

SUBMITTED 1 OCT 23

REVISION REQ. 16 NOV23; REVISION RECD. 20 DEC 23

ACCEPTED 18 JAN 24

ONLINE-FIRST: JANUARY 2024

DOI: <https://doi.org/10.18295/squmj.1.2024.005>

## Support for Mandatory COVID-19 Vaccines for 5–11-Year-Old Children

### *A cross-sectional study of Omani mothers*

\*Salah Al Awaidy,<sup>1</sup> Faryal Khamis,<sup>2</sup> Thamra Al Ghafri,<sup>3</sup> Abdallah Badahdah<sup>4</sup>

<sup>1</sup>Health Affairs, Ministry of Health, Muscat, Oman; <sup>2</sup>Department of Medicine, The Royal Hospital, Muscat, Oman; <sup>3</sup>Directorate General of Health Services, Ministry of Health, Muscat, Oman; <sup>4</sup>School of Psychology, Sociology and Rural Studies, South Dakota State University, Brookings, USA.

\*Corresponding Author's e-mail: [salah.awaidy@gmail.com](mailto:salah.awaidy@gmail.com)

### Abstract

**Objectives:** The vaccination against COVID-19 has averted millions of fatalities during the COVID-19 pandemic. Nevertheless, a considerable number of parents and caregivers oppose mandating COVID-19 vaccines for children. This study investigated the variables that influenced a sample of Omani mothers' support for mandatory COVID-19 vaccines for children. **Methods:** A Cross-Sectional Study of Omani Mothers was collected from 700 mothers (response rate = 73.4%) of children 5–11 years old from several healthcare facilities in Oman using a structured questionnaire between February 20 and March 13, 2022. Univariable and multivariable logistic regression models were used to analyze the data. **Results:** The median age of mothers was 38 years (SD = 5.14). The results of multivariable logistic regression were generally consistent with those of the univariable analysis except for age (OR = 1.06, 95% CI [.58, 1.93],  $p = .86$ ) and income (OR = 1.09, 95% CI [.58, 2.03],  $p = .79$ ). Mothers who were vaccine hesitant (OR = 9.82, 95% CI [5.27, 18.28],  $p < .001$ ), tested positive for COVID-19 (OR = 3.25, 95% CI [1.80, 5.86],  $p < .001$ ), and had one or two doses of COVID-19 vaccines (OR = 5.41, 95% CI [2.92, 10.03],  $p < .001$ ) were more likely to refuse mandating COVID-19 vaccines for children 5–11 years old. **Conclusions:** The findings should aid public health authorities in designing future childhood

vaccine literacy programs with a specific attention to some subgroups in Oman to help reduce opposition to vaccines in future pandemics among mothers.

**Keywords:** COVID-19; Mandatory vaccine; Vaccine hesitancy; Children; Oman.

## **Advances in Knowledge**

- Improving uptake of COVID-19 immunization among children in Oman.
- Identify some of the variables that influence support for mandatory COVID-19 immunization among 5–11 year-old children in Oman.
- Improving vaccine literacy will help increase vaccination rates.

## **Applications to Patient Care**

- To effectively implement evidence-based mandatory vaccination initiatives.
- To enable comprehensive health communication strategies that promote childhood vaccinations.

## **Introduction**

The COVID-19 vaccines reduce the risk of both infection and transmission among children.<sup>1</sup> Nonetheless, a small proportion of children experienced severe illnesses that required treatment, and a few have died as a result of the disease.<sup>2</sup> Specifically, children with underlying co-morbidities such as obesity, heart, kidney, or liver disease, and cancer are at a greater risk of developing severe COVID-19 disease. Children with COVID-19 are susceptible to developing 'long COVID, which is characterized by symptoms such as fatigue, brain fog, and shortness of breath.<sup>3</sup> Hence, vaccinating children should reduce the possibility of COVID-19-related health issues and interference with their education and social activities.<sup>4</sup>

