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The impact of the covid-19 pandemic on the commitment to routine pediatric vaccination among the population in the kingdom of Saudi Arabia 2021: A cross-sectional study

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ABSTRACT

Backgroud: The goal of this study was to see how the COVID-19 pandemic affected children's vaccination in Saudi Arabia. During the COVID-19 pandemic, we investigated the population's commitment to routine immunization of their children as well as the prevalence of vaccine misconceptions. *Methods:* A cross-sectional study was done on 586 parents of children under 6 years of age. An online questionnaire was used that included items to collect data about parents' demographics, knowledge about childhood vaccination and its side effects, practice toward vaccination of their children before and after the COVID-19 pandemic. *Results:* Approximately 67.2% of parents reported having good knowledge about the benefits of vaccines for their children, and 7.2% had ever declined to vaccinate their infant, with the most common reason being concern about vaccine side effects. Prior to this pandemic, 88% of parents had their children's vaccinations scheduled on a regular basis, while 25.3% had missed or postponed their children's vaccinations. 26.8% of the participants and their families were willing to take a coronavirus vaccine if one was available. During the epidemic, non-Saudi participants had a significantly greater percentage of those who missed or delayed a child's immunization. Participants who had one or two children and those with ages ranging from 18-25 years had a higher percentage of those who were willing to take a vaccine against the coronavirus. *Conclusions:* Addressing parents about the need of protecting their children from vaccine-preventable diseases is vital even as the COVID-19 pandemic persists.

Keywords: impact, covid-19, vaccinations, pediatric, KSA

1. INTRODUCTION

Vaccination is one of the most efficient methods of illness prevention. A vaccination aids the immune system in recognizing and combating pathogens such as viruses and bacteria, keeping us safe from the diseases they cause. Vaccines protect against more than 25 diseases that are disabling or life-threatening (Vaccines and Immunization, 2020). Vaccine apprehension is a major public health concern. Even as the COVID-19 pandemic persists, reminding parents of the vital need to protect their children from serious vaccine-preventable diseases, even as the COVID-19 pandemic continues, is critical because children who are not protected by vaccines may be more susceptible to sickness (Santoli et al., 2020).

Primary care practitioners in COVID-19-affected areas should continue to adopt visit separation measures. Scheduling sick visits and well-child visits at various times of the day, decreasing crowding in waiting rooms, and cooperating with community healthcare professionals to locate separate places for offering well visits for children are just a few examples (Information for Pediatric Healthcare Providers, 2020). Right now, we're all focused on COVID-19 and the race to develop a vaccine. Vaccine-preventable disease (VPD) is a major worry that necessitates strict adherence to guidelines in order to prevent serious sickness in children (Bianchini et al., 2019). Parents can help keep our communities safe and healthy by stepping up and ensuring our children are vaccinated on time. As vaccination is delayed or skipped, children are vulnerable to certain preventable diseases and can also impact herd immunity (Risks of Delaying or Skipping Vaccines, 2020). In the Kingdom of Saudi Arabia (KSA), due to different reasons, such as the unavailability of the vaccine in certain primary health facilities and travelling when vaccination was due, vaccination delays ranged from 9% to 24% (Hasanain & Jan, 2002; Banjari et al., 2018; Almoosa et al. 2020).

Only one study was undertaken in the Qassim region during the COVID-19 pandemic to estimate the prevalence of delayed immunization and to analyze the reasons and barriers to delayed immunization (Alsuhaibani & Alaqeel, 2020). According to the poll, 73.2% of parents had appointments for their child's vaccination in pandemic duration, and 23.4% reported a delay of more than one month in their child's immunization. The most prevalent reason for the delay (60.9%) was a fear of contracting COVID-19. Vaccination delays have been related to large family numbers and lack of health insurance. In the Kingdom, there has been little research on the influence of the COVID-19 outbreak on child immunization. The goal of this study was to determine the influence of routine childhood vaccinations on the population of Saudi Arabia.

