The Willingness of Malaysian Parents To Vaccinate Their Children Below 12 Years Old Against COVID-19 – A Large Cross-Sectional Study

Diana-Leh-Ching Ng
University Malaysia Sarawak
Gin-Gin Gan
University of Malaya
Chee-Shee Chai
University Malaysia Sarawak
Nur Adila Bt Anuar
University of Malaya
Woweham Sindeh
University of Malaya
Wei-Jing Chua
University of Malaya
Asri B Said
University Malaysia Sarawak
Seng-Beng Tan (pramudita_1@hotmail.com)
University of Malaya

Research Article

Keywords: COVID-19 vaccine, children, vaccine acceptance, vaccine refusal, vaccine hesitancy

Posted Date: December 28th, 2021

DOI: https://doi.org/10.21203/rs.3.rs-1138573/v1

Abstract

Background:

The administration of a new drug such as the COVID-19 vaccine in children could be a major concern for their parents. This study aims to assess the willingness of Malaysian parents to vaccinate their children < 12 years old against COVID-19.

Methods:

An online cross-sectional study was conducted nationwide in Malaysia from 29th August 2021 to 17th October 2021. Parents with children < 12 years old were recruited by the snowball sampling method.

Results:

Of the 4,438 survey responses received, 3,528 (79.5%) parents were included in the analysis. Of these parents, 2,598 (73.6%) were willing, 486 (13.8%) were not willing, and 444 (12.6%) were still undecided to vaccinate their children against COVID-19. Those who were single parent [odds ratio (OR): 2.0, 95% confidence internal (CI): 1.32 – 3.04, p = 0.001], had secondary or lower education (OR: 1.5, 95% CI: 1.21 – 1.96, p < 0.001), worked as healthcare worker (OR: 1.7, 95% CI: 1.34 – 2.26, p < 0.001), had significant contact with COVID-19 (OR: 1.3, 95% CI: 1.09 – 1.63, p = 0.006), and already received COVID-19 vaccine (OR: 15.4, 95% CI: 9.76 – 24.33, p < 0.001) were significantly more willing to vaccinate their children against COVID-19.

The common reasons given by parents who were willing to vaccinate their children against COVID-19 include vaccination could protect their children (99.4%), the vaccination could protect other family members (99.3%), and the vaccine was effective (98.2%). The common reasons given by parents who were not willing to vaccinate their children against COVID-19 include the uncertainty towards the new vaccine (96.1%), worry about the vaccine contents (93.2%), limited information about the vaccine from the doctors (82.3%), and believed the vaccine was unsafe (79.8%)

Conclusions:

Nearly three-quarters of Malaysian parents were willing to vaccinate their children < 12 years old against COVID-19. The COVID-19 vaccination history of the parents was the strongest independent predictor for their willingness to vaccinate their children. Future health education should target parents at risk of vaccine refusal or hesitation, focus to address the common reasons for refusing the COVID-19 vaccine, and highlight the benefits of the COVID-19 vaccine.

Introduction:

Immunization is the most reliable and cost-effective public health intervention ever implemented in human history, which has saved millions of lives each year.(1, 2) Vaccine confers protection against

pathogens via two mechanisms.(3) First, it stimulates the B-cells to produce neutralizing antibodies that provide immediate immunity.(4) Second, it induces the production of antigen-specific memory T-cells that persists even long after the pathogens have been eliminated to confer protection against subsequent infection.(5) To date, immunization programs have successfully controlled several contagious diseases worldwide, such as smallpox, polio, diphtheria, pertussis, and rubella.(6)

Since its first emergence in December 2019, the coronavirus 2019 (COVID-19) has spread rapidly to every part of the world, leading to global public health emergency and pandemic. As of 22nd September 2021, 230 million people have been infected with COVID-19 worldwide, resulting in 4.7 million deaths.(7) Even though control of human movement such as lockdown, travel restriction, and quarantine are effective containment and mitigation strategies for COVID-19, it leads to significant mental health,(8) and socioeconomic burden.(9) Pandemic fatigue as a consequence of prolonged public health measures and restrictions may contribute to the rebound of COVID-19 cases.(10)

The rapid development of vaccine against COVID-19 offers hope for everyone to see an end to the pandemic. The World Health Organization has listed six COVID-19 vaccines under the emergency use listing for adults as of 31st July 2021.(11) Meanwhile, the United States (USA) Food and Drug Administration had granted the emergency use of Pfizer-BioNtech COVID-19 vaccine in teenagers ≥ 12 years old on 10th May 2021. A good efficacy in terms of reduction in symptomatic infection, hospitalization, critical illness, and deaths, as well as safety profile, was reported in phase three studies of these vaccines.

In Malaysia, a recent figure from the Crisis Preparedness and Response Center of the Ministry of Health highlighted that 15.3% of COVID-19 cases were detected among children. By 30th August 2021, an alarming number of 310,074 children had been diagnosed with COVID-19, leading to 41 deaths. Even though children infected by COVID-19 tend to be asymptomatic and have a lower mortality rate,(12) they may still be suffered from other complications, such as mental stress during isolation, social stigmatization, and long-term lung complications. Besides, Multi-System Inflammatory Syndrome in Children (MIS-C) is a rare but potentially fatal complication of COVID-19 among them.(13)

Vaccination in children often required consent from the parents or guardians. Therefore, the administration of a new drug such as the COVID-19 vaccine in children could be a major concern among them due to various factors. These include 1.) The most appropriate dosage of COVID-19 vaccine for children at different age groups – Due to the differences in pharmacokinetics that are influenced by their age, body composition, the functionality of liver and kidneys, as well as the maturation of the enzymatic system, children require a different dosage of vaccine from adults and even among themselves.(14) 2.) The difficulty in monitoring short-term side effects of vaccine – Children, especially those at a younger age may have difficulty in understanding the monitoring instruction and expressing their problem. Some complications such as myocarditis and pericarditis were reported more commonly in the younger and were difficult to detect.(15) 3.) The unforeseen long-term side effects of the vaccine – Children are more

prone to suffer from long-term side-effects if there are any, because the vaccine is given at a much younger age. Autoimmune, fertility, and tumorigenic are among those concerns.

The administration of the COVID-19 vaccine to Malaysian children < 12 years old will only begin in 2022 and be subjected to the approval of the local authority. Therefore, we decided to conduct this study that aims to assess the willingness of Malaysian parents to vaccinate their children < 12 years old against COVID-19. The sociodemographic and influencing factors that affect their willingness were also determined.

Materials And Methods:

Study Design and Patients

A nationwide cross-sectional study was conducted in Malaysia from 29th August 2021 to 17th October 2021. The inclusion criteria of the study were: aged ≥ 18 years old, parent of child or children < 12 years old, and currently residing in Malaysia. The minimum sample size was 665 subjects, calculated based on the type-1 error of 5%, the absolute error of 5%, and the expected proportion of 48.2% for acceptance rate among parents to allow their children to receive the COVID-19 vaccine.(16)

This study was conducted in accordance with the Declaration of Helsinki. Online informed written consent was obtained from every respondent before the commencement of the study. Ethics approval was obtained from the Medical Research and Ethics Committee of the University Malaya Medical Center (MECID. No: 202182 – 10437).

