences by age of respondents, income levels, and health insurance coverage. Among parents who were less than 30 years old, the percent of parental willingness was 32.5% compared to 21.2% and 28.8% among those in the 30–40 years and older than 40 years' groups, respectively. As income level increases, parental willingness to vaccinate seems to also increase; 18.2% among less than JOD500 (\approx \$700), 24.0% among JOD500 to JOD1000 and 31.7% among $>$ JOD1000. Respondents with private health insurance (32.2%) seems to

Table 1 Distribution of Study Participants by Background Characteristics and Willingness to Vaccinate

		Total (N=564)		Parental Willingness to Vaccinate Children				P-value
				Not Willing		Willing		
		Number	%	N	%	N	%	
TOTAL		564	100.0%	421	74.6%	143	25.4%	
Age of participant (y)	30 or less	83	14.7%	56	67.5%	27	32.5%	0.047
	30 to 40	297	52.7%	234	78.8%	63	21.2%	
	More than 40	184	32.6%	131	71.2%	53	28.8%	
Relationship to child	Father	97	17.2%	65	67.0%	32	33.0%	0.057
	Mother	467	82.8%	356	76.2%	111	23.8%	
Residency	Rural	87	15.4%	71	81.6%	16	18.4%	0.065
	Urban	477	84.6%	350	73.4%	127	26.6%	
Employment history	Currently working	312	55.3%	229	73.4%	83	26.6%	0.448
	Worked before	153	27.1%	120	78.4%	33	21.6%	
	Never worked	99	17.6%	72	72.7%	27	27.3%	
Educational levels	High school or less	61	10.8%	47	77.0%	14	23.0%	0.101
	Bachelor	304	53.9%	233	76.6%	71	23.4%	
	Diploma	75	13.3%	59	78.7%	16	21.3%	
	Postgraduate	124	22.0%	82	66.1%	42	33.9%	
COVID-19 vaccination	No	91	16.1%	85	93.4%	6	6.6%	<0.001*
	Yes	473	83.9%	336	71.0%	137	29.0%	
Youngest child (JOD)	less than 500	257	45.6%	193	75.1%	64	24.9%	0.947
	5 to 10	234	41.5%	173	73.9%	61	26.1%	
	More than 10	73	12.9%	55	75.3%	18	24.7%	
Youngest child received regular vaccines	Some	28	5.0%	21	75.0%	7	25.0%	0.206*
	All	504	89.4%	372	73.8%	132	26.2%	
	Never	30	5.3%	27	90.0%	3	10.0%	
It is not necessary that my child receives regular vaccines	No	519	92.0%	388	74.8%	131	25.2%	0.477*
	Yes	45	8.0%	33	73.3%	12	26.7%	
Income level (JOD)	Less than 500	148	26.2%	121	81.8%	27	18.2%	0.013
	500–1000	208	36.9%	158	76.0%	50	24.0%	
	More than 500	208	36.9%	142	68.3%	66	31.7%	
Health Insurance	None	140	24.8%	108	77.1%	32	22.9%	0.044
	Public	250	44.3%	195	78.0%	55	22.0%	
	Private	174	30.9%	118	67.8%	56	32.2%	
Number of children	1 or 2	225	39.9%	155	68.9%	70	31.1%	0.10
	More than 2	339	60.1%	266	78.5%	73	21.5%	
Chronic diseases for child	None	446	79.1%	339	76.0%	107	24.0%	0.148
	Yes	118	20.9%	82	69.5%	36	30.5%	

Note: *Fisher's exact test was used.

Abbreviations: JOD, Jordanian Dinars; N, number; P, probability; y, years; %, percent.

have higher parental willingness to vaccinate their children compared to those with public insurance (22.0%) and no insurance (22.9%) (Table 1).

Among respondents who reported not receiving COVID-19 vaccine, 93.4% were unwilling to vaccinate their children, whereas 6.6% were willing to do so. While among those who reported to be vaccinated only 29.0% were willing to vaccinate their children and 71.0% were not willing. Significant differences between parental willingness and trusting healthcare providers, as a source of COVID-19 infection and vaccination information, as well as confidence/trust in vaccines if recommended by pediatricians, were detected. The majority of parents who reported willingness to vaccinate their children agreed/strongly agreed with the statements regarding trusting healthcare providers, as a source of COVID-19 information, and confidence in the vaccine, if recommended by a pediatrician, while those who were unwilling to vaccinate were more likely to disagree/strongly disagree with such statements (Table 2).