2. METHODS

Study design/setting

This is a cross-sectional study carried out through an online questionnaire during the period from August 16, 2020, to May 5, 2021.

Study participants

According to the response to the online survey, 586 parents were the participants of this study. The inclusion criteria were parents of children aged 0 to 2 years living in the KSA during the COVID-19 pandemic. The exclusion criteria were the parents of children with chronic illnesses or taking chronic therapies affecting a vaccination schedule.

Data analysis

The IBM Statistical Package for Social Sciences (SPSS) version 25 was used to examine the data (IBM SPSS Statistics for Windows, Armonk, NY). The Chi-squared test (2) was used to evaluate the connection between variables, and qualitative data were reported as percentages and numbers. Statistical significance was defined as a p-value of less than 0.05.

3. RESULTS

In total, 30.4% of the participants had an age > 40 years, 91.6% were of Saudi nationality, 66% had a university education, and 41.1% had more than three children, as presented in Table 1.

Table 1 Demographics of the 586 Participants and the Number of Children

Characteristic		Number (%)
Age	18 - 25	117 (19.9)
	26 - 30	96 (16.3)
	31 - 35	94 (16)
	36 - 40	101 (17.2)

	More than 40	178 (30.6)
Nationality	Saudi	537 (91.6)
	Non-Saudi	49 (8.4)
Educational level	Primary	1 (0.2)
	Middle	21 (3.6)
	Secondary	76 (13)
	University	387 (67)
	Diploma	48 (8.2)
	Postgraduate	47 (8)
	Not educated	6 (1)
Number of children	One	162 (27.6)
	Two	91 (15.5)
	Three	92 (15.6)
	More than 3	241 (41.3)

The table 2 demonstrates that most of the participants (67.3%) reported that they had a significant level of knowledge about the advantages of vaccination for children, 9.4% thought that vaccines are more dangerous than the diseases they are designed to prevent, and 15.9% thought that certain vaccines cause autism in children. Of them, only 7.2% had ever refused to vaccinate their child, and the usual cause was being worried about the possible side effects of vaccinations. Of the participants, 30.2% and 16.6% reported that they and their families sometimes and always take the seasonal flu vaccination, respectively.

Table 2 The 586 participants were divided into groups according to their regarding pediatric vaccination, the side effects, ever refused to vaccinate their child, and taking the seasonal flu vaccine

Variables		Number (%)
How much do you know about the advantages of vaccination for children?	A great deal	394 (67.3)
	Only a little	180 (30.7)
	Nothing at all	12 (2)
Do you think vaccines are more dangerous than the diseases they are designed to prevent? (Like measles vaccination more hazardous than measles disease)	I don't know	91 (15.5)
	No	440 (75.1)
	Yes	55 (9.4)
Do you think certain vaccines cause autism in children?	Yes	93 (15.9)
	No	459 (78.3)
	I don't know	34 (5.8)
Have you ever refused to vaccinate your child?	No	544 (92.8)
	Yes	42 (7.2)
If your answer to the previous question was yes, why is that?	A child's health condition	3 (7.1)
	Preoccupation with the vaccination date	13 (30.9)
	I don't believe in the necessity of vaccination.	8 (19)
	COVID-19 lockdown	2 (4.7)
	I worry about the possible side effects of the vaccinations.	16 (38.3)

Most of the participants (88.1%) had regularly scheduled their child's vaccination before the COVID-19 pandemic, 36.5% vaccinated their children during the pandemic, and 25.3% missed or delayed their children's vaccinations during the pandemic. Only 2% of parents reported being infected or one in their family with the coronavirus due to their visit to take the vaccination (Table 3).