Procedure

An online survey was used for the data collection due to the ongoing COVID-19 pandemic in the country. The respondents of the study were recruited using the snowball sampling method. Advertisement and questionnaire in Google forms were sent to the respondents via mobile WhatsApp. They were asked to complete an online consent form after confirming that they understood the purpose, risks, and benefits of the study. This anonymous self-administered questionnaire was either in English, Malay, or Mandarin languages. The questionnaire took approximately 10-15 minutes to complete. No incentive was offered for completing the questionnaire.

The questionnaire was developed by a group of experts in the COVID-19 vaccine via literature review and discussion, taking into account the local situation and policies.(17–21) It consisted of three parts: part one - the sociodemographic characteristics and clinical data of the parents, part two – the demographic characteristic and clinical data of the children, and part three – the willingness of the parents to allow their children to take the COVID-19 vaccine, and reasons behind the decision. The sociodemographic characteristics of the parents include age, gender, marital status, region of residence, education level, household income, employment status, whether the respondents were healthcare workers, whether they lived together with the elderly or someone with chronic illness, and the number of children < 12 years old

that they had. The clinical data of the parents include whether they had been significantly contacted with COVID-19, whether they had been diagnosed with COVID-19, whether their families, relatives, or colleagues had been diagnosed with COVID-19, as well as their COVID-19 vaccination status. The demographic characteristic of the children includes age, while the clinical data was concerned if they had chronic illness. Parents can answer “Yes”, “No”, or “Unsure” concerning their willingness to vaccinate their children against COVID-19, followed by the reasons for their decision. A dichotomous answer of “Yes” or “No” was used for all the questions for reasons, except for “other reasons” for which a written answer was required.

The region of residence was divided into Central region (Selangor, Kuala Lumpur, and Putrajaya), Southern region (Johor, Melaka and Negeri Sembilan), Northern region (Perak, Penang, Kedah and Perlis), East Coast (Pahang, Kelantan and Terengganu), and Borneo Island (Sabah, Sarawak and Labuan). For household income, B40 was defined as the lowest 40%, M40 as the middle 40%, and T20 as the top 20% of the family income group in Malaysia.(22) The significant contact with COVID-19 was divided into that required quarantine, and that required self-surveillance. The age group of the children was divided into 5 – 11 years old, 2 – 4 years old, and < 2 years old based on the development and dosage of the COVID-19 vaccine in clinical trials.

For parents who were willing to vaccinate their children against COVID-19, thirteen reasons were listed for them to choose (Supplement Figure 1). Two reasons were regarding vaccine properties, three reasons were regarding the recommendation of the vaccine, three reasons were regarding the severity of COVID-19 in the country, two reasons were regarding targets protected by the vaccine, and three reasons were regarding freedom after vaccination.

For parents who were not willing to vaccinate their children against COVID-19, sixteen reasons were listed for them to choose (Supplement Figure 2). Four reasons were regarding vaccine properties, three reasons were regarding limited information about the vaccine, five reasons were regarding characteristics of the children, three reasons were regarding post-vaccination freedom was not essential, and one question was regarding the cultural and religious concern.

For parents who were still unsure if will vaccinate their children against COVID-19, thirteen factors that may affect their decision in the future were listed (Supplement Figure 3). Four reasons were regarding vaccine properties, three reasons were regarding recommendation, two reasons were regarding the severity of COVID-19 in the country at that time, three reasons were regarding freedom obtained after vaccination, and one question was regarding outcomes of vaccination program in other countries.

Statistical analysis

Results for the categorical variables were expressed as percentages, while results for the continuous variables were expressed as mean ± standard deviation (SD), or median with interquartile range. Differences in variables were examined between parents who were willing to vaccinate their children against COVID-19 versus those who were not willing or still unsure. Differences in categorical variables

were compared using the Chi-Squared test or Fisher Exact test. Differences in continuous variables were compared using an independent t-test or Mann-Whitney U test. Multivariate analyses were performed using logistic regression. A 2-sided p-value of less than 0.05 was considered significant in this study. Statistical analyses were performed by using the software package, Statistical Package for the Social Sciences (SPSS for Windows version 25.0, SPSS Inc, Chicago, IL, USA).

Results:

Sociodemographic characteristics and clinical data of the parents and children

Of the 4,438 survey responses received, 3,965 (89.3%) respondents agreed to participate in the study. After excluding 437 (9.8%) respondents who did not have children < 12 years old, the final sample consisted of 3,528 (79.5%) parents. The sociodemographic characteristics and clinical data of these parents and their children are as shown in Table 1.

Table 1
Sociodemographic characteristics and clinical data of the parents and children

Parameters	Total respondents, n = 3,528
Age, (mean ± SD, 95% CI)	38.6 ± 6.64,
Years	34.52 – 35.31
Gender, n (%)	2,495 (70.7)
Mother	1,033 (29.3)
Father	
Marital status, n (%)	3,337 (94.6)
Married couple	191 (5.4)
Single parent	
Region, n (%)	2,057 (58.3)
Central	488 (13.8)
Southern	325 (9.2)
Northern	125 (3.5)
East coast	533 (15.1)
Borneo	
Education level, n (%)	2,951 (83.6)
Tertiary	577 (16.4)
Secondary and below	
Household income, n (%)	1,201 (34.0)
B40	1,517 (43.0)
M40	810 (23.0)
T20	

* from the total of 3,528 respondents

Italic: subgroup of parents with COVID-19 contact

Abbreviations: SD, standard deviation; CI, confidence interval; COVID-19, coronavirus 2019; B40, lowest 40% of family income group; M40, middle 40% of family income group; T20, top 20% of the family income group.

Parameters	Total respondents, n = 3,528
Employment status, n (%)	2,793 (79.2)
Employed	700 (19.8)
Unemployed	35 (1.0)
Retired	
Healthcare workers, n (%)	3,006 (85.2)
No	522 (14.8)
Yes	
Lived with elderly or someone with chronic illness, n (%)	2,576 (73.0)
No	952 (27.0)
Yes	
History of contact with COVID-19, n (%)	2,668 (75.6)
No	860 (24.4)
Yes	*344 (9.8)*
Required quarantine	*516 (14.6)*
Required self-surveillance	
Had been diagnosed with COVID-19, n (%)	3,297 (93.5)
No	198 (5.6)
Yes	33 (0.9)
Prefers not to answer	
Families, relatives, colleagues diagnosed with COVID-19, n (%)	1,140 (32.3)
No	2,388 (67.7)
Yes	

* from the total of 3,528 respondents
Italic: subgroup of parents with COVID-19 contact
Abbreviations: SD, standard deviation; CI, confidence interval; COVID-19, coronavirus 2019; B40, lowest 40% of family income group; M40, middle 40% of family income group; T20, top 20% of the family income group.