COVID-19 Risk Perception

COVID-19 risk perception seems to have significant effects on parental willingness to vaccinate their children. About 80% of parents who are willing to vaccinate their children reported that “the likelihood that their family and friends catching COVID-19 infection in the next 6 months” as high or extremely high, compares to 66.3% among their unwilling counterparts. As a response to the questions regarding children’s susceptibility and likelihood of catching SARS-CoV-2 infection; 93.7% of willing parents answered “yes they are susceptible” and 46.9% reported that the likelihood of infection is high or extremely high. In comparison, 75.5% of unwilling counterparts responded “yes” to susceptibility question and only one quarter to the likelihood of infection as high or extremely high. Higher percentage (58.1%) of willing parents reported that their children “will suffer from serious health problems if infected with SARS-CoV-2” compared to unwilling parents (42.5%) (Table 3).

COVID-19 Vaccine Risk Perception

Regarding the parentals’ perceived risk of COVID-19 vaccine, significant differences were detected by parental willingness. Those who reported to be unwilling to vaccinate their children were more likely to have concerns regarding the safety of the vaccine, including potential side effects, long-term health problems, harmful substances it contains (Table 4). On the other hand, willing respondents were more likely to strongly agree/agree with statements that the vaccine “is effective against SARS-CoV-2 infection” and “is the best approach to reduce chances of infection” (Table 5).

COVID-19 Vaccine Trust

Lack of sufficient information about the vaccine and its expedited release are other factors that significantly affected parental willingness to vaccinate their children ($p < 0.001$ and $p < 0.001$, respectively). Compared to those who reported to be willing to vaccinate their children, those who reported to be unwilling to vaccinate were more likely to strongly agree or agreed with the statements that they do not “trust COVID-19 vaccine as it was recently discovered” and that vaccine information in children is not “enough” and “more information is needed” (Table 5).

Factors Affecting Decision to Vaccinate

Significant differences were detected between parental willingness and factors affecting decision to vaccinate. The majority of participants who reported willingness “agreed” with the statements that pediatricians’ recommendation (86%), number COVID-19 infection in the community (77.6%), and type of vaccine (74.8%), affect their decisions to vaccinate their children. On the other hand, child’s age (77.9%), and potential vaccine side effects (72.0%), were reported by the majority of unwilling participants to affect their decision to vaccinate their children. Two-thirds of willing parents and less than one half of unwilling ones did not agree that “opinions of family members and friends” affect decisions to vaccinate. Of interest, 74.1% of willing and 64.8% of unwilling agreed that chronic diseases are a major factor affecting participants’ decision to vaccinate (Table 2).

Table 2 Distribution of Study Participants by Factors Affecting Decision to Vaccinate and Parental Willingness

		Parental Willingness to Vaccinate Children				Total		P-value
		Not Willing		Willing		N	%	
		N	%	N	%			
I feel confident and assured given my child COVID-19 vaccine if it was recommended by a pediatrician	Strongly agree Agree Neutral Disagree Strongly disagree	4 27 78 148 164	1.0% 6.4% 18.5% 35.2% 39.0%	62 68 11 2 0	43.4% 47.6% 7.7% 1.4% 0.0%	66 95 89 150 164	11.7% 16.8% 15.8% 26.6% 29.1%	<0.001*
I trust healthcare providers as a source of COVID-19 information	Strongly agree Agree Neutral Disagree Strongly disagree	38 96 135 92 60	9.0% 22.8% 32.1% 21.9% 14.3%	58 70 11 2 2	40.6% 49.0% 7.7% 1.4% 1.4%	96 166 146 94 62	17.0% 29.4% 25.9% 16.7% 11.0%	<0.001*
Age of my child will affect my decision to vaccinate my child	Agree Neutral Disagree	328 37 56	77.9% 8.8% 13.3%	90 30 23	62.9% 21.0% 16.1%	418 67 79	74.1% 11.9% 14.0%	<0.001
Chronic illnesses will affect my decision to vaccinate my child	Agree Neutral Disagree	273 72 76	64.8% 17.1% 18.1%	106 17 20	74.1% 11.9% 14.0%	379 89 96	67.2% 15.8% 17.0%	0.12
Pediatrician's advice will affect my decision to vaccinate my child	Agree Neutral Disagree	120 139 162	28.5% 33.0% 38.5%	123 16 4	86.0% 11.2% 2.8%	243 155 166	43.1% 27.5% 29.4%	<0.001*
Potential side effects (fever and soreness at injection site) will affect decision to give my child the vaccine	Agree Neutral Disagree	303 55 63	72.0% 13.1% 15.0%	79 32 32	55.2% 22.4% 22.4%	382 87 95	67.7% 15.4% 16.8%	<0.001
Opinions of family members and friends will affect my decision to vaccinate my child	Agree Neutral Disagree	95 120 206	22.6% 28.5% 48.9%	34 21 88	23.8% 14.7% 61.5%	129 141 294	22.9% 25.0% 52.1%	0.003
Number of COVID-19 infections in my community will affect my decision to vaccinate my child	Agree Neutral Disagree	177 131 113	42.0% 31.1% 26.8%	111 16 16	77.6% 11.2% 11.2%	288 147 129	51.1% 26.1% 22.9%	<0.001
Vaccine type will affect my decision to vaccinate my child	Agree Neutral Disagree	187 116 118	44.4% 27.6% 28.0%	107 16 20	74.8% 11.2% 14.0%	294 132 138	52.1% 23.4% 24.5%	<0.001

Note: *Fisher's exact test was used.

