

Coronavirus Pandemic

The impact of the COVID-19 pandemic on parents' behavior toward scheduled pediatric vaccinations in Saudi Arabia

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Abstract

Introduction: Coronavirus disease (COVID-19) is caused by a newly discovered coronavirus and has resulted in a global pandemic. The World Health Organization recommended avoiding any delay or disruption of immunization services, as this could result in increases in outbreak-prone vaccine-preventable diseases. This study aimed to determine the impact of the COVID-19 pandemic on parents' behaviour towards their children's scheduled vaccinations.

Methodology: This web-based cross-sectional study recruited 1,143 parents/guardians of children below six years of age living in Saudi Arabia between May 1 and May 30, 2020 via social media platforms. A self-developed online questionnaire consisting of eight items was used. Simple and multiple binary logistic regression was used to determine the factors associated with vaccine delay during the COVID-19 pandemic.

Results: The parents/guardians were aged 20–60 years; 82% were aged between 20 and 39 years. It was found that 26% of parents did not vaccinate their children on time according to the national immunization schedule in regular situations, and 38% of parents reported delaying vaccination due to the COVID-19 pandemic. The multiple logistic regression analysis found that having two or more children, living in Riyadh or the Western region or not vaccinating children during regular situations were associated with an increased risk of vaccine delay during the COVID-19 pandemic.

Conclusions: Delaying children's vaccinations during the COVID-19 pandemic was influenced most by living in regions with high COVID-19 prevalence and having two or more children.

Key words: COVID-19; immunization; parent's behavior; Saudi Arabia; vaccine delay.

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Introduction

COVID-19 is a disease caused by a newly discovered strain of coronavirus (novel SARS-CoV-2), which became a pandemic involving countries all over the world [1]. It can be transmitted mostly through direct contact with infected respiratory droplets, and airborne transmission is possible in specific circumstance [2]. This viral transmission and spread of the disease encouraged several countries to implement serious measures and different levels of lockdown, from national quarantines to school closures, partial lockdowns and even complete lockdowns in some countries, such as China and Italy [3,4]. These measures, which directly led to the implementation of mobility and traveling restrictions, affected many businesses (some had to be shut down temporarily), impacted financial markets, eroded confidence and

heightened uncertainty [5]. The healthcare system was also affected, as many countries initiated a range of measures to contain the pandemic, such as shifting healthcare resources to help manage the COVID-19 response [6].

During the pandemic and with infection control parameters such as social distancing, parents tended to avoid non-essential visits to hospitals or medical centres, including well-child visits [7]. Parents with children who needed vaccinations started asking about the importance and timing of these vaccinations and the possibility of postponing them. In the United States, there was a decrease in the ordering of vaccines a week after the declaration of a state of national emergency [8]. Despite all these factors, the World Health Organization (WHO) recommended avoiding any kind of delay or disruption of immunization services, even

for a short time, as it could increase the number of susceptible individuals and raise the likelihood of outbreak-prone vaccine-preventable diseases (VPDs) [9]. The WHO mentioned in its first guiding principle for immunization activities during COVID-19 that immunization should continue to be provided and made a priority, since it is a fundamental health service and an important protector of the community during the pandemic [10]. Taking into consideration the protection of healthcare workers, parents and children, immunization delivery strategies should be adopted under safe and protected conditions [8]. In addition, delaying any vaccine will result in a delay in the next vaccine [11].

In Saudi Arabia, before the COVID-19 pandemic, up to 23% of parents delayed their children's scheduled vaccinations for different reasons [12,13]. To the best of the authors' knowledge, no studies have been conducted in Saudi Arabia on parents' behaviour towards their children's vaccinations during COVID-19. Therefore, this study aimed to determine the impact of COVID-19 on parents' behaviour towards their children's scheduled vaccinations in Saudi Arabia.

Table 1. Characteristics of the studied participants (n = 1,143).

Variables	n (%)
Relationship to child	
Mother/female guardian	1,009 (88)
Father/male guardian	134 (12)
Parents' age, years	
20 – 39	941 (82)
≥ 40	202 (18)
Maternal education level	
≤ Secondary school	122 (11)
Bachelor degree	856 (75)
Postgraduate	165 (14)
Number of children	
One	328 (29)
Two	368 (32)
Three or more	447 (39)
Place of residence	
Riyadh region	428 (37)
Western region	136 (12)
Eastern region	93 (8)
Qassim region	425 (37)
North region	38 (3)
South region	23 (2)
Do you timely vaccinate your child according to the national immunization schedule in regular situations?	
Yes	848 (74)
No	295 (26)
Has your child been four weeks late (or more) for their scheduled vaccination due to COVID-19?	
Yes	436 (38)
No	707 (62)

Methodology

A web-based cross-sectional study was conducted between May 1 and 30, 2021. The participants included parents or guardians of children below six years old living in Saudi Arabia (all participants are referred to herein as “parents”). Parents with children who were due to receive a vaccination within the study period were included, while those with no vaccination due at the time of the study were excluded. An online questionnaire was developed based on previous studies [9] that correlated with this study's objective. It was reviewed by three experts and piloted on 40 participants. Their results were excluded from the study. It took approximately four to five minutes to complete and was composed of two sections: characteristics of the study participants (age, education level, number of children and place of residence), and vaccination-related questions (e.g., “Do you vaccinate your child on time in regular situations? i.e. before COVID-19 pandemic” and “Has your child been late for his/her scheduled vaccination for four weeks or more due to COVID-19?”). The study title, objective, voluntary nature of participation, declarations of confidentiality and anonymity, estimated duration (4–5 minutes), the link and the other above-mentioned information were included on the cover page.