Table 3 distribution of the participants according to being regularly scheduled for a child's vaccination before covid-19 pandemic, vaccinating their children or delayed vaccination due to the pandemic, being coronavirus-infected due to vaccination visit, and willingness to take the coronavirus vaccine

Variable		Number (%)
Are you regularly scheduled for your child's vaccination before the COVID-19 pandemic?	No	70 (11.9)
	Yes	516 (88.1)
Have you gone to vaccinate your child during the COVID-19 pandemic?	No	372 (63.5)
	Yes	214 (36.5)
Did you miss or delay your child's vaccination in the period of COVID-19 pandemic?	No	438 (74.7)
	Yes	148 (25.3)
Has anyone in your family been infected with the coronavirus due to the visit to take the vaccination?	No	574 (98)
	Yes	12 (2)

Only 26.8% of the participants and their families were willing to take a vaccine against the coronavirus if it is made available. The percentages details are shown in figure 1. The participants with primary education had a much higher percentage of those who thought they had a great deal of knowledge about the advantages of vaccination for children ($p \leq 0.001$). On the other hand, a non-significant relationship was found between this knowledge and the participants' age, nationality, and the number of the p-value of children was greater than 0.05, which were not substantially different, as clarified in table 4.

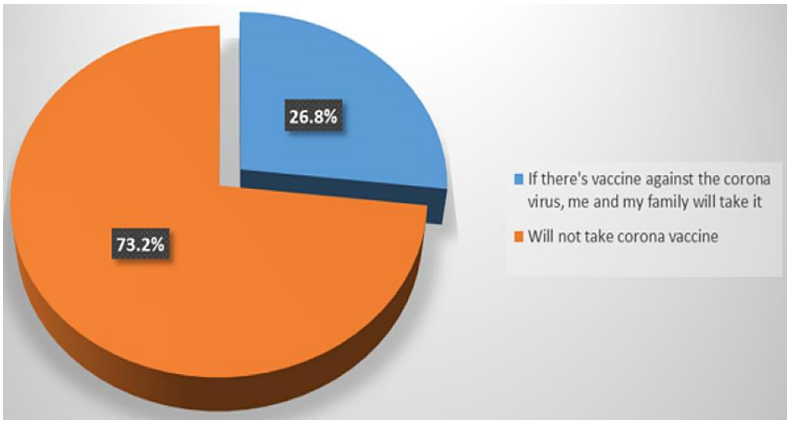

Figure 1 Percentage distribution of participants and their families willing to take a vaccine against coronavirus if it becomes available

Table 4 the relationship between the knowledge of the advantages of vaccination for children, participants' demographics, and the number of children

Variable		How much do you know about the advantages of vaccination for children?			$\chi 2$	P-value
		Nothing at all (N, %)	Only a little (N, %)	A great deal (N, %)		
Age	18 - 25	4 (3.4)	47 (40.2)	66 (56.4)	10.32	0.243
	26 - 30	2 (2.1)	30 (31.3)	64 (66.6)		
	31 - 35	1 (1.1)	22 (23.4)	71 (75.5)		
	36 - 40	2 (2)	31 (30.7)	68 (67.3)		

	More than 40	3 (1.7)	50 (28.1)	125 (70.2)		
Nationality	Saudi	10 (1.9)	162 (30.2)	365 (67.9)	2.22	0.329
	Non-Saudi	2 (4.1)	18 (36.7)	29 (59.2)		
Educational Level	Primary	0 (0.0)	0 (0.0)	1 (100)	40.75	< 0.001
	Middle	0 (0.0)	7 (33.3)	14 (66.7)		
	Secondary	4 (5.3)	28 (36.8)	44 (57.9)		
	University	5 (1.3)	120 (31)	262 (67.7)		
	Diploma	0 (0.0)	11 (22.9)	37 (77.1)		
	Postgraduate	1 (3.1)	12 (25.5)	34 (72.3)		
	Not educated	2 (33.3)	2 (33.3)	2 (33.3)		
Number of Children	One	5 (3.1)	53 (32.7)	104 (64.2)	7.93	0.243
	Two	0 (0.0)	31 (34.1)	60 (65.9)		
	Three	0 (0.0)	31 (33.7)	61 (66.3)		
	More than three	7 (2.9)	65 (27)	169 (70.1)		

The participants of non-Saudi nationality had a substantially greater percentage of those who missed or delayed a child's vaccination in the period of the COVID-19 pandemic ($p \leq 0.001$). However, there was no statistically significant relationship between missing or postponing a child's vaccination in the time of the COVID-19 pandemic and the participants' age, educational level, or t the probability of children was greater than 0.05 (Table 5).