Abbreviations: N, number; P, probability; %, percent.

Discussion

In order to reduce COVID-19 pandemic burden and mitigate its spread, herd immunity should be achieved ensuring more than 70% of the population, including children,²² are immune against the SARS-CoV-2 infection. As observed with other respiratory infections, effective paediatric vaccination may contribute to lower infections in adults and will help reduce infection spread in the community.²³ Still, vaccine hesitancy, including parental vaccines refusal, is a serious global public health problem. In 2019, the World Health Organization (WHO) identified vaccine hesitancy as one of the top 10 global health threats given its association with outbreaks and deaths from vaccine-preventable diseases.²⁴⁻²⁶ After that,

Table 3 Distribution of Study Participants by COVID-19 Risk Perception and Parental Willingness

		Parental Willingness to Vaccinate Children				Total		P-value
		Not Willing		Willing		N	%	
		N	%	N	%			
The likelihood that my friends and family will catch COVID-19 in the next 6 months	Strongly agree	90	21.4%	53	37.1%	143	25.4%	0.002*
	Agree	189	44.9%	61	42.7%	250	44.3%	
	Neutral	119	28.3%	23	16.1%	142	25.2%	
	Disagree	16	3.8%	5	3.5%	21	3.7%	
	Strongly disagree	7	1.7%	1	0.7%	8	1.4%	
COVID-19 had infected many people in my country	Strongly agree	184	43.7%	96	67.1%	280	49.6%	<0.001*
	Agree	191	45.4%	40	28.0%	231	41.0%	
	Neutral	34	8.1%	5	3.5%	39	6.9%	
	Disagree	7	1.7%	2	1.4%	9	1.6%	
	Strongly disagree	5	1.2%	0	0.0%	5	0.9%	
My child will suffer health problems when infected with SARS-CoV-2	Strongly agree	40	9.5%	29	20.3%	69	12.2%	0.003*
	Agree	139	33.0%	54	37.8%	193	34.2%	
	Neutral	172	40.9%	43	30.1%	215	38.1%	
	Disagree	57	13.5%	15	10.5%	72	12.8%	
	Strongly disagree	13	3.1%	2	1.4%	15	2.7%	
I think that my child will catch SARS-CoV-2	Strongly agree	23	5.5%	22	15.4%	45	8.0%	<0.001*
	Agree	82	19.5%	45	31.5%	127	22.5%	
	Neutral	79	18.8%	17	11.9%	96	17.0%	
	Disagree	14	3.3%	0	0.0%	14	2.5%	
	Strongly disagree	223	53.0%	59	41.3%	282	50.0%	
Children can catch SARS-COV-2 infection	No	21	5.0%	2	1.4%	23	4.1%	<0.001*
	Do not know	82	19.5%	7	4.9%	89	15.8%	
	Yes	318	75.5%	134	93.7%	452	80.1%	
COVID-19 had infected many people in my country	Strongly agree	184	43.7%	96	67.1%	280	49.6%	<0.001*
	Agree	191	45.4%	40	28.0%	231	41.0%	
	Neutral	34	8.1%	5	3.5%	39	6.9%	
	Disagree	7	1.7%	2	1.4%	9	1.6%	
	Strongly disagree	5	1.2%	0	0.0%	5	0.9%	

Note: *Fisher's exact test was used.

Abbreviations: N, number; P, probability; %, percent.

some COVID-19 vaccines have been declared safe and effective against COVID-19 among children.²⁷ In Jordan, about 200,000 children between 12 and 17 years have received the COVID-19 vaccine as of March 2022. This represents 4.5% of the total 4.4 million vaccinated in Jordan. The national epidemiologic committee recommended to begin vaccination among children between 5 and 12 years. However, Jordan Ministry of Health has not yet administered COVID-19 vaccine to children of this age group. This study explored parental willingness towards administering COVID-19 vaccine for their children 5 to 12 years old in Jordan. Our results indicated that only one in every four parents showed willingness to vaccinate their children against COVID-19 suggesting generally low acceptance of childhood COVID-19 vaccination. This low parental willingness level calls for immediate public health actions to ensure such epidemiologically influential age group is immune against COVID-19 infection as well as the spread of COVID-19 in the community. Without proper immunity among this age group, school children will be a corner stone in the community spread of COVID-19 new

Table 4 Distribution of Study Participants by COVID-19 Vaccine Risk Perception and Parental Willingness