There is a large body of research on caregivers' intention to vaccinate their children against COVID-19.<sup>5-7</sup> It shows that support for vaccination of children against COVID-19 is complex and influenced by several factors such as concerns about vaccine safety, belief in conspiracy theories, effectiveness of the vaccines, and caregivers' sociodemographic variables, including age, income, and education. Support for COVID-19 vaccines for children, however, waxed and waned over the course of the pandemic<sup>8-11</sup> To illustrate, a study conducted from 2021-2022

found that parental intent to vaccinate children declined over a 3-month period, but reverted to baseline after 6 months.<sup>11</sup>

In the fight to stop or slow the spread of COVID-19 disease, several governments, schools, healthcare entities, and private businesses around the world mandated COVID-19 vaccination.<sup>12,13</sup> Debates, however, erupted during the pandemic regarding the legality, ethics, and effectiveness of mandated COVID-19 vaccines for some populations, including children.<sup>14-17</sup>

Although research indicates low vaccination rates among young children,<sup>18-20</sup> little research has been done to explore caregivers support for mandatory COVID-19 vaccines, especially in the Arab world.<sup>21-23</sup> The current study presents survey data gathered in 2022 to investigate the attitudes of Omani mothers towards mandating COVID-19 vaccines for children 5-11 years old. To better understand the factors that correlate with attitudes, several variables including age, income, employment status, educational attainment, and vaccine hesitancy were examined. The findings of the present study should provide public health authorities in Oman with data to better prepare for future pandemic related vaccination campaigns.

## **Methods**

### ***Study Setting***

This study took place in Muscat Governorate, which includes Muscat, the capital of the Sultanate of Oman, the largest of the 11 Governorates, with an estimated 1,302,440 inhabitants. The Directorate General of Health Services in Muscat governorate houses 30 primary healthcare centers, 2 polyclinics, and 3 hospitals.

### ***Participants and Procedure***

This is a cross-sectional survey of mothers of children between the ages of 5 and 11 years were recruited using a convenience sampling method. They were approached during their visits to seven primary care centers in Muscat governorate by 14 family physicians between February 20 and March 13, 2022. To determine the sample size, we assumed that 50% of mothers are hesitant about their views. Hence, a minimum of 550 participants would be needed with an interval of confidence of 99% (z value of 2.58), a margin of error of 5% (delta value of 0.05), and a

participation refusal rate of 20%. After initial screening, we approached 954 eligible mothers, and only 700 completed the surveys (response rate = 73.4%).

The 14 research assistants, all family physicians, were recruited and trained to administer a face-to-face Arabic questionnaire. Only Omani mothers aged 18 years and older with children between the ages of 5 and 11 years were enrolled in the study. Informed consent was obtained from all mothers. Participation was voluntary and anonymous, and participants received no compensation.

## ***Measures***

### ***Mother Socio-demographic***

We collected sociodemographic data from mothers, including age, household income, educational attainment, employment status, and the number of children aged 5–11 years. We also asked about COVID-19 infections, COVID-19 vaccination status, and the decision-maker in the family with respect to vaccinating children against COVID-19. The age of the participants was dichotomized based on the median value (median =38) into “38 and younger” and “39 and older”. Household income was measured by an open-ended one item then divided into “≤ 4,679 USD (1,802 Riyals Oman)” and “≥ 4,681 USD (1,724 Riyals Oman)” groups. Six response categories that ranged from 1 (did not attend school) to 6 (postgraduate degree) were used to assess educational level. The educational level is then divided into “high school or less” and “college degree or higher” categories. A binary item (employed/not employed) was used to report on employment status. Regarding the history of COVID-19 test results, participants were asked whether they ever tested positive, negative, not sure, or do not know. The COVID-19 vaccination status was assessed by one question that asked if they had received no vaccines against COVID-19, one dose/two doses, or two doses and a booster shot. This item was divided into two categories: “one dose/two doses” and “two doses and a booster”. Finally, participants reported on who would make the final decision about whether their children should be vaccinated against COVID-19. Four response options were given, including me only, my husband only, both my husband and I, or do not know. Prior to conducting the actual study, we pilot tested the study questionnaire using a sample of 25 mothers with children 5-11. Appropriate changes were made including words missing and the removal of two items.