Parameters	Total respondents, n = 3,528
Vaccinated for COVID-19, n (%)	130 (3.7)
No	3,332 (94.4)
Yes	66 (1.9)
Prefers not to answer	
Children under 12 years, (mean ± SD, 95% CI)	2.0 ± 1.13,
Number	1.97 – 2.04
Age groups of children, n (%)	2,703 (76.6) *
5 – 11 years	1,691 (47.9) *
2 – 4 years	567 (16.1) *
Below 2 years	
Children had chronic illness, n (%)	3,345 (94.8)
No	132 (3.7)
Yes	51 (1.4)
Prefers not to answer	
* from the total of 3,528 respondents	
Italic: subgroup of parents with COVID-19 contact	
Abbreviations: SD, standard deviation; CI, confidence interval; COVID-19, coronavirus 2019; B40, lowest 40% of family income group; M40, middle 40% of family income group; T20, top 20% of the family income group.	

These parents had a mean age of 38.6 ± 6.64 years. The majority of them were a mother (70.7%), married couples (94.6%), from the central region of Malaysia (58.3%), had tertiary education (83.6%), currently working (79.2%), and were non-healthcare workers (85.2%). The family income composition of parents in this study was not much different from that observed in the country, of which 34.0% were B40, 43.0% were M40, and the remaining 23.0% were T20.

27.0% of the parents were staying with the elderly or someone with chronic illness. 24.4% of the parents had a history of significant contact with COVID-19, of which 9.8% required quarantine and 14.6% required self-surveillance. Only 5.6% of the parents had been diagnosed with COVID-19, with another 0.9% refusing to disclose further. Most of the parents had families, relatives, or colleagues that had been diagnosed with COVID-19 (67.7%). A big majority of them (94.4%) had received the COVID-19 vaccine.

The mean number of children < 12 years old that they had was 2.0 ± 1.13. 76.6% of parents had children 5 – 11 years old, 47.9% of parents had children 2 – 4 years old, and 16.1% of parents had children < 2 years old. 3.7% of the parents informed that their children had chronic illness, while another 1.4% of them were not keen to disclose.

The willingness of the parents to vaccinate their children against COVID-19 and factors that influenced their decision

Of the 3,528 parents, 2,598 (73.6%) were willing to vaccinate their children against COVID-19, while the remaining 486 (13.8%) were not willing to vaccinate their children against COVID-19 and 444 (12.6%) were still undecided (Table 2).

Table 2
The willingness of the parents to vaccinate their children against COVID-19

Parameters	Willing, n = 2,598 (73.6%)	Not willing or unsure, n = 930 (26.4%)	p-value	Multivariate analysis, OR (95% CI), p-value
Age, (mean ± SD, 95% CI) Years	38.5 ± 6.67	39.0 ± 6.56	0.046	1.0 (0.99 – 1.00), 0.257
Gender, n (%)			0.597	-
Mother	1,831 (70.5)	664 (71.4)		
Father	767 (29.5)	266 (28.6)		
Marital status, n (%)			0.006	
Married couple	2,441 (94.0)	896 (96.3)		Ref
Single parent	157 (6.0)	34 (3.7)		2.0 (1.32 – 3.04), 0.001
Region, n (%)			0.001	
Central	1,525 (58.7)	532 (57.2)		Ref
Southern	365 (14.0)	123 (13.2)		1.1 (0.84 – 1.38), 0.584
Northern	210 (8.1)	115 (12.4)		0.7 (0.53 – 0.91), 0.008
East coast	86 (3.3)	39 (4.2)		0.8 (0.51 – 1.18), 0.226
Borneo	412 (15.9)	121 (13.0)		1.2 (0.96 – 1.60), 0.103
Education level, n (%)			< 0.001	
Tertiary	2,139 (82.3)	812 (87.3)		Ref
Secondary and below	459 (17.7)	118 (12.7)		1.5 (1.21 – 1.96), < 0.001
Household income, n (%)			0.833	-
B40	877 (33.8)	324 (34.8)		
M40	1,121 (43.1)	396 (42.6)		
T20	600 (23.1)	210 (22.6)		

Abbreviations: SD, standard deviation; CI, confidence interval; COVID-19, coronavirus 2019; B40, lowest 40% of family income group; M40, middle 40% of family income group; T20, top 20% of the family income group, OR, odds ratio.

Parameters	Willing, n = 2,598 (73.6%)	Not willing or unsure, n = 930 (26.4%)	p-value	Multivariate analysis, OR (95% CI), p-value
Employment status, n (%)				
Employed	2,085 (80.3)	708 (76.1)	0.012	Ref
Unemployed	492 (18.9)	208 (22.4)		0.8 (0.69 – 1.04), 0.109
Retired	21 (0.8)	14 (1.5)		0.7 (0.31 – 1.42), 0.290
Healthcare workers, n (%)				
No	2,167 (83.4)	839 (90.2)	< 0.001	Ref
Yes	431 (16.6)	91 (9.8)		1.7 (1.34 – 2.26), < 0.001
Lived with elderly or someone with chronic illness, n (%)				
No	1,880 (72.4)	696 (74.8)	0.144	-
Yes	718 (27.6)	234 (25.2)		
History of contact with COVID-19, n (%)				
No	1,921 (73.9)	747 (80.3)	< 0.001	Ref
Yes	677 (26.1)	183 (19.7)		1.3 (1.09 – 1.63), 0.006
Had been diagnosed with COVID-19, n (%)				
No	2,440 (93.9)	857 (92.2)	0.026	Ref
Yes	140 (5.4)	58 (6.2)		0.7 (0.49 – 1.06), 0.099
Prefers not to answer	18 (0.7)	15 (1.6)		0.8 (0.34 – 2.06), 0.705
Families, relatives, colleagues diagnosed with COVID-19, n (%)				
No	850 (32.7)	290 (31.2)	0.390	-
Yes	1,748 (67.3)	640 (68.8)		

Abbreviations: SD, standard deviation; CI, confidence interval; COVID-19, coronavirus 2019; B40, lowest 40% of family income group; M40, middle 40% of family income group; T20, top 20% of the family income group, OR, odds ratio.

Parameters	Willing, n = 2,598 (73.6%)	Not willing or unsure, n = 930 (26.4%)	p-value	Multivariate analysis, OR (95% CI), p-value
Vaccinated for COVID-19, n (%)				
No	24 (0.9)	106 (11.4)	< 0.001	Ref
Yes	2,571 (99.0)	761 (81.8)		15.4 (9.76 – 24.33), < 0.001
Prefers not to answer	3 (0.1)	63 (6.8)		0.3 (0.08 – 0.93), 0.039
Children under 12 years, (mean ± SD, 95% CI)	2.0 ± 1.14	2.1 ± 1.12	0.020	1.0 (0.90 – 1.03), 0.276
Number				
Age groups of children, n (%)				
5 – 11 years	1,970 (75.8)	733 (78.8)	0.065	-
2 – 4 years	1,236 (47.6)	455 (48.9)	0.480	
Below 2 years	425 (16.4)	142 (15.3)	0.437	
Children had chronic illness, n (%)				
No	2,483 (95.6)	862 (92.7)	< 0.001	Ref
Yes	99 (3.8)	33 (23.5)		1.0 (0.62 – 1.47), 0.826
Prefers not to answer	16 (0.6)	35 (3.8)		0.2 (0.11 – 0.48), < 0.001

Abbreviations: SD, standard deviation; CI, confidence interval; COVID-19, coronavirus 2019; B40, lowest 40% of family income group; M40, middle 40% of family income group; T20, top 20% of the family income group, OR, odds ratio.