Table 5 the relationship between missing or delaying a child's vaccination in the covid-19 pandemic period and the participants' demographics and number of children

Variable		Did you miss or delay your child's vaccination in the COVID-19 pandemic?		$\chi 2$	P-value
		No (N, %)	Yes (N, %)		
Age	18 - 25	113 (96.6)	4 (3.4)	5.51	0.239
	26 - 30	89 (92.7)	7 (7.3)		
	31 - 35	83 (88.3)	11 (11.7)		
	36 - 40	93 (92.1)	8 (7.9)		
	More than 40	166 (93.3)	12 (6.7)		
Nationality	Saudi	502 (93.5)	35 (6.5)	4.07	0.044
	Non-Saudi	42 (85.7)	7 (14.3)		
Educational Level	Primary	1 (100)	0 (0.0)	7.84	0.25
	Middle	21 (100)	0 (0.0)		
	Secondary	67 (88.2)	9 (11.8)		
	University	361 (93.3)	26 (6.7)		
	Diploma	47 (67.9)	1 (2.1)		
	Postgraduate	42 (89.4)	5 (10.6)		
	Not educated	5 (83.3)	1 (16.7)		

Number of children	One	150 (92.6)	12 (7.4)	1.32	0.723
	Two	85 (93.4)	6 (6.6)		
	Three	83 (90.2)	9 (9.8)		
	More than three	226 (93.8)	15 (6.2)		

The participants who had one or two children had a significantly higher percentage of those who were willing, as well as their families, to take a vaccine against the coronavirus if it becomes available ($p < 0.05$). On the other hand, a non-significant relationship was found between this willingness and the participants' nationality, educational level, level of knowledge about a pediatric vaccination advantage, or their opinion that vaccines are more dangerous than the diseases they are designed to prevent ($p > 0.05$). The table 6 presents the relationship.

Table 6 relationship between the participants and their families' willingness to take a vaccine against the coronavirus if it is made available and their demographics and the number of children

Variable		If there is a vaccine against the coronavirus is made available, will you and your family take the vaccine?		$\chi 2$	P-value
		No (No, %)	Yes (No, %)		
Nationality	Saudi	46 (27.2)	391 (72.8)	0.51	0.473
	Non-Saudi	11 (22.4)	38 (77.6)		
Educational level	Primary	1 (100)	0 (0.0)	5.99	0.424
	Middle	7 (33.3)	14 (66.7)		
	Secondary	19 (25)	57 (75)		
	University	100 (25.8)	287 (74.2)		
	Diploma	12 (25)	36 (75)		
	Postgraduate	17 (36.2)	30 (63.8)		
	Not educated	1 (16.7)	5 (83.3)		
Number of children	One	31 (19.1)	131 (80.9)	15.82	0.001
	Two	16 (17.6)	75 (82.4)		
	Three	28 (30.4)	64 (69.6)		
	More than three	82 (34)	159 (66)		
How much do you know about the advantages of vaccination for children?	Nothing at all	5 (41.7)	7 (58.3)	4.24	0.12
	Only a little	56 (31.1)	124 (68.9)		
	A great deal	96 (24.4)	298 (75.6)		
Do you think vaccines are more dangerous than the diseases they are designed to prevent? (Like the measles vaccination is more dangerous than the measles disease)	I don't know	31 (34.1)	60 (65.9)	3.84	0.146
	No	109 (24.8)	331 (75.2)		
	Yes	17 (30.9)	38 (69.1)		

The participants with ages ranging from 18 - 25 years had a dramatically higher percentage of those who were willing, as well as their families, to take a vaccine against the coronavirus when it became available compared to other age groups ($p < 0.05$) (Figure 2).