		Parental Willingness to Vaccinate Children				Total		P-value
		Not Willing		Willing				
		N	%	N	%	N	%	
I am worried about the potential effects of COVID-19 vaccines on my child's health	Strongly agree	267	63.4%	18	12.6%	285	50.5%	<0.001*
	Agree	112	26.6%	66	46.2%	178	31.6%	
	Neutral	27	6.4%	32	22.4%	59	10.5%	
	Disagree	11	2.6%	23	16.1%	34	6.0%	
	Strongly disagree	4	1.0%	4	2.8%	8	1.4%	
I am worried about the long term complications of COVID-19 vaccine	Strongly agree	302	71.7%	21	14.7%	323	57.3%	<0.001*
	Agree	91	21.6%	51	35.7%	142	25.2%	
	Neutral	20	4.8%	32	22.4%	52	9.2%	
	Disagree	5	1.2%	32	22.4%	37	6.6%	
	Strongly disagree	3	0.7%	7	4.9%	10	1.8%	
I think COVID-19 vaccine contains harmful substances	Strongly agree	134	31.8%	1	0.7%	135	23.9%	<0.001*
	Agree	128	30.4%	9	6.3%	137	24.3%	
	Neutral	136	32.3%	47	32.9%	183	32.4%	
	Disagree	13	3.1%	61	42.7%	74	13.1%	
	Strongly disagree	10	2.4%	25	17.5%	35	6.2%	
My child will suffer side effects if vaccinated	Strongly agree	141	33.5%	12	8.4%	153	27.1%	<0.001*
	Agree	172	40.9%	57	39.9%	229	40.6%	
	Neutral	101	24.0%	58	40.6%	159	28.2%	
	Disagree	4	1.0%	15	10.5%	19	3.4%	
	Strongly disagree	3	0.7%	1	0.7%	4	0.7%	
Children are more likely to suffer vaccine side effects compared to adults	Strongly agree	114	27.1%	7	4.9%	121	21.5%	<0.001*
	Agree	110	26.1%	20	14.0%	130	23.0%	
	Neutral	144	34.2%	63	44.1%	207	36.7%	
	Disagree	41	9.7%	42	29.4%	83	14.7%	
	Strongly disagree	12	2.9%	11	7.7%	23	4.1%	

Note: *Fisher's exact test was used.

Abbreviations: N, number; P, probability; %, percent.

variants and a risk group for disseminating SARS-CoV-2 infection to the older age groups, another epidemiologically influential group, including grandparents.

Parental willingness towards vaccinating their 5 to 12 years old children against COVID-19 in Jordan appears to be less positive than that reported in other countries. About 60% of parents in Italy were inclined to vaccinate their children and 29.6% were “considering the opportunity”.²⁸ A high rate of parental acceptance was also reported in China (72.6%).²⁹ In England, most parents showed acceptance of COVID-19 vaccination for their children (definitely 48.2%, unsure but leaning towards yes 40.9%).¹² Similar results were also observed among parents of children under 12 years of age in Canada and Israel.³⁰ Saudi Arabia, a country with a borderline with Jordan, reported relatively higher rate of parental acceptance with 53.7% of the parents reported willingness to vaccinate their children below 18 years old³¹ in one study, and 46.1% willingness to vaccinate their children aged between 5 and 12 years in another study.³² Differences between Jordan and Saudi Arabia may reflect methodological approaches and population structure. The study conducted in Saudi Arabia³² mainly focused on one urban setting, which reflects a diverse population of migrants from almost all over the world as stated in the limitation of the study. As well, the economic power in Saudi Arabia, and the socio-economic characteristics of the population, are different, higher, than that in Jordan. This could explain the observed

Table 5 Distribution of Study Participants by COVID-19 Vaccine Trust and Parental Willingness

