A survey study of vaccine hesitancy among children to COVID-19 vaccination and the roles of parental and social media influence

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ABSTRACT

Introduction: The COVID-19 pandemic brought unprecedented shifts in public health measures, including accelerated mass vaccination programmes. Although most children with COVID-19 are asymptomatic or have mild disease, they may act as reservoirs for SARS-CoV-2 transmission. Furthermore, multisystem inflammatory syndrome in children (MIS-C) can cause serious complications. COVID-19 vaccines became available in 2022 for Malaysian children aged 5–18, sparking public discussions on safety and necessity, which may have contributed to modest uptake in younger children. As most vaccine hesitancy studies focus on adults, our study aimed to assess hesitancy among children aged 10–17 and explore parental and social media influences on minors' assent to vaccination.

Materials and Methods: This study was conducted in the outpatient clinic of a tertiary and academic children's specialist hospital. A total of 200 parent-child pairs participated in a survey using an adapted and translated questionnaire in the Malay language, comprising 35-items divided into three sections with the attendance of a trained interviewer. Vaccine hesitancy was assessed using a 5-point Likert scale adapted from the Oxford COVID-19 Vaccine Hesitancy Scale.

Results: The parent-participants were predominantly mothers (81%) and child-participants were equally distributed between primary and secondary schoolers. Vaccine hesitancy rates were 50% and 46% among parents and children, respectively. The overall vaccine hesitancy score was graded as moderate (mean score, 2.44; SD 0.43) among the children. Parents who were unemployed or homemakers were significantly associated with vaccine hesitancy in the child when compared with those on fulltime jobs (69.4% versus 30.6%, p=0.010). Parental history of COVID-19 was significantly associated with vaccine hesitancy (p=0.025), whereas parental hesitancy to vaccinate their child was associated with increased child vaccine hesitancy (p=0.004). Primary school than secondary school children were more likely to be vaccine hesitant (56% versus 36%, p=0.005). Vaccine hesitancy was negatively associated with the child's full-vaccination status (p=0.021). More than half of the children surveyed spent at least 6 hours daily on their smart devices, with one-third spending at least three hours on social media. However, their preferred choice of media platforms to seek Covid-19 information, was television (20.5%), followed by social media (17%) and printed media (11.5%). Of note, children in the non-vaccine hesitant group preferred COVID-19 information accessed from television and printed media (t=2.755, p=0.006 and t=2.539, p=0.011, respectively).

Conclusion: This study demonstrates that vaccine hesitancy in children negatively impacted the uptake of COVID-19 vaccine. Parental hesitancy significantly influences the child's hesitancy to vaccination. Health promotion programmes on vaccination may need to be intensified to the more at-risk for vaccine hesitancy among parents who are unemployed or homemakers and primary school children. Addressing vaccine hesitancy incorporating the child's agency in this respect for assent to vaccination may be a positive strategy in enhancing its uptake. While social media is undeniably an important channel, traditional media such as television remains an established and trusted option for dissemination of health policies and recommendations.

KEYWORDS:
Assent, COVID-19, Vaccination, Vaccine hesitancy, Parental consent, SARS-CoV-2, Social media

INTRODUCTION

COVID-19 first emerged in Wuhan, China in December 2019 and rapidly became a global pandemic within months of its emergence. In Malaysia, the Ministry of Health's Crisis Preparedness and Response Centre reported that 15.3% of total COVID-19 cases occurred in children.[1] By August 30, 2021, 310,074 children had contracted COVID-19, resulting in 41 deaths. Although children infected with COVID-19 are often asymptomatic and have a lower risk of death, they may suffer from morbidities such as, fear of isolation, depression, social stigma, and long-term cognitive and health issues.[2,3] Additionally, multi system inflammatory syndrome in children (MIS-C), is a serious and potentially life-threatening complication of the virus.[3] As an immediate control strategy, vaccines against Covid-19 underwent accelerated development, clinical trials and regulatory approval with