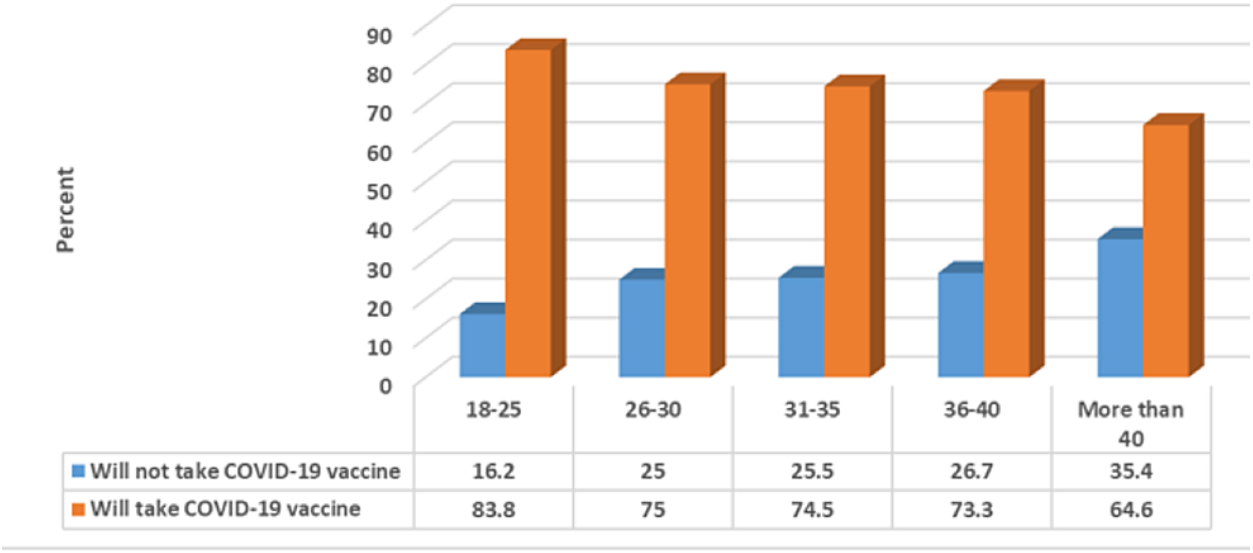

Figure 2 Relationship between participants and their families' willingness to take the vaccine against the coronavirus if it becomes available and their age
N.B.: ($\chi 2 = 13.59$, p-value = 0.009)

Those participants who reported that they and their families sometimes took the seasonal flu vaccine had a higher percentage of those willing to take a vaccine against the coronavirus if it became available ($p < 0.05$), as illustrated in Figure 3.

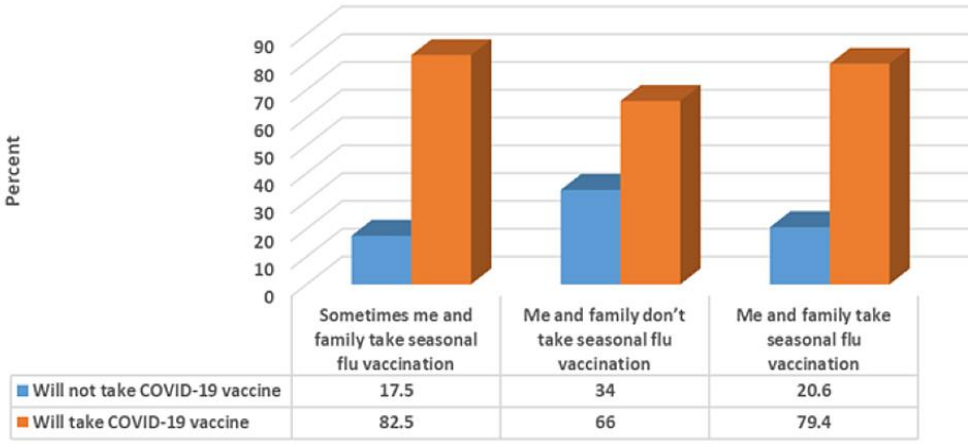

Figure 3 Percentage of participants who willing to take a vaccine against the coronavirus
NB: ($\chi 2 = 17.85$, p-value ≤ 0.001)