		Parental Willingness to Vaccinate Children				Total		P-value
		Not Willing		Willing		N	%	
		N	%	N	%			
I think COVID-19 vaccine is effective against SARS-CoV-2 infection	Strongly agree	7	1.7%	43	30.1%	50	8.9%	<0.001*
	Agree	71	16.9%	70	49.0%	141	25.0%	
	Neutral	147	34.9%	22	15.4%	169	30.0%	
	Disagree	106	25.2%	5	3.5%	111	19.7%	
	Strongly disagree	90	21.4%	3	2.1%	93	16.5%	
I cannot trust COVID-19 vaccine as it was recently discovered	Strongly agree	279	66.3%	10	7.0%	289	51.2%	<0.001
	Agree	98	23.3%	21	14.7%	119	21.1%	
	Neutral	33	7.8%	45	31.5%	78	13.8%	
	Disagree	8	1.9%	51	35.7%	59	10.5%	
	Strongly disagree	3	0.7%	16	11.2%	19	3.4%	
There is not enough information regarding COVID-19 vaccines in children, and more information is needed	Strongly agree	315	74.8%	33	23.1%	348	61.7%	<0.001*
	Agree	87	20.7%	61	42.7%	148	26.2%	
	Neutral	13	3.1%	18	12.6%	31	5.5%	
	Disagree	3	0.7%	25	17.5%	28	5.0%	
	Strongly disagree	3	0.7%	6	4.2%	9	1.6%	
Vaccination is the best approach to reduce chances of infection	Strongly agree	12	2.9%	62	43.4%	74	13.1%	<0.001*
	Agree	67	15.9%	64	44.8%	131	23.2%	
	Neutral	140	33.3%	13	9.1%	153	27.1%	
	Disagree	116	27.6%	3	2.1%	119	21.1%	
	Strongly disagree	86	20.4%	1	0.7%	87	15.4%	
Vaccination will not protect my child from the infection	Strongly agree	171	40.6%	9	6.3%	180	31.9%	<0.001*
	Agree	141	33.5%	34	23.8%	175	31.0%	
	Neutral	80	19.0%	22	15.4%	102	18.1%	
	Disagree	25	5.9%	59	41.3%	84	14.9%	
	Strongly disagree	4	1.0%	19	13.3%	23	4.1%	
I think COVID-19 vaccine is the only way to end the COVID-19 pandemic	Strongly agree	14	3.3%	54	37.8%	68	12.1%	<0.001*
	Agree	52	12.4%	67	46.9%	119	21.1%	
	Neutral	134	31.8%	15	10.5%	149	26.4%	
	Disagree	129	30.6%	4	2.8%	133	23.6%	
	Strongly disagree	92	21.9%	3	2.1%	95	16.8%	

Note: *Fisher's exact test was used.

Abbreviations: N, number; P, probability; %, percent.

differences in parental willingness to vaccinate their children. As well, it provides insight that differences in parental willingness levels are not universal and need to be investigated in different population structures.

The reported low level of parental willingness to vaccinate children calls for revisiting the risk communication strategies used to mitigate the spread of COVID-19 measures. Cultural attributes in this regard may also be further investigated to see how such differences could be justified in line with the global impact of the epidemic. Caution, however, should also be considered regarding the time of survey administration. During the early stages of the epidemic, also during early administration of the vaccine, the overall risk of COVID-19 may have been lower than that when Omicron and Delta variants were of greater concerns. Such factors could affect related willingness and hesitancy. Other factors that may help clarify global differences in parental vaccine hesitancy, or willingness, include cultural disparities, level of confidence in authorities, and perceived trustworthiness of healthcare providers when it comes to COVID-19

vaccination programs. Of importance, as well, is the political scheme observed in this epidemic and the way information, or misinformation, is being consumed and translated by parents of children. Shall healthcare providers be left alone to provide guidance to parents in this regard, one can expect that parental willingness to vaccinate their children be higher than this observed in the majority of countries.

Factors associated with higher parental willingness included younger age, higher income levels, and private health insurance coverage, but not educational levels. Considering that parents who are 30 years old or younger are probably those who have the financial means to be married with children suggests that higher social class is associated with higher parental willingness to vaccinate their children in Jordan. This is supported by the fact that, in Jordan, education is an asset that has been part of a cultural wealth regardless of the social class. Reports from other countries showed that higher parental willingness rates were associated with older age. In Saudi Arabia, a wealthy Arab state, the highest willingness rate was among parents between 31 and 40 years old while in Latin America and Caribbean, parents between 35 and 54 years have higher intentions to vaccinate their children.^{31,33} In contrast, other studies reported conflicting results with higher educational achievements presented as a barrier or as a promoter of children vaccination.^{34,35} Regardless, participants' socio-demographic characteristics play a crucial role in designing public health interventions to ensure successfully implemented vaccination interventions. Accordingly, country-specific variations in willingness should be considered as a key element in adopting interventions targeting school age children. A one-size-fits-all interventions may carry the risk of failure and more culturally appropriate interventions are then an imminent need. With such tailored interventions, which considers socio-demographic variations in parental willingness, one needs to identify high-risk groups that need immediate interventions. According to our results, low social class parents seem to be the most in need for immediate interventions.

Parental COVID-19 vaccination history seems to be a determinant factor in their willingness to vaccinate their children. With parents who did not receive COVID-19 vaccine being less willing to vaccinate their children, our results were in concordance with other reports from Korea, China and the United States.^{34,36,37} Parental hesitancy may then reflect not only on themselves but also on their children. Interventions targeting vaccine hesitancy should then focus not only on adults but also children. Accordingly, household-designed interventions may be needed to overcome the issues related to vaccine hesitancy regardless of age. This is critical as overcoming adults' hesitancy may be needed as the first step in establishing good vaccination programs.