Sociodemographic factors that influenced the parents' decision include their age (p = 0.046), marital status (p = 0.006), region of residence (p = 0.001), education level (p < 0.001), employment status (p = 0.012), and if they were healthcare workers (p < 0.001). Clinical factors that influenced parents' decision include history of significant contact with COVID-19 (p < 0.001), previous diagnosis of COVID-19 (p = 0.026), and their COVID-19 vaccination status (p < 0.001). Children factors that influenced the parents' decision include the number of children < 12 years old (p = 0.020), and if the children had chronic illness (p < 0.001).

Multivariate analysis showed that those who were single parent [odds ratio (OR): 2.0, 95% confidence internal (CI): 1.32 – 3.04, p = 0.001], had secondary or lower education (OR: 1.5, 95% CI: 1.21 – 1.96, p < 0.001), worked as healthcare worker (OR: 1.7, 95% CI: 1.34 – 2.26, p < 0.001), had significant contact with COVID-19 (OR: 1.3, 95% CI: 1.09 – 1.63, p = 0.006), and already received COVID-19 vaccine (OR: 15.4, 95%

CI: 9.76 – 24.33, $p < 0.001$) were significantly more willing to vaccinate their children against COVID-19. On the other hand, the willingness of parents from Northern zone of the country to vaccinate their children against COVID-19 was significantly lower when compared to those from Central zone (OR: 0.7, 95% CI: 0.53 – 0.91, $p = 0.008$).

The reasons parents willing to vaccinate their children against COVID-19

All the reasons provided in the survey were agreed by the majority of the parents (77.5 – 99.4%) as the rationale behind their willingness to vaccinate their children against COVID-19 (Figure 1). The three most common reasons were COVID-19 vaccination could protect their children (99.4%), the COVID-19 vaccination of their children also could protect other family members (99.3%), and the COVID-19 vaccine was effective (98.2%). Additional reasons that were added by the parents include COVID-19 vaccination in children could contribute to overall herd immunity, and children had difficulty adhering to precautionary measures.

The reasons parents were not willing to vaccinate their children against COVID-19

The common reasons that given by parents who were not willing to vaccinate their children against COVID-19 include the uncertainty towards the new COVID-19 vaccine (96.1%), worried the contents of the COVID-19 vaccine (93.2%), limited information about the COVID-19 vaccine for children from the doctors (82.3%), and they believed that the COVID-19 vaccine was unsafe (79.8%) (Figure 2). Children had been diagnosed with COVID-19 (5.8%), culture and religion factors (26.5%), and children had an allergy (40.7%) were the less common reasons given by the parents. Additional reasons that were added by the parents include they had a bad experience during their COVID-19 vaccination, they believed an alternative treatment was available to prevent COVID-19 infection, and children may acquire COVID-19 infection during the vaccination.

Factors that parents who were still hesitant would like to consider before allowing their children to vaccinate against COVID-19

Other than recommendations in social media (35.3%) and recommendations from families or friends (41.4%), all the factors (70.5 – 98.9%) listed in the survey were the main consideration of the parents before allowing their children to vaccinate against COVID-19 (Figure 3). No additional concern was added by the parents.

Discussion:

In this study that focuses on the willingness of Malaysian parents to allow their children < 12 years old to receive the COVID-19 vaccine, nearly three-quarters of the parents were keen to vaccinate their children. In general, having parents that already received the COVID-19 vaccine was the strongest independent predictor of allowing children to be vaccinated. Other independent predictors of willingness to vaccinate the children include being a single parent, having a lower education level, working as a healthcare worker, and having a history of significant exposure to COVID-19. Parents from the Northern zone of the country were less keen to vaccinate their children compare to those from the Central zone.

To date, studies focusing on parents' willingness to vaccinate children < 12 years old against COVID-19 were still limited. Teasdale et al reported 49.4% of parents in the USA were willing to vaccinate their children < 12 years old against COVID-19.(23) On the other hand, Almusbah et al reported only 25.6% of parents in Arab were willing to vaccinate their children < 12 years old against COVID-19.(24) Another study by Hetherington et al reported 60.4% of mothers in Canada were keen to obtain the COVID-19 vaccine for their 9 – 12 years old children.(19) More studies were looking at the willingness of the parents to vaccinate children < 18 years old against COVID-19. For example, multinational studies by Skjefte et al and Goldman et al respectively reported 69.2% and 65.2% of the parents were willing to vaccinate their children < 18 years old against COVID-19.(25, 26) The willingness of parents to vaccinate children < 18 years old against COVID-19 ranged 44.3 – 73.0% in the USA,(27–30) 59.3 – 72.7% in China,(31, 32) 64.2% in Korea,(33) 60.4% in Italy,(34) 51.0% in Germany,(35) and 48.0% in the United Kingdom.(17) Parents in Turkey consistently reported a lower willingness (29.0 – 36.3%) to vaccinate their children < 18 years old against COVID-19.(20, 36) When compared to these studies, parents in our study were more willing to vaccinate their children against COVID-19, even though previous evidence had shown parents were more likely to vaccinate their older children, especially those teenagers.(26, 30) This study was conducted after the majority of the adults in Malaysia had been vaccinated and in the midst of nationwide vaccination for teenagers could be the explanation. Goldman et al had reported caregivers in the USA, Canada, and Israel were more willing to accept the expedited approval of the COVID-19 vaccine for children < 12 years old after the emergency approval and commencement of the national vaccine program for COVID-19 in adults.(37)

Based on the available literature, independent predictors of parents that willing to vaccinate their children < 12 years old against COVID-19 include male respondents,(23, 24) higher educational level,(19, 23) higher household income,(19, 23) Asian in origin,(23), more willing to get COVID-19 vaccine for themselves,(23) and having children that completed standard immunization.(19) In children < 18 years old, independent predictors of parents that willing to vaccinate their children against COVID-19 include male respondents,(20, 26, 28, 34, 36) older age,(25, 28, 34) higher household income,(25, 28) willing or already taken COVID-19/influenza vaccine,(20, 26, 28, 30) perceived threat to COVID-19,(20, 28) working as healthcare workers,(20) and having children that completed routine immunization.(25) Even though the majority of the studies showed parents with higher education were more willing to vaccinate their children,(25, 30, 34) Wang et al,(31) Yigit et al,(36) and Temsah et al reported the opposite result.(38)

The psychological domain gradient of the Health Belief Model stated parents who neither delay or refuse their vaccination were more likely to allow vaccination in their children, and vice-versa.(39) This explained parents who already received the vaccine in our study were more willing to get their children vaccinated against COVID-19. Besides, Bourassa et al also reported the health behaviour during the COVID-19 pandemic was heavily influenced by past health behaviour,(40) for example, willingness for vaccination. Single parents, healthcare workers, and those with a history of significant contact in our study were more willing to vaccinate their children against COVID-19 due to a higher level of perceived threat. The influence of education level on vaccination attitude was conflicting. Opel et al and Smith et al attributed higher vaccination hesitancy in parents with higher education to safety concerns.(41, 42) The lower vaccination rate and COVID-19 cases in the Northern zone compared to the Central zone during this study was conducted explained the lower willingness of parents there to vaccinate their children.