4. DISCUSSION

Immunizations are a critical health service that protects vulnerable people from vaccine-preventable diseases (VPD). By receiving immunizations on time, individuals and populations are covered, and the risk of a VPD outbreak is reduced (Aljarbou et al., 2021). Preventing a VPD outbreak not only saves lives but also requires fewer resources than reacting to one, alleviating the strain on a health system that is still reeling from the COVID-19 pandemic (Immunization in the context of COVID-19 pandemic, 2020). During the COVID-19 pandemic, the factors behind vaccination delays in children were explored. According to the survey, 7.2% of parents have ever refused to vaccinate their children, and 25.3% had missed or delayed their children's vaccines during the epidemic. This demonstrates that the COVID-19 epidemic impacted the availability of children's immunizations in Saudi Arabia's Qassim region.

Previous Saudi study, published in 2020, investigated the impact of the COVID-19 pandemic on childhood immunization (Alsuhaibani & Alaqeel, 2020). Similar findings were discovered in this investigation; about 23.4% of parents said their child's vaccine was delayed by more than one month. Resulting in missed medical appointments and staying at home during the coronavirus epidemic, some regular immunizations for infants and young children were lost. According to the Centers for Disease

Control and Prevention (CDC), fewer vaccine doses could lead to outbreaks (Risks of Delaying or Skipping Vaccines, 2020). Furthermore, childhood immunization has been identified by the World Health Organization (WHO) as a core health service that must be delivered to COVID-affected children (Immunization in the context of COVID-19 pandemic, 2020). This research conducted in 2021 in Saudi Arabia found that 15% of parents reported a vaccine delay without rescheduling it, 24.3 % reported a delay but were rescheduled, and 2.1 % cancelled the rest of their children's immunizations (Aljarbou et al., 2021). Another Saudi study found the same effect of the pandemic of COVID-19 on pediatric immunization, with a decline in visits for birth and 2, 4, 6, 9, and 12-month immunizations (Alrabiaah et al., 2020).

This study found that only 2% of participants reported being infected or one in their family with the coronavirus due to a vaccination visit. Fear of developing COVID-19 was the most common cause for immunization delays, according to the Saudi study (Alsuhaibani & Alaqeel, 2020). According to the findings, routine children immunization should be prioritized, and targeted efforts should be implemented to achieve a considerable and long-term rise in vaccination rates during pandemics. Another study in Turkey (oruh Akyol et al., 2021) found similar outcomes of vaccination delays during the pandemic. Furthermore, the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) announced that 23 million children will be denied crucial childhood immunizations as a result of routine health care in 2020 (Unicef, 2020).

During the pandemic, public misinformation and a lack of faith in vaccine safety and efficacy may have contributed to vaccine hesitation (Causey et al., 2021; Dror et al., 2020). A prior study highlighted barriers in the vaccine delivery process to low- and middle-income countries during the outbreak (Nelson, 2020). Only 2% of parents or a member of their family were infected with the coronavirus as a result of a visit to get vaccinated, according to the findings of this study. In a Saudi study, worry of becoming infected the most prevalent cause of vaccination delays was shown to be COVID-19 (Alsuhaibani & Alaqeel, 2020). Routine childhood immunization should be prioritized, and targeted initiatives should be implemented to achieve a considerable and long-term rise in vaccines during pandemics, according to the study. According to a new global assessment, routine immunization programs will face severe hurdles in 2020, with the COVID-19 pandemic generating the most widespread and significant global disruption in recent memory. Although some places are recovering, a combination of poor catch-up vaccination services, persistent SARS-CoV-2 transmission, and chronic vaccine coverage deficiencies prior to the pandemic threatens to undermine recovery (Causey et al., 2021).