Safety of the vaccine was a major factor associated with parental vaccination refusal to vaccinate children. This has been identified in previous studies as a major concern for children's COVID-19 vaccination.^{30,31,38,39} This factor also connects with lack of sufficient information regarding COVID-19 vaccines and their expedited release; factors that are reported in literature to significantly affect decision-making regarding children vaccination.³¹ On the other hand, COVID-19 risk perception seems to be a primary motivation for vaccination willingness as identified in our results, where an association was noted between vaccination willingness and perceived risk of SARS-Cov-2 infection. This is similar to prior reports of parental plan to vaccinate their child against COVID-19 and other infections, such as H1N1 pandemic.⁴⁰⁻⁴³ Overall, our results provide evidence of the major concerns that may define parental hesitancy and provide an insight on what exactly needs to be targeted. With proper information dissemination from family pediatrician, one can expect that perception of risk, along with correct medical information about vaccines, are targets for public health interventions. With proper tools, concerns related to lack of sufficient information and safety, amalgamated with risk evaluation and assessment, can of an added value during routine pediatric visits, and during follow-up calls with parents.

Parents who reported utilizing healthcare providers as sources of information about COVID-19 were more likely to report higher levels of willingness and lower hesitancy towards children vaccination.¹³ To this end, type of information to be shared with parents is also of critical importance in decision-making. Higher exposure to positive COVID-19 related information was associated with higher parental willingness to vaccinate their children while higher exposure to negative information was negatively associated with parental willingness.²⁹ Directing parents, and local media, to more reliable and trusted sources of information may then improve parental awareness related to COVID-19, which may reflect on their willingness to vaccinate their children.

Overall, while this study reported low parental willingness to vaccinate their children, it also identified key target elements to address such willingness levels and key target groups that can boost vaccination program effectiveness. Still, our study has its own limitations. First, Jordan, at the time of data collection, has not yet approved administering COVID-19 vaccines to 5–12 years old children. Accordingly, parental willingness to vaccinate their children may change once the vaccines are locally approved for this age group. Second, the questionnaire was based on online data collection utilizing a convenient sample. With such, results may not be generalizable. Still, some of our results are comparable to the global attitudes related to children's vaccination. During COVID-19, research activities that involved direct contact with potential study participants were not feasible as it would have exposed them to infection risk. While social media utilization may not be universal in Jordan, it is believed that parents of younger children have good access to social media platforms. Accordingly, we do not believe this study have excluded a significant portion of the population and that it has produce a sample that is probably representative to parents of young children. Regardless of the limitations, our results call for qualitative assessment of attributes to parental willingness as it could further our understanding of this critical issue.

Conclusion

This study provides an insight about the low rate of parents' acceptability of COVID-19 vaccine for their children in Jordan. Vaccine hesitancy appears to be driven by multiple factors. Perceived risk of COVID-19 and trust in healthcare system are of the most important predictors of parents' attitude, and concerns about vaccine side effects is a major cause for parental refusal. Addressing these factors is of critical importance to guide the development of future campaigns that involve paediatricians and healthcare professionals to promote vaccine safety and enhance the rate of vaccine uptake.

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Disclosure

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References

1. CDC. Coronavirus disease (COVID-19) situation reports. 2022. Available from: <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports>. Accessed May 5, 2022.
2. Auger KA, Shah SS, Richardson T, et al. Association between statewide school closure and COVID-19 incidence and mortality in the US. *JAMA*. 2020;324:859–870. doi:10.1001/jama.2020.14348
3. Calvani M, Cantiello G, Cavani M, et al. Reasons for SARS-CoV-2 infection in children and their role in the transmission of infection according to age: a case-control study. *Ital J Pediatr*. 2021;47:1–10. doi:10.1186/s13052-021-01141-1
4. Piraveenan M, Sawleshwarkar S, Walsh M, et al. Optimal governance and implementation of vaccination programmes to contain the COVID-19 pandemic. *R Soc Open Sci*. 2021;8(6):210429. doi:10.1098/rsos.210429
5. CDC. Different COVID-19 vaccines; 2022. Available from: <https://www.cdc.gov/coronavirus/2019-ncov/vaccines/different-vaccines.html>. Accessed May 5, 2022.
6. WHO issues its first emergency use validation for a COVID-19 vaccine and emphasizes need for equitable global access; 2022. Available from: <https://www.who.int/news/item/31-12-2020-who-issues-its-first-emergency-use-validation-for-a-covid-19-vaccine-and-emphasizes-need-for-equitable-global-access>. Accessed May 5, 2022.
7. World Health Organisation. Jordan: WHO coronavirus disease (COVID-19) dashboard with vaccination data. World Health Organization; 2021:1–5. Available from: <https://covid19.who.int/region/emro/country/jo>. Accessed May 5, 2022.
8. Jordan Ministry of Health. Ministry of Health, the official website of the Jordanian Ministry of Health | Coronavirus disease. Jordan Ministry of Health; 2020. Available from: <https://corona.moh.gov.jo/en>. Accessed May 5, 2022.
9. World Health Organisation. COVID-19 disease in children and adolescents: scientific brief; 2021. Available from: https://www.who.int/publications/i/item/WHO-2019-nCoV-Sci_Brief-Children_and_adolescents-2021.1. Accessed May 5, 2022.
10. Butler R. Vaccine hesitancy: what it means and what we need to know in order to tackle it; 2022. Available from: https://www.who.int/immunization/research/forums_and_initiatives/1_RBButler_VH_Threat_Child_Health_gvirf16.pdf. Accessed May 5, 2022.
11. Goldman RD, Yan TD, Seiler M, et al. Caregiver willingness to vaccinate their children against COVID-19: cross sectional survey. *Vaccine*. 2020;38:7668–7673. doi:10.1016/J.VACCINE.2020.09.084