### ***COVID-19 Mandatory Vaccines***

Support for mandatory COVID-19 vaccines for children 5-11 years old was measured by a single item: “COVID-19 vaccines should be compulsory in Oman for children ages 5-11. The item was followed by a 5-point Likert scale, with 1 representing strongly disagreeing and 5 indicating strongly agreeing. To have a clear picture of mother support for mandating COVID-19 vaccines, the “not sure” responses were removed from the analysis. Then, the item was averaged and dichotomized using the median as a cut-off point into supportive (*strongly disagree and agree*) and not supportive (*disagree and strongly agree*) of mandatory COVID-19 vaccines.

### ***Vaccine Hesitancy Scale***

To assess vaccine hesitancy, participants responded to a 4-item scale using a 5-point Likert-type format that ranged from 1 (strongly disagree) to 5 (strongly agree). Items were adopted from previous studies with some editing.<sup>24,25</sup> Examples of these items were “I do not trust that the COVID-19 vaccines can protect children from COVID-19 disease” and “Children COVID-19 vaccines are effective”. An exploratory factor analysis using principal axis factoring with the Promax rotation ( $k = 4$ ) showed a one-factor solution that explained 58% of the variance in the data ( $\alpha = .85$ ). After reverse coding one item, all items were averaged, as higher scores represent lower levels of hesitancy, and then dichotomized using the median score (median = 3.0) as a cut-off point. So, mothers who scored equal to or above the median were classified as “less hesitant”.

### ***Analytic Approach***

Descriptive statistics, including the mean, standard deviations, frequency counts, and percentages, were used to describe the study variables. To explore the factors associated with support for mandating COVID-19 vaccines for children 5-11 years old, univariable and multivariable logistic regression models were used. All statistical analyses were performed using SPSS V. 29 (IBM Corp., 2016).

Univariable binary logistic regression analyses were performed to assess the association between sociodemographic variables (age, income, educational level, employment status) and COVID-19-related factors (vaccine hesitancy, COVID-19 vaccination status, COVID-19 test results) and

the dependent variable of opposing mandatory COVID-19 vaccines for children 5-11 years old. Variables with a  $p$  value  $< 0.10$  in the univariate analysis were included in the multivariate logistic regression analysis to identify variables that were associated with the dependent variable. The odds ratio (OR) values and their 95% confidence intervals (95% CI) were calculated, and a  $p$  value  $< 0.05$  was considered to be statistically significant. We used the Hosmer and Lemeshow chi-squared test to evaluate the model fit of the multivariable logistic regression analysis. A  $p$ -value of less than 0.05 was deemed statistically significant.

### ***Ethical Approval***

The study was approved by the Regional Study Approval and Ethical Review Committee (MoH/CSR/22/25452) at the Directorate General of Health Services in Muscat Governorate, Ministry of Health, and in accordance with the Declaration of Helsinki.

### **Results**

The present data comes from 700 mothers who visited one of the seven primary public health care centers in Muscat Governorate, the capital of Oman. Participants had a median age of 38 years (SD = 5.14, range = 25–53) with a sizable proportion (75%) having 1–2 children. Almost half of the children (48%) were girls. Most of the mothers (73%) had a college degree or higher, and 70.3 % were working full-time, mostly in the public sector (84.5%). Slightly less than half (46.9%) made  $\leq 4,679$  USD a month or less. A small number of the participants were not employed (29.7%). Half of the sample tested positive for COVID-19, while the other 42.7% tested negative, and the rest (7.4%) were not sure or did not know. Almost all (92.5%) mothers reported that they and their husband would make the final decision regarding vaccinating their children against COVID-19. As for the outcome variable, after mothers who were not sure ( $n=92$ ) were removed from the logistic regression analyses, only a small percentage (25.3%) were supportive of mandatory vaccination, while the majority (74.4%) were against it [Table 1].