Common reasons that were given by the parents that are willing to vaccinate their children < 12 years old against COVID-19 include believing the vaccine can protect their children, the vaccine can protect family and others, the vaccine was effective, and if the vaccination was recommended by healthcare workers or government.(19, 24) Similar reasons were also given by the parents who were willing to vaccinate their children < 18 years old against COVID-19, with additional reasons of believing the vaccine can help to control pandemic, and the benefits of vaccination outweigh the harms.(17, 20) On the other hand, uncertainty to the new vaccine, the concern of efficacy, side-effect, and safety of the vaccine, as well as perception that children were at lower risk to get COVID-19 were the main reasons parents hesitate or not keen to vaccinate their children < 12 years old or < 18 years old against COVID-19.(17, 19, 20, 23, 24) Parents in our study also reported similar reasons for willing and not willing to vaccinate their children against COVID-19, except the outcome of the vaccination program in other countries, and severity of COVID-19 in the community/among children were the main concern among parents who still hesitate. Previous literature had shown acceptance of vaccine was frequently associated with external factors (such as information about vaccine protection, and recommendation of vaccine by healthcare workers or government), while hesitancy and refusal of the vaccine were mainly due to vaccine-specific factors (such as perceived vaccine safety, efficacy, and disease susceptibility) explained the results observed in the current study.(43)

Children comprised 28.3% of Malaysian's population of 32.7 million, of which more than half of them were still < 12 years old. Therefore, the finding of the current study that a quarter of Malaysian parents with children < 12 years were unwilling or hesitate to vaccinate their children against COVID-19 was worrying. Besides, the finding that parents who haven't received their COVID-19 vaccine were at a fifteen times higher risk of refusing or hesitating to vaccinate their children against COVID-19 is worth prompt attention. The current study also identified vaccine-specific factors that led to COVID-19 vaccine refusal and hesitancy, as well as external factors that promote a positive attitude towards COVID-19 vaccination. Based on these findings, more targeted health education can be planned to mitigate COVID-19 vaccination refusal and hesitancy in parents of children < 12 years old.

First, more health education is needed to increase parents' awareness towards COVID-19 vaccination in children < 12 years old. Its' contents should be comprehensive, multilingual, and layman-friendly in order to reach out to parents from all walks of life. The common channel for Malaysians to obtain COVID-19 vaccine information such as electronic media and social media could be the ideal education platform, while printed materials and face-to-face public talks may still benefit certain populations particularly those from the rural area and less educated.(44) Second, health education should target parents at risk of vaccine refusal or hesitant, such as those who still haven't received the COVID-19 vaccine. This group of parents could be reached on the social platform (such as Facebook and WhatsApp group) that provides inaccurate information to them. A recent study by Johnson et al highlighted Facebook pages that against vaccine were greater in number, cross networking, and more common in parenting or school groups.(45) MySejahtera, a mobile application developed by the Malaysian government to facilitate contact tracing and vaccination of COVID-19 could assist in identifying unvaccinated parents and subsequently deliver correct information to them. Third, health education should focus to address the common reasons for refusing the COVID-19 vaccine, such as uncertainty of new vaccine, worry of vaccine contents, the concern of vaccine safety, and lack of information from the doctors. Fourth, health education should highlight the benefits of the COVID-19 vaccine thus able to promote more vaccination rollout, such as being able to protect children, being able to protect family and others, as well as the good efficacy. Fifth, experimental and real-world data comparing health outcomes of children < 12 years old that vaccinated versus unvaccinated against COVID-19 should be provided to parents once available.

This is among the very few studies that assess parents' willingness to vaccinate their younger children against COVID-19, and the first in Malaysia. This study had a large sample size and involved population throughout the country. The reasons why parents were willing, unwilling, and hesitate to vaccinate their children against COVID-19 were comprehensively evaluated, including open-ended questions for them to express opinions. There were several limitations in this study. First, snowball sampling was a non-probability sampling method. Second, only parents with internet access could participate in this online survey. Third, the respondents from the Northern zone were relatively smaller. Forth, influenza vaccination history was not assessed because it was not routinely administrated among adults or the younger population in Malaysia. Fifth, the parents' knowledge of COVID-19 and their source of information about COVID-19 was not assessed, which could be a confounding factor.

Conclusions:

Nearly three-quarters of Malaysian parents were willing to vaccinate their children < 12 years old against COVID-19. The COVID-19 vaccination history of the parents was the strongest independent predictor for their willingness to vaccinate their children. Perceived efficacy and protection conferred by the COVID-19 vaccine promote a positive vaccination attitude among the parents, while the uncertainty of new vaccine, the concern of vaccine content and safety, as well as lack of information from the doctors, led to vaccine refusal among them. Therefore, future health education should target parents at risk of vaccine refusal or hesitation, focus to address the common reasons for refusing the COVID-19 vaccine, and highlight the benefits of the COVID-19 vaccine.

Abbreviations

COVID-19, coronavirus 2019; USA, United States of America; MIS-C, Multi-System Inflammatory Syndrome in Children; B40, lowest 40% of family income group; M40, middle 40% of family income group; T20, top 20% of the family income group; SD, standard deviation; OR, odds ratio; CI, confidence internal.

Declarations

Ethic Approval and Informed Consent:

Ethical approval for this study was obtained from the Medical Ethic Committee of the University Malaya Medical Center with Ethics no: MECID. No: 202182 – 10437. This study was conducted in accordance with the Declaration of Helsinki. All methods were carried out according to the relevant guidelines and regulations. Online written informed consent was obtained from all the study respondents.

Consent for publication:

Not applicable.

Availability of Data and Materials:

The datasets generated and/or analysed during the current study are not publicly available due to limitations of ethical approval involving the respondents' data and anonymity, but are available from the corresponding author on reasonable request.

Competing Interest:

The authors declare no potential conflicts of interest in respect to the research, authorship, and publication of this article.

Funding:

This study was not financially supported.

Authors Contributions:

Diana-Leh-Ching Ng, Gin-Gin Gan, Chee-Shee Chai, Nur Adila Bt Anuar, Woweham Sindeh, Wei-Jing Chua, Asri B Said, Seng-Beng Tan had contributed substantially to this study, which includes:

1. Substantial contributions to conception and design, data acquisition, or data analysis and interpretation;
2. Drafting the article or critically revising it for important intellectual content;
3. Final approval of the version to be published; and

4. Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy and integrity of the work are appropriately investigated and resolved.

Acknowledgements:

We would like to express our gratitude to all the respondents who had participated in the study. We also thank Grammarly for language editing.