12. Bell S, Clarke R, Mounier-Jack S, Walker JL, Paterson P. Parents' and guardians' views on the acceptability of a future COVID-19 vaccine: a multi-methods study in England. *Vaccine*. 2020;38:7789–7798. doi:10.1016/j.vaccine.2020.10.027
13. Alfieri NL, Kusma JD, Heard-Garris N, et al. Parental COVID-19 vaccine hesitancy for children: vulnerability in an urban hotspot. *BMC Public Health*. 2021;21:1–9. doi:10.1186/S12889-021-11725-5/TABLES/2
14. Ruggiero KM, Wong J, Sweeney CF, et al. Parents' intentions to vaccinate their children against COVID-19. *J Pediatr Heal Care*. 2021;35:509–517. doi:10.1016/J.PEDHC.2021.04.005
15. Galanis P, Vraka I, Siskou O, Konstantakopoulou O, Katsiroumpa A, Kaitelidou D. Willingness and influential factors of parents to vaccinate their children against the COVID-19: a systematic review and meta-analysis. *medRxiv*. 2021. doi:10.1101/2021.08.25.21262586
16. Al-Mistarehi AH, Kheirallah KA, Yassin A, et al. Determinants of the willingness of the general population to get vaccinated against COVID-19 in a developing country. *Clin Exp Vaccine Res*. 2021;10:171. doi:10.7774/CEVR.2021.10.2.171
17. Jordan Department of Statistics. Jordan in figure 2017 – department of statistics; 2022. Available from: <http://dosweb.dos.gov.jo/products/jordan-in-figure2017/>. Accessed May 5, 2022.
18. Zhou M, Zhao L, Kong N, Campy KS, Wang S, Qu S. Predicting behavioral intentions to children vaccination among Chinese parents: an extended TPB model. *Hum Vaccines Immunother*. 2018;14:2748–2754. doi:10.1080/21645515.2018.1496765
19. Willis DE, Andersen JA, Bryant-Moore K, et al. COVID-19 vaccine hesitancy: race/ethnicity, trust, and fear. *Clin Transl Sci*. 2021;14:2200–2207. doi:10.1111/cts.13077
20. Murphy J, Vallières F, Bentall RP, et al. Psychological characteristics associated with COVID-19 vaccine hesitancy and resistance in Ireland and the United Kingdom. *Nat Commun*. 2021;12:1–15. doi:10.1038/s41467-020-20226-9
21. Danabal KGM, Magesh SS, Saravanan S, Gopichandran V. Attitude towards COVID 19 vaccines and vaccine hesitancy in urban and rural communities in Tamil Nadu, India – a community based survey. *BMC Health Serv Res*. 2021;21:1–10. doi:10.1186/s12913-021-07037-4
22. Kwok KO, Lai F, Wei WI, Wong SYS, Tang JWT. Herd immunity – estimating the level required to halt the COVID-19 epidemics in affected countries. *J Infect*. 2020;80:e32–e33. doi:10.1016/j.jinf.2020.03.027
23. Kao CM, Orenstein WA, Anderson EJ. The importance of advancing severe acute respiratory syndrome coronavirus 2 vaccines in children. *Clin Infect Dis*. 2021;72:515–518. doi:10.1093/cid/ciaa712
24. Ten threats to global health in 2019; 2022. Available from: <https://www.who.int/news-room/spotlight/ten-threats-to-global-health-in-2019>. Accessed May 5, 2022.
25. Glanz JM, McClure DL, Magid DJ, Daley MF, France EK, Hambidge SJ. Parental refusal of varicella vaccination and the associated risk of varicella infection in children. *Arch Pediatr Adolesc Med*. 2010;164:66–70. doi:10.1001/archpediatrics.2009.244
26. Glanz JM, McClure DL, O'Leary ST, et al. Parental decline of pneumococcal vaccination and risk of pneumococcal related disease in children. *Vaccine*. 2011;29:994–999. doi:10.1016/j.vaccine.2010.11.085
27. CDC. CDC recommends pediatric COVID-19 vaccine for children 5 to 11 years | CDC online newsroom. CDC Press Release. 2021;8. Available from: <https://www.cdc.gov/media/releases/2021/s1102-PediatricCOVID-19Vaccine.html>. Accessed May 5, 2022.