The questionnaire was distributed via different social media platforms. Data were collected on an Excel spreadsheet, and Stata v6 was used for analysis. The frequency and percentage of the participants' characteristics were calculated. Simple and multiple binary logistic regression was used, and vaccination delay was defined as a delay of four weeks or more [9,14,15]. A p-value of less than or equal to 0.05 indicated strong evidence against the null hypothesis. Ethical approval for the study was obtained from Qassim University, Saudi Arabia (registration number 191206).

Results

The study included 1,143 participants, most of whom were mothers or other female guardians (88%). Most of the parents were aged between 20 and 39 years (82%). Three-quarters of mothers had bachelor's degrees (75%), more than one-third of parents had three or more children (39%) and 37% of parents resided in the Riyadh region. It was found that 26% of parents did not vaccinate their children on time according to the national immunization schedule in regular situations, and 38% of parents reported that they had delayed vaccinations due to COVID-19 (Table 1).

In bivariate analysis, vaccine delay due to COVID-19 was associated with parents aged 40 years or older (Odds ratio (OR) = 0.65, 95% confidence interval (95% CI) = 0.47–0.91, p -value = 0.001), Parents with two children (OR = 1.82, 95% CI = 1.33–2.49, p -value < 0.001), parents with three children or more (OR = 1.66, 95% CI = 1.23–2.25, p -value = 0.001), parents who live in the Riyadh region or the Western region (OR = 1.80, 95% CI = 1.36–2.38, p -value < 0.001 and OR = 2.29, 95% CI = 1.54–3.40, p -value < 0.001, respectively), and parents who did not vaccinate their children on time in regular situations, (OR = 5.02, 95% CI = 3.78–6.66, p -value < 0.001). In multivariable analysis, parents with two children (OR = 1.52, 95% CI = 1.08–2.13, p -value = 0.016), parents with three children or more (OR = 1.57, 95% CI = 1.13–2.18, p -value = 0.007), live in Riyadh or the Western region (OR = 1.72, 95% CI = 1.27–2.33, p -value < 0.001 and OR = 2.27, 95% CI = 1.48–3.47, p -value < 0.001, respectively), and parents who reported delayed vaccination in regular situations (OR = 4.80, 95% CI = 3.59–6.43, p -value < 0.001), were associated with an increased risk of delayed vaccination during COVID-19 as shown in Table 2.

Discussion

To the best of the authors' knowledge, this is the first study on parents' behaviour towards the scheduled vaccination of children below six years of age living in Saudi Arabia during the COVID-19 pandemic. It was

found that 38% of the parents delayed their children's vaccinations during the pandemic, compared to 26% who reported having delayed vaccinations before the pandemic. This finding could be attributed to parents' fear that their children may be infected with COVID-19 during healthcare visits, acquiring the infection from either healthcare workers or the healthcare setting. Despite the huge effort by the Saudi Ministry of Health to maintain the population's safety, concerns remain about visiting healthcare centres to get scheduled vaccinations. Other factors that may impact family behaviour include misconceptions about vaccinations during the pandemic and vaccine availability [10,16].

The present study showed that parents with two or more children had a greater tendency to delay vaccinations, and this finding is consistent with previous studies [17]. This could be related to difficulty in accessing healthcare services or due to parents' interest in vaccinations decreasing and their concern about the other family members at home during healthcare visits increasing; these reasons were reported in previous studies [12,18,19].

The geographic spread and extent of COVID-19 vary from country to country, and in each country, there is unequal distribution among regions or states [20]. This was also the case in Saudi Arabia, where the distribution of confirmed COVID-19 cases varied. Therefore, this study investigated whether there was an association between the region of residence and the

Table 2. Unadjusted and adjusted analysis of factors associated with parents who delayed vaccinations during COVID-19 in Saudi Arabia.