The results of the univariable binary logistic regression analysis showed that mothers 38 years old and younger,  $OR= 2.35$ , 95% CI [1.62, 3.41],  $p < .001$ , low income mothers,  $OR= 2.98$ , 95% CI [1.90, 4.67],  $p < .001$ , vaccine hesitant ones,  $OR= 11.73$ , 95% CI [7.56, 18.19],  $p < .001$ , those tested positive for COVID-19,  $OR= 2.75$ , 95% CI [1.87, 4.06],  $p < .001$ , and those who got one or

two doses of COVID-19 vaccines,  $OR= 2.75$ , 95% CI [1.87, 4.06],  $p <.001$ , were significantly associated with higher odds of rejecting mandatory COVID-19 vaccines for 5-11 year old children. Finally, support for mandatory vaccination was not related to educational status  $p = .11$  and employment status,  $p = .25$  [Table 2].

As for the multivariable logistic regression, the Hosmer and Lemeshow test indicated a good fit of the data ( $\chi^2 = 9.82$  (8)  $p = .28$ ). The logistic regression model was statistically significant,  $\chi^2$  (5) = 189.52,  $p < .000$ , explained 54.0% (Nagelkerke  $R^2$ ) of the variance in opposition to mandatory vaccines, and correctly classified 85.8 % of cases. The results were generally consistent with that of the univariable analysis except for age ( $OR= 1.06$ , 95% CI [.58, 1.93],  $p = .86$ ) and income ( $OR = 1.09$ , 95% CI [.58, 2.03],  $p = .79$ ). That is, vaccine hesitant mothers ( $OR = 9.82$ , 95% CI [5.27, 18.28],  $p <.001$ ), those who tested positive for COVID-19 ( $OR = 3.25$ , 95% CI [1.80, 5.86],  $p <.001$ ), and those who had one or two doses of COVID-19 vaccines ( $OR = 5.41$ , 95% CI [2.92, 10.03],  $p <.001$ ) were associated with refusal to mandate COVID-19 vaccines for children 5-11 years old.

## Discussion

In this cross-sectional study, we collected data from Omani mothers to explore the effect of their age, income, education, employment status, vaccine hesitancy, infection with COVID-19, and COVID-19 vaccination on their support for mandatory COVID-19 vaccines for children 5-11 years old.

The results of multivariable logistic regression analysis suggested that vaccine hesitant mothers, those who tested positive for COVID-19, and those who had one or two doses of COVID-19 vaccines were associated with a refusal to support mandatory COVID-19 vaccines.

The current study showed that 74.4% of the mothers rejected the idea of mandating COVID-19 vaccines for children-while the minority (25.3%) were in favor. Although most studies focused on parents rather than mothers, our finding is similar to a study in Jordan where 77.6% of parents opposed mandating COVID-19 vaccines for children.<sup>26</sup> Other studies, however, showed higher rates of support for mandatory vaccines, including a study of parents of children aged 2-15 years

in India that found 81% endorsed COVID-19 mandatory vaccines for children.<sup>27</sup> In Poland, 44.4% of parents believed that vaccinations should be mandatory,<sup>23</sup> while in Germany the percentage was 31%.<sup>28</sup> When mandatory COVID-19 vaccination is linked to school attendance, 44% of caregivers stated that vaccines should never be mandated.<sup>13</sup> A similar result was obtained from parents in New York City, which found that 44.3% supported school-based vaccine mandates for students.<sup>29</sup>

One potential explanation for the strong opposition to mandatory vaccination in our study is that our participants may have had low levels of COVID-19 vaccine literacy. Work on the vaccination of children during and prior to COVID-19 showed a link between health literacy and the likelihood of childhood vaccination.<sup>30-32</sup> Hence, it is important to provide caregivers with accurate information for future vaccines and to increase levels of trust in the health establishment.