28. Montalti M, Rallo F, Guaraldi F, et al. Would parents get their children vaccinated against sars-cov-2? Rate and predictors of vaccine hesitancy according to a survey over 5000 families from Bologna, Italy. *Vaccines*. 2021;9:366. doi:10.3390/vaccines9040366
29. Zhang KC, Fang Y, Cao H, et al. Parental acceptability of COVID-19 vaccination for children under the age of 18 years: cross-sectional online survey. *JMIR Pediatr Parent*. 2020;3:e24827. doi:10.2196/24827
30. Goldman RD, Krupik D, Ali S, et al. Caregiver willingness to vaccinate their children against COVID-19 after adult vaccine approval. *Int J Environ Res Public Health*. 2021;18:10224. doi:10.3390/ijerph181910224
31. Altulahi BA, Alaboodi T, Alharbi KG, Alajmi MS, Alkanhal H, Alshehri A. Perception of parents towards COVID-19 vaccine for children in Saudi Population. *Cureus*. 2021;13. doi:10.7759/cureus.18342
32. Al-Khlaiwi T, Meo SA, Almousa HA, et al. National COVID-19 vaccine program and parent's perception to vaccinate their children: a cross-sectional study. *Vaccines*. 2022;10(2):168. doi:10.3390/vaccines10020168
33. Urrunaga-Pastor D, Herrera-Añazco P, Uyen-Cateriano A, et al. Prevalence and factors associated with parents' non-intention to vaccinate their children and adolescents against COVID-19 in Latin America and the Caribbean. *Vaccines*. 2021;9:1303. doi:10.3390/VACCINES9111303
34. Lu X, Wang J, Hu L, Li B, Lu Y. Association between adult vaccine hesitancy and parental acceptance of childhood covid-19 vaccines: a web-based survey in a northwestern region in China. *Vaccines*. 2021;9:1088. doi:10.3390/vaccines9101088
35. Larson HJ, Jarrett C, Eckersberger E, Smith DMD, Paterson P. Understanding vaccine hesitancy around vaccines and vaccination from a global perspective: a systematic review of published literature, 2007–2012. *Vaccine*. 2014;32:2150–2159. doi:10.1016/j.vaccine.2014.01.081
36. Rane MS, Robertson MM, Westmoreland DA, Teasdale CA, Grov C, Nash D. Intention to vaccinate children against COVID-19 among vaccinated and unvaccinated US parents. *JAMA Pediatr*. 2021. doi:10.1001/jamapediatrics.2021.5153
37. Choi SH, Jo YH, Jo KJ, Park SE. Pediatric and parents' attitudes towards COVID-19 vaccines and intention to vaccinate for children. *J Korean Med Sci*. 2021;36:1–12. doi:10.3346/jkms.2021.36.e227
38. Xu Y, Xu D, Luo L, et al. A cross-sectional survey on COVID-19 vaccine hesitancy among parents from Shandong vs. Zhejiang. *Front Public Heal*. 2021;9:1722. doi:10.3389/fpubh.2021.779720
39. Yigit M, Ozkaya-Parlakay A, Senel E. Evaluation of COVID-19 Vaccine Refusal in Parents. *Pediatr Infect Dis J*. 2021;40:E134–E136. doi:10.1097/INF.0000000000003042
40. Faasse K, Newby J. Public perceptions of COVID-19 in Australia: perceived risk, knowledge, health-protective behaviors, and vaccine intentions. *Front Psychol*. 2020;11. doi:10.3389/fpsyg.2020.551004
41. Setbon M, Raude J. Factors in vaccination intention against the pandemic influenza A/H1N1. *Eur J Public Health*. 2010;20:490–494. doi:10.1093/eurpub/ckq054
42. Rubin GJ, Potts HWW, Michie S. Likely uptake of swine and seasonal flu vaccines among healthcare workers. A cross-sectional analysis of UK telephone survey data. *Vaccine*. 2011;29:2421–2428. doi:10.1016/j.vaccine.2011.01.035
43. Bish A, Yardley L, Nicoll A, Michie S. Factors associated with uptake of vaccination against pandemic influenza: a systematic review. *Vaccine*. 2011;29:6472–6484. doi:10.1016/j.vaccine.2011.06.107

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