References

1. Hajj Hussein I, Chams N, Chams S, El Sayegh S, Badran R, Raad M, et al. Vaccines Through Centuries: Major Cornerstones of Global Health. Front Public Health. 2015;3:269.
2. Rodrigues CMC, Plotkin SA. Impact of Vaccines; Health, Economic and Social Perspectives. Frontiers in microbiology. 2020;11:1526.
3. Pulendran B, Ahmed R. Immunological mechanisms of vaccination. Nat Immunol. 2011;12(6):509–17.
4. Plotkin SA, Plotkin SA. Correlates of Vaccine-Induced Immunity. Clinical Infectious Diseases. 2008;47(3):401–9.
5. Sallusto F, Lanzavecchia A, Araki K, Ahmed R. From vaccines to memory and back. Immunity. 2010;33(4):451–63.
6. Center of Disease Control. 14 Diseases You Almost Forgot About (Thanks to Vaccines) 2020; https://www.cdc.gov/vaccines/parents/diseases/forgot-14-diseases.html. Accessed 20 November 2021.
7. Worldometer. COVID-19 CORONAVIRUS PANDEMIC 2020, 2021; https://www.worldometers.info/coronavirus/. Acccessed 22 September 2021.
8. Yee A, Hodori NAM, Tung Y-Z, Ooi P-L, Latif SABA, Isa HM, et al. Depression level and coping responses toward the movement control order and its impact on quality of life in the Malaysian community during the COVID-19 pandemic: a web-based cross-sectional study. Annals of General Psychiatry. 2021;20(1):31.
9. Bonaccorsi G, Pierri F, Cinelli M, Flori A, Galeazzi A, Porcelli F, et al. Economic and social consequences of human mobility restrictions under COVID-19. Proceedings of the National Academy of Sciences. 2020;117(27):15530-5.
10. World Health Organization. Regional Office for E. Pandemic fatigue: reinvigorating the public to prevent COVID-19: policy considerations for Member States in the WHO European Region. 2021; https://apps.who.int/iris/handle/10665/335820. Accessed 25 November 2021.
11. World Helath Organisation. Coronavirus disease (COVID-19): Vaccines, 2021; https://www.who.int/emergencies/diseases/novel-coronavirus-2019/covid-19-vaccines. Accessed 25 November 2021.

12. Zimmermann P, Curtis N. Why is COVID-19 less severe in children? A review of the proposed mechanisms underlying the age-related difference in severity of SARS-CoV-2 infections. Archives of Disease in Childhood. 2021;106(5):429–39.
13. Feldstein LR, Rose EB, Horwitz SM, Collins JP, Newhams MM, Son MBF, et al. Multisystem Inflammatory Syndrome in U.S. Children and Adolescents. The New England journal of medicine. 2020;383(4):334–46.
14. Mahmood I. Prediction of drug clearance in children: impact of allometric exponents, body weight, and age. Therapeutic drug monitoring. 2007;29(3):271–8.
15. Witberg G, Barda N, Hoss S, Richter I, Wiessman M, Aviv Y, et al. Myocarditis after Covid-19 Vaccination in a Large Health Care Organization. New England Journal of Medicine. 2021;385:2140–2149.
16. El-Elimat T, AbuAlSamen MM, Almomani BA, Al-Sawalha NA, Alali FQ. Acceptance and attitudes toward COVID-19 vaccines: A cross-sectional study from Jordan. PLoS One. 2021;16(4):e0250555.
17. 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(49):7789–98.
18. Scherer AM, Gedlinske AM, AM P. Acceptability of Adolescent COVID-19 Vaccination Among Adolescents and Parents of Adolescents — United States, April 15–23, 2021; https://www.rand.org/pubs/external_publications/EP68682.html. Accessed 26 November 2021.
19. Hetherington E, Edwards SA, MacDonald SE, Racine N, Madigan S, McDonald S, et al. SARS-CoV-2 vaccination intentions among mothers of children aged 9 to 12 years: a survey of the All Our Families cohort. CMAJ Open. 2021;9(2):E548-E55.
20. Yılmaz M, Sahin MK. Parents' willingness and attitudes concerning the COVID-19 vaccine: A cross-sectional study. Int J Clin Pract. 2021;75(9):e14364.
21. Majlis Keselamatan Negara. Malaysia National Security Council on COVID-19, 2021; https://www.mkn.gov.my/web/ms/covid-19/. Accessed 22 September 2021.
22. Che Sulaiman NF, Sanusi NA, Muhamad S. Survey dataset of Malaysian perception on rising cost of living. Data in Brief. 2020;28:104910.
23. Teasdale CA, Borrell LN, Kimball S, Rinke ML, Rane M, Fleary SA, et al. Plans to Vaccinate Children for Coronavirus Disease 2019: A Survey of United States Parents. The Journal of Pediatrics. 2021;237:292–7.
24. Almusbah Z, Alhajji Z, Alshayeb Z, Alhabdan R, Alghafli S, Almusabah M, et al. Caregivers' Willingness to Vaccinate Their Children Against COVID-19 in Saudi Arabia: A Cross-Sectional Survey. Cureus. 2021;13(8):e17243-e.
25. Skjefte M, Ngirbabul M, Akeju O, Escudero D, Hernandez-Diaz S, Wyszynski DF, et al. COVID-19 vaccine acceptance among pregnant women and mothers of young children: results of a survey in 16 countries. European Journal of Epidemiology. 2021;36(2):197–211.

26. Goldman RD, Yan TD, Seiler M, Parra Cotanda C, Brown JC, Klein EJ, et al. Caregiver willingness to vaccinate their children against COVID-19: Cross sectional survey. Vaccine. 2020;38(48):7668–73.
27. Ruggiero KM, Wong J, Sweeney CF, Avola A, Auger A, Macaluso M, et al. Parents' Intentions to Vaccinate Their Children Against COVID-19. Journal of Pediatric Health Care. 2021;35(5):509–17.
28. Kelly BJ, Southwell BG, McCormack LA, Bann CM, MacDonald PDM, Frasier AM, et al. Predictors of willingness to get a COVID-19 vaccine in the U.S. BMC Infectious Diseases. 2021;21(1):338.
29. Alfieri NL, Kusma JD, Heard-Garris N, Davis MM, Golbeck E, Barrera L, et al. Parental COVID-19 vaccine hesitancy for children: vulnerability in an urban hotspot. BMC Public Health. 2021;21(1):1662.
30. Szilagyi PG, Shah MD, Delgado JR, Thomas K, Vizueta N, Cui Y, et al. Parents' Intentions and Perceptions About COVID-19 Vaccination for Their Children: Results From a National Survey. Pediatrics. 2021;148(4).
31. Wang Q, Xiu S, Zhao S, Wang J, Han Y, Dong S, et al. Vaccine Hesitancy: COVID-19 and Influenza Vaccine Willingness among Parents in Wuxi, China—A Cross-Sectional Study. Vaccines. 2021;9(4):342.
32. Xu Y, Zhang R, Zhou Z, Fan J, Liang J, Cai L, et al. Parental psychological distress and attitudes towards COVID-19 vaccination: A cross-sectional survey in Shenzhen, China. Journal of affective disorders. 2021;292:552–8.
33. 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(31):e227.
34. Montalti M, Rallo F, Guaraldi F, Bartoli L, Po G, Stillo M, 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 (Basel). 2021;9(4).
35. Brandstetter S, Böhmer MM, Pawellek M, Seelbach-Göbel B, Melter M, Kabesch M, et al. Parents' intention to get vaccinated and to have their child vaccinated against COVID-19: cross-sectional analyses using data from the KUNO-Kids health study. European journal of pediatrics. 2021;180(11):3405–10.
36. Yigit M, Ozkaya-Parlakay A, Senel E. Evaluation of COVID-19 Vaccine Refusal in Parents. The Pediatric infectious disease journal. 2021;40(4):e134-e6.
37. Goldman RD, Marneni SR, Seiler M, Brown JC, Klein EJ, Cotanda CP, et al. Caregivers' Willingness to Accept Expedited Vaccine Research During the COVID-19 Pandemic: A Cross-sectional Survey. Clinical therapeutics. 2020;42(11):2124–33.
38. Temsah MH, Alhuzaimi AN, Aljamaan F, Bahkali F, Al-Eyadhy A, Alrabiaah A, et al. Parental Attitudes and Hesitancy About COVID-19 vs. Routine Childhood Vaccinations: A National Survey. Front Public Health. 2021;9:752323.
39. Smith PJ, Humiston SG, Marcuse EK, Zhao Z, Dorell CG, Howes C, et al. Parental delay or refusal of vaccine doses, childhood vaccination coverage at 24 months of age, and the Health Belief Model. Public Health Rep. 2011;126 Suppl 2(Suppl 2):135–46.