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eventual implementation of mass vaccination programmes globally. First indicated for adults aged 18 and above, the COVID-19 vaccine was subsequently approved for use in teenagers aged 12 years and older, followed by children aged 5-11 years by late 2021. The College of Paediatrics, Academy of Medicine of Malaysia also endorsed and published a position statement to recommend vaccination against COVID-19 for children, 5 years old and above, in 2022.[4] Administration of the vaccine to children in Malaysia via the National COVID-19 Immunisation Programme for Children (PICKids) initiative commenced in September, 2021 for teenagers aged 12 years and older, and in February, 2022 for children aged 5 to 11 years.[5] By January 2024, the majority (90.8%) of teenagers have received 2 doses of the vaccine, compared to less than half (43.3%) of children aged 5-11 years who have received 2 doses of the vaccine.[1] The lower uptake in younger children may be the result of hesitancy from parental concerns with regards to vaccine safety profile and side effects balanced against the benefits for children who were deemed to experience much milder forms of COVID-19. Many adults have also expressed hesitancy toward COVID-19 vaccination, particularly concerning the use of newer mRNA technology.[6]

"Vaccine hesitancy" as proposed by the Strategic Advisory Group of Experts on Immunization (SAGE), defines it as, delay in the acceptance or refusal of vaccination despite the availability of vaccination services.[7] Despite significant efforts in developing and implementing Covid-19 public health policies, vaccine hesitancy towards approved COVID-19 vaccines continue to be a major barrier, especially for children.[8] Inaccurate and conflicting information available to the public, especially on social media, parental mistrust could be factors that may impede the success of future paediatric vaccination programmes.[9] Studying the COVID-19 vaccination program uptake in children may provide an understanding of the multiple factors contributing to vaccine hesitancy. Addressing these factors appropriately may assist in strategizing effective vaccination programmes in the future.

It has been suggested that the trust in COVID-19 vaccination can be built through timely and clearly disseminated messages on social platforms advocating the safety and efficacy of the vaccines.[10] In this regard, social media reportedly contributes to at least 35% of the decision to get vaccinated.[11] The risk-benefit evaluation on COVID-19 vaccines such as perceived risks, side effects, anti-vaccination reports from information shared through various sources including social media to the public are associated with an individual's vaccine hesitancy.[12,13] Vaccine hesitancy may also be highly influenced by behavioural and attitudinal factors.[14] A systematic review reported that Malaysia has one of the highest acceptance rates, globally, of COVID-19 vaccination among adults (94.3%).[10] For minors, studies have primarily focused on parental consent or hesitancy to vaccinate their children. The hesitancy rates ranged from 12.6% to 33%.[11,15] However, studies looking at vaccine hesitancy and the children assent to vaccination in the context of parental opinions are lacking. We conducted this survey in the hope to gather valuable insights into how children independently perceive vaccines in the era of COVID-19, evaluate children's agency in appropriate decision making and the extent in accessing social media for informed choices.

MATERIALS AND METHODS

Study design, sampling and conduct

This was a descriptive cross-sectional survey-based study conducted at the outpatient clinic of the Universiti Kebangsaan Malaysia (UKM) Specialist Children's Hospital, Kuala Lumpur. The sample size was calculated using the formula proposed by Daniel.[16] The formula, , accounts for the desired confidence level (Z), estimated population proportion (P), and margin of error (d). For this study, a 95% confidence level was applied, along with an estimated vaccination hesitancy prevalence of 50% to maximize variability, and a 7% margin of error. This resulted in a final sample size of 200 participants. Each study participant comprised a child paired with one parent, who provided consent and served as the primary decision-maker. Children who were 10 to 17 years old were recruited. Parents and children must be able to converse, respond, and read in the Malay language.

This study was approved by the Research Ethics Committee of UKM (RECUKM) (Reference: JEP-2021-824). Potential participants were approached in the outpatient clinic and with the parental informed written consent obtained, each participant pair was given a QR code linking to a Google Form based questionnaire to be completed. The survey was completed in the presence of a trained investigator who was available to assist in clarifying any uncertainties. Overall, each participant pair took 10 – 15 minutes to complete the survey.

Development and validation of the study instrument

The study data was collected using a newly developed and validated questionnaire, adapted from the SOMEHAVE study, a survey aimed to assess the influence of social media on COVID-19 vaccine hesitancy among parents in Singapore and Malaysia for their children.[17] This survey questionnaire, originally in English, was translated into the Malay language by a native Malay-speaking study supervisor and medical officers to ensure clarity, cultural and linguistic relevance for the majority who are Malay children in this targeted study population. Additionally, a special section specific for children was adapted and translated using the Oxford COVID-19 Vaccine Hesitancy Scale.[18] This Malay-language based questionnaire is referred to in this study as the "Modified Oxford COVID-19 Vaccine Hesitancy Scale", which is unpublished but copyrighted.[19]