Variables	Delayed n (%)	Unadjusted OR (95% CI)	p -value	Adjusted OR (95% CI)	p -value
Mother's age, years					
20 – 39	375 (40)	Reference		Reference	
≥ 40	61 (30)	0.65 (0.47–0.91)	0.011	0.79 (0.55–1.14)	0.205
Maternal education level					
≤ Secondary school	44 (36)	Reference		Reference	
Bachelor degree	333 (39)	1.13 (0.76–1.67)	0.547	1.11 (0.72–1.73)	0.633
Postgraduate	59 (36)	0.99 (0.61–1.61)	0.957	1.06 (0.62–1.81)	0.840
Number of children					
One	96 (29)	Reference		Reference	
Two	158 (43)	1.82 (1.33–2.49)	< 0.001	1.52 (1.08–2.13)	0.016
Three or more	182 (41)	1.66 (1.23–2.25)	0.001	1.57 (1.13–2.18)	0.007
Place of residence					
Qassim region	129 (30)	Reference		Reference	
Riyadh region	188 (44)	1.80 (1.36–2.38)	< 0.001	1.72 (1.27–2.33)	<0.001
Western region	68 (50)	2.29 (1.54–3.40)	< 0.001	2.27 (1.48–3.47)	<0.001
Eastern region	36 (39)	1.45 (0.91–2.31)	0.118	1.51 (0.91–2.48)	0.107
Northern region	9 (24)	0.71 (0.33–1.55)	0.391	0.56 (0.24–1.29)	0.175
Southern region	6 (26)	0.81 (0.31–2.10)	0.665	0.86 (0.32–2.37)	0.777
Do you timely vaccinate your child in regular situations?					
Yes	240 (28)	Reference		Reference	
No	196 (66)	5.02 (3.78–6.66)	< 0.001	4.80 (3.59–6.43)	< 0.001

percentage of delayed scheduled vaccinations. There was a significant number of delayed vaccinations in the Riyadh and Western region, areas that had the highest numbers of confirmed COVID-19 cases in Saudi Arabia during the study period [21].

The current study revealed that parents who reported having delayed vaccination of their children before the COVID-19 pandemic were more likely to have delayed vaccination during the COVID-19 pandemic. This was the strongest determinant of vaccination delay during the pandemic. This finding could be attributed to some families' doubts about the safety of and/or need for vaccines; some are not convinced that vaccinations protect their children and others even think that vaccinations can increase their children's susceptibility to other diseases [9,22].

There was no evidence of an association between vaccination delay during the pandemic and both parents' age and education. Although maternal age and education level are known to have a major effect on a mother's behaviour in child caregiving, including vaccination [9], in the current study, no association was observed between maternal education level and vaccination delay. This finding is consistent with the results of a study from Turkey [23] and inconsistent with the outcomes of studies from the United States [24,25]. It has been reported that caregivers with an education level of secondary school or lower are more likely to delay or refuse their children's scheduled vaccinations due to financial issues (e.g., insurance), a lack of healthcare facilities in their area or unfounded beliefs and ideas about vaccines [24,26]. Furthermore, no significant association was found between parents' age and behaviour towards vaccination delays during the COVID-19 pandemic, which is similar to what has been reported in the literature [11,22].

In the midst of the COVID-19 pandemic, the WHO specifically emphasised the importance of vaccination against VPDs, with the aims of increasing the global population's awareness and ensuring children's safety [27]. It recommended the continuation of vaccination programmes and clarified the need to maintain physical distancing and avoid mass vaccination campaigns [28]. In Saudi Arabia, the Ministry of Health (MOH) and the Saudi Centre for Disease Control and Prevention (CDC) established protocols for safe healthcare practices during the pandemic that prioritise the protection of children and their families. These practices ensure that the necessary precautions are taken and safety measures are in place to allow health centres' and vaccination services to be available for the Saudi population [29].

This study had some limitations. First, selection bias in the recruitment of participants cannot be ruled out because recruitment was undertaken online. This method was used because the study was conducted during the lockdown. Second, the cross-sectional study design cannot be used to determine specific causal relationships. Third, the questionnaire was distributed via online social media platforms. This may have restricted the inclusion of parents who had limited social media or internet access.

Conclusions

Under normal conditions, vaccination delays are a significant societal issue. This study found that, during the COVID-19 pandemic, the proportion of parents who delayed their children's scheduled vaccinations increased compared to under normal conditions. This delay was greatest in the regions with the highest COVID-19 prevalence and in families with two or more children, especially those who did not vaccinate their children on time before the COVID-19 pandemic. However, parent/guardian age and education level had no effect on the vaccination delay. To reduce the delays in vaccination under normal and pandemic circumstances, further education and knowledge should be provided to families and society in general about the importance of vaccination through programmes and campaigns. In such activities, it should be highlighted that, under all circumstances, vaccination is a priority for children's health and immunity.

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Authors' contributions

Abdullah Saleh Al-Nafeesah, Ashwaq Ahmed AIE'ed Abdullah Saleh Aldamigh, Basel Abdulrahman Almansoor: participated in writing the questionnaire and reviewing the manuscript, Abdullah Al-Nafeesah, Ashwaq Ahmed AIE'ed, Osama Al-Wutayd: had contribution in writing the manuscript, literature review did the analysis of the study result. All the authors read and approved the final draft of the manuscript.

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