40. Bourassa KJ, Sbarra DA, Caspi A, Moffitt TE. Social Distancing as a Health Behavior: County-Level Movement in the United States During the COVID-19 Pandemic Is Associated with Conventional Health Behaviors. Annals of Behavioral Medicine. 2020;54(8):548–56.
41. Opel DJ, Taylor JA, Mangione-Smith R, Solomon C, Zhao C, Catz S, et al. Validity and reliability of a survey to identify vaccine-hesitant parents. Vaccine. 2011;29(38):6598–605.
42. Smith PJ, Chu SY, Barker LE. Children Who Have Received No Vaccines: Who Are They and Where Do They Live? Pediatrics. 2004;114(1):187–95.
43. Gowda C, Dempsey AF. The rise (and fall?) of parental vaccine hesitancy. Hum Vaccin Immunother. 2013;9(8):1755–62.
44. Mohamed NA, Solehan HM, Mohd Rani MD, Ithnin M, Che Isahak CI. Knowledge, acceptance and perception on COVID-19 vaccine among Malaysians: A web-based survey. PLOS ONE. 2021;16(8):e0256110.
45. Johnson NF, Velásquez N, Restrepo NJ, Leahy R, Gabriel N, El Oud S, et al. The online competition between pro- and anti-vaccination views. Nature. 2020;582(7811):230–3.

Figures

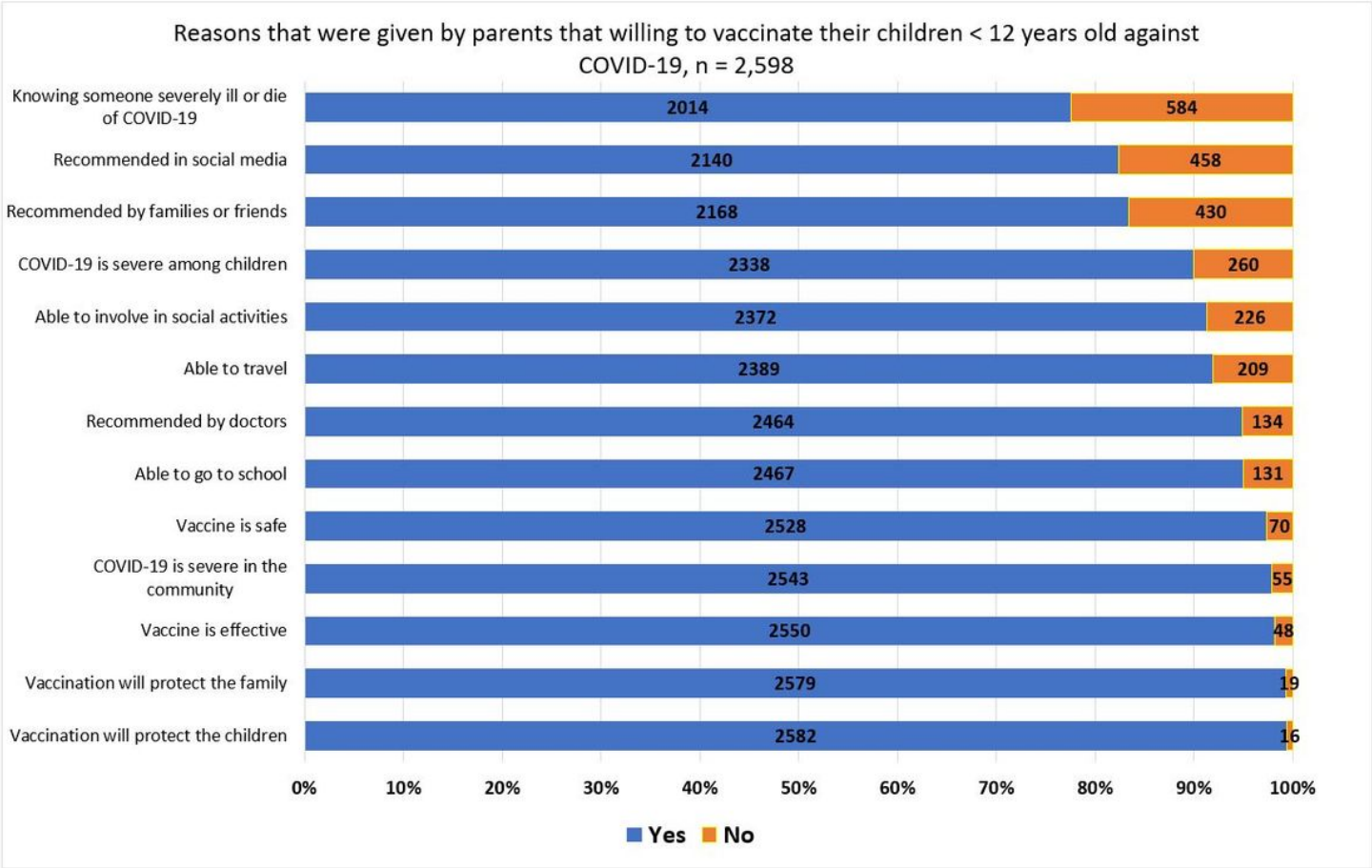

Figure 1

Reasons that were given by parents that willing to vaccinate their children < 12 years old against COVID-19