Furthermore, according to an Indonesian study, immunization coverage declined by 5%, 10%, and 20% in each region, depending on the scenario (Suwantika et al., 2020). Even while the COVID-19 pandemic continues, most parents ensured that their children were protected from serious vaccine-preventable infections during their child's immunization visit by keeping social distance, using hand disinfectants after handling things, and wearing face masks and gloves. Despite the fact that the COVID-19 pandemic is still ongoing, according to the present survey, 67.2% of parents reported to be extremely knowledgeable about the benefits of vaccination for children and the importance of vaccinating their children. They learned how to maintain routine immunizations up to date by engaging with healthcare providers and following the vaccine recommendation. However, 9.4% of parents feel vaccines because more harm than the diseases they are designed to prevent, and 15.9% believe some vaccines cause autism in children.

7.2 % of parents in the current research claimed they had ever refused to vaccinate their child. The most prevalent reason given was fear of the vaccine's possible side effects. In a previous Saudi poll, 60.9 % of people claimed they put off being immunized to avoid developing COVID-19 (Alsuhaibani & Alaqeel, 2020). Recent pandemics (the 2009-2010 swine flu (H1N1) pandemic and the 2015-2016 Zika virus outbreaks) have also seen vaccine delays (Mertens et al., 2020). The usual concerns were increased dread of the epidemic and anxiety for the health of loved ones.

Countries should commit to continuing immunization programs while adhering to the "do no harm" concept and limiting COVID-19 transmission during immunization activities. Vaccination visits can also be used to spread information about how to reduce the risk of COVID-19 viral transmission, how to recognize COVID-19 disease signs and symptoms, and what to do if symptoms arise (Vaccines and Immunization, 2020).

Limitations

The use of a self-reported questionnaire could have a recall bias.

5. CONCLUSION

Even while the COVID-19 outbreak persists, parents must be educated about the importance of protecting their children from vaccine-preventable diseases. In the current study, only 7.2% of parents had ever declined to vaccinate their infant, with the general

reason being concern about vaccine side effects. Before the COVID-19 pandemic, approximately 88% of parents had their children's vaccinations scheduled on a regular basis, while 25.3% had missed or postponed their children's vaccinations. This study recommends that the entire Saudi population be vaccinated against COVID-19. In addition, health-related policymakers should concentrate on and prioritize childhood vaccination, as well as continue to work to raise public awareness to ensure vaccination coverage for any future pandemics.

Acknowledgement

We thank the participants who were all contributed samples to the study.

Criteria for inclusion in the authors'/ contributors' list

A pre-designed questionnaire was prepared and distributed online through social media. The questionnaire included items to collect data about participants' character, the number of children, knowledge about pediatric vaccination, its side effects, whether they have ever refused to vaccinate their child (or children), taking the seasonal flu vaccine, being regularly scheduled for the child's vaccinations before the COVID-19 pandemic, delayed vaccination due to the pandemic, being coronavirus-infected due to vaccination visit, and their willingness to take a vaccine against the coronavirus if it is made available.

Informed consent

All individuals who were selected in the study provided their written and oral informed consent. All individuals whose identifiable information is included in this manuscript provided additional informed consent.

Ethical approval

Ethical approval of the study was granted from the Ibn Sina National College (ISNC) Research and Ethics Committee (IEC Ref No: H-05-24122020) in line with the Declaration of Helsinki for Human Studies. There was voluntary online participation in the study after the declaration of the aim of the research and their right to refuse participation. Ethical conduct was maintained during data collection and throughout the research process. Privacy of data collection and confidentiality was assured.

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Conflict of interests

The authors declare that there are no conflicts of interests.

Data and materials availability

All data associated with this study are present in the paper.

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