We found mothers who tested positive for COVID-19 and those who received COVID-19 vaccines were associated with higher odds of rejecting mandatory COVID-19 vaccines for their children. One plausible explanation is that mothers had some concerns regarding the efficacy, and safety of the vaccines, despite almost all of them having received COVID-19 vaccines, and the belief that children may obtain immunity through infection. Another interpretation is that mothers were hesitant adopters. That is, despite the fact that the majority of them had been vaccinated, they were vaccine hesitant.<sup>33</sup>

Our study has a few limitations. First, as with all self-reported surveys, there is a risk of potential bias. In other words, mothers' responses may have been affected because of the presence of the interviewers. They might have exaggerated some of the information provided, such as their vaccination status, due to social desirability. Additionally, we utilized a convenience sample of mothers attending health centers in one governorate, which limits the generalizability of our findings. Third, the survey was conducted between February 20 and March 13, 2022, and the perceived vaccine benefits and risks could have changed over time, especially with the emergence of variants causing less severe disease. Fourth, the study results can't be applied to the Omani community because most of the women who took part in the study have college degrees.



Finally, there were other variables that might influence mothers support for COVID-19 mandatory vaccines that we did not include in our study, such as belief in conspiracy theories and perceived severity of the disease.

## **Conclusion**

Despite these limitations, this study provides some insight on attitudes toward mandatory COVID-19 vaccination for young children among mothers prior to the start of a vaccination campaign targeting children aged 5-11. While new variants of COVID-19 continue to emerge amid the waning of COVID-19 vaccine-induced protection, evidence-based mandatory childhood vaccination policies against COVID-19 and future pandemics that do not impose unnecessary burdens on parents are desirable.

## **Authors' Contribution**

SAA, FK, TA, AB developed the original idea and are the supervisors of the research study. AB, TA, FK and SAA developed the questionnaire and drafted the study protocol. TA, SAA, and FK data collection and assisted with ethical clearance. TK conducted data analysis. SAA, AB, FK, TA wrote the draft manuscript and finalization of manuscript. All authors reviewed the analyzed data, manuscript writing and provided input into the manuscript. All authors approved the final version of the manuscript.

## **Conflict of Interest**

The authors declare no conflict of interest.

## **Funding**

No funding was received for this study.

## **Acknowledgements**

We acknowledged each and every public health professional who helped us with the study's execution.

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**Table 1:** Characteristics of the Study Sample.

Characteristics	N (%) *
Age (M = 37.61, SD 5.29)	700
Monthly income	
≤ 4,679 USD (1802 Riyals Oman)	233 (46.9)
≥ 4,681 USD (1724 Riyals Oman)	264 (53.1)
Education	
College degree of higher	510 (72.9)
High school or less	189 (27.1)
Employment status	
Working	492 (72.3)
Not working	203 (29.7)
COVID-19 experience	
Tested positive	349 (53.9)
Tested negative	299 (46.1)
Not sure/do not know	52 (7.4)
Vaccination status	
One or two doses	443 (63)
Two doses and booster	251 (36.2)
COVID-19 vaccine decision maker	
Mother or father only	49 (7.1)
Both mother and father	639 (92.5)

Note. N =700

\*Total percent may not sum to 100% because of missing responses

**Table 2:** Odds Ratio and 95% Confidence Interval of Opposition to Mandating COVID-19 Vaccination of Children 5-11 Years Old by Vaccine Hesitancy, Vaccination Status, COVID-19 Test Result, and Demographic Variables.

Variable	Univariable model OR [95% CI]	p-value	Multivariable model OR [95% CI]	p-value
Age (ref: ≥ 39 years)				
≤ 38 years	2.35 [1.62, 3.41]	0.00	1.06 [.58, 1.93]	.86
Income (ref: ≥ 1,800)				
Less than 1,800	2.98 [1.90, 4.67]	0.00	1.09 [.58, 2.03]	.79
Education (ref: College degree or higher)				
High school or less	1.42 [.93, 2.18]	0.11		
Employment (ref: Working)				
Not working	1.27 [.84, 1.92]	0.25		
Vaccine hesitancy (ref: Low hesitancy)				
High hesitancy	11.73 [7.56, 18.19]	0.00	9.82 [5.27, 18.28]	0.00
COVID-test (ref: Tested negative)				
Tested positive	2.75 [1.87, 4.06]	0.00	3.25 [1.80, 5.86]	0.00
Vaccination Status (ref: Two doses and boosted)				
One/two doses	2.75 [1.87, 4.0]	0.00	5.41 [2.92, 10.03]	0.00