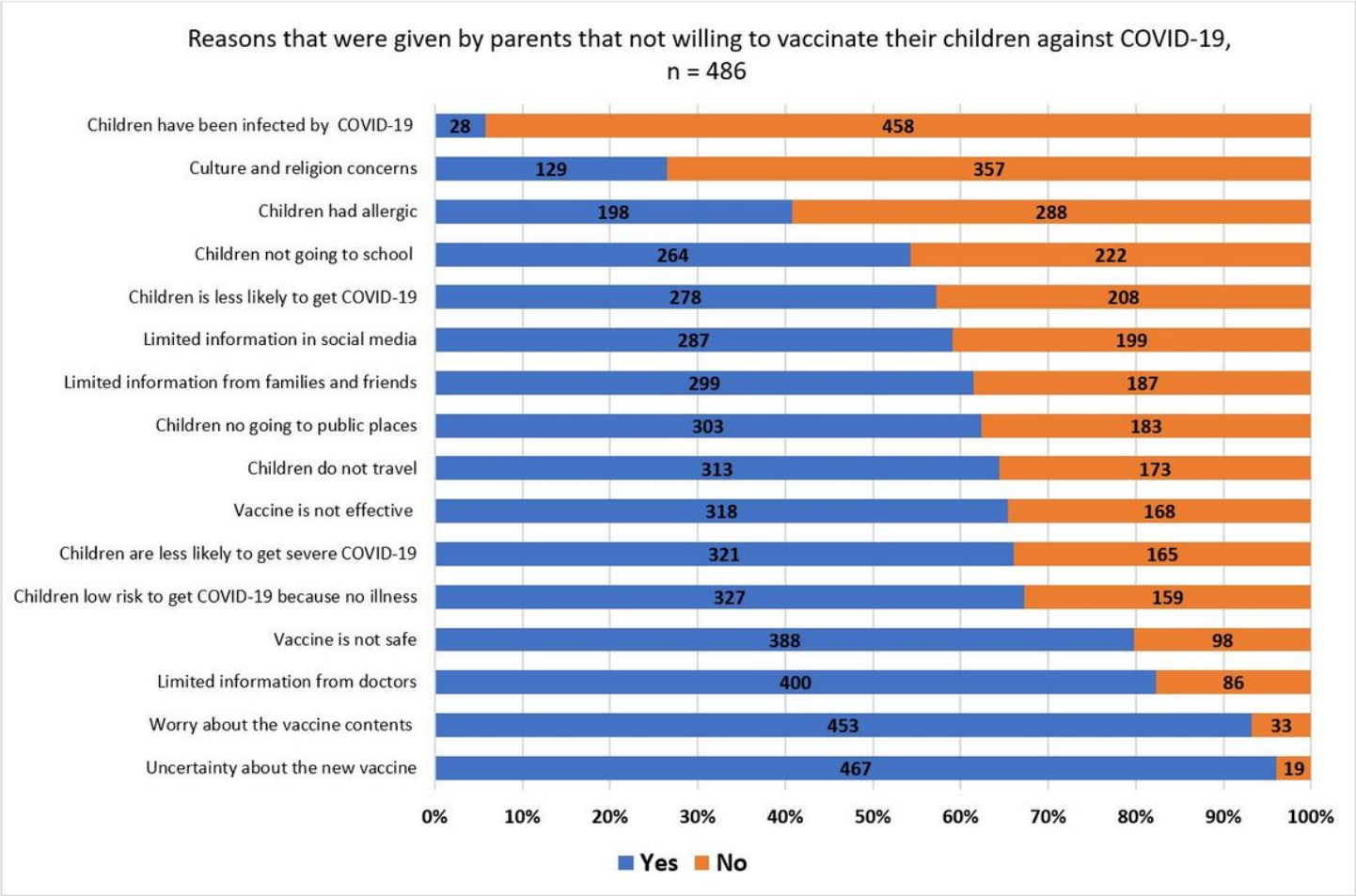

Figure 2

Reasons that were given by parents that not willing to vaccinate their children against COVID-19

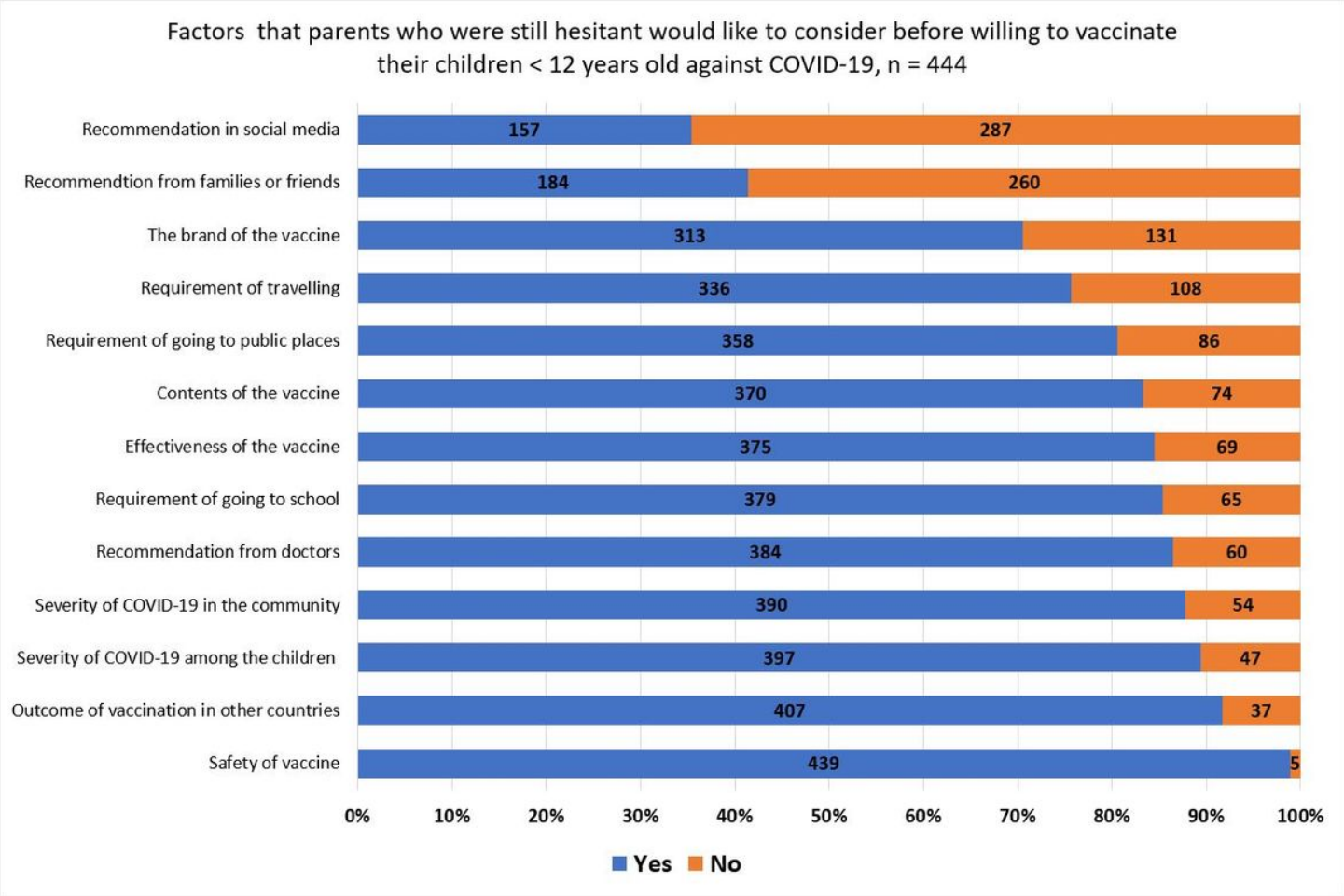

Figure 3

Factors that parents who were still hesitant would like to consider before willing to vaccinate their children < 12 years old against COVID-19

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- SupplementFigure13.docx