Following the translation, a cognitive debriefing was conducted with six parents and their children to identify potential misunderstandings or ambiguities in the translated questionnaire. Feedback on wording, comprehension, cultural nuances, sentence structure, word choice, and grammar were gathered, and the questionnaire was revised accordingly. After this refinement, the revised questionnaire underwent pilot testing with a larger sample of 20 patients to assess its practical application. To ensure the reliability of the questionnaire, internal consistency was evaluated using Cronbach's alpha. The overall reliability coefficient was 0.52,

indicating a moderate level of internal consistency. Specifically, Section A had a Cronbach's alpha of 0.56, Section B scored 0.60, and Section C scored 0.75. The lower score in Section A was attributed to the different response options for demographic-related questions.

Further adjustments were made to enhance sentence structure, word choice, and overall grammatical accuracy, before the final version of the questionnaire was produced (Supplement 1). This questionnaire comprises of 35 questions that are divided into three sections.

Section A: Parental demographics, COVID-19 history, vaccination history, and hesitancy towards vaccinating their children.

Section B: Child demographics, COVID-19 history, vaccination history, smart device and social media use, sources of COVID-19-related information accessed, and knowledge gained.

Section C: The Modified Oxford Covid-19 Vaccine Hesitancy Scale.[19]

Section A and Sections B and C were to be completed by the parent and the child, respectively.

The independent variables in this study include the socio-demographic data of the parent and child pair, COVID-19 vaccination and infection history, and the use of smart devices, social media, and traditional media. Items were assessed using multiple-choice or yes/no response options. The frequency and preferred sources accessed to obtain COVID-19 information reported by children, and parental attitudes towards vaccination were captured. These items were measured using a 5-point Likert scale, where higher scores reflected greater frequency, preference, and more positive attitudes.

The dependent variable pertained to COVID-19 vaccination hesitancy in the child, which was assessed using the Modified Oxford COVID-19 Vaccine Hesitancy Scale.[19] This is a 7-item adapted questionnaire, whereby a survey participant could score from a minimum of 7 to a maximum of 35 points with a higher score indicating greater hesitancy. A mean score was then calculated from the cumulative scores obtained from the seven items, and the mean scores were categorized into one of the three grades of vaccine hesitancy: low (1–2.33), moderate (2.34–3.66), or high (3.67–5.00). The moderate and high grades are considered as vaccine hesitant in this study.

Statistical analysis

Data analysis was performed using IBM SPSS version 26. Continuous data were presented as mean and standard deviation. Due to small number of participants with high scores, both moderate and high scores were combined to form one group of vaccine hesitant, to be balanced for comparison against the low scores, non-hesitant group. Chi-square analysis was performed to assess the differences between these two groups against the independent variables. Linear logistic regression and Pearson correlation analysis were used to assess the strength and direction of the association between independent variables and vaccine hesitancy.

RESULTS

The parents who participated in this survey were predominantly mothers (81%). Almost half (42%) had a minimum education at the college/matriculation/pre-university/diploma level, and are from the middle-income category (41.5%). Approximately 50% of the parents worked in the health, education and science fields. A small proportion (5%) had overseas education or work experience. The children participants showed slightly more males (56.5%) than females (43.5%), but equally distributed between primary and secondary schools (Table I).

Figure 1 shows the distribution of mean vaccine hesitancy scores among the children. The overall mean score for the group was 2.44 (SD 0.43), indicating moderate hesitancy. However, this score is likely skewed by one child participant with an overall score of 3.86. The participant was a 13-year old male participant who was unvaccinated because of the fear of side effects, and has had a history of asymptomatic Covid-19 infection. Of note, his mother, who also participated in the survey showed similar characteristics and she was hesitant to vaccinate this child.

Several parental and child factors were associated with vaccine hesitancy in children. Children of unemployed parents were significantly associated with vaccine hesitancy. Conversely, children of parents who had overseas education/work experience were significantly associated with non-vaccine hesitant. Primary school than secondary school children were more likely to be vaccine hesitant (Table IIa).

Our study population showed high rates of 96.5% in adults and 93.5% in children who received complete COVID-19 vaccination. The small proportion of unvaccinated adults cited “medical reasons” (57.1%) and “the lack of interest” (28.6%) as the two most common justification. The reasons for non-vaccination in children were mainly because of the fear of side effects (30.7%), a pre-existing medical condition (23.21%) and non-consenting parents (23.1%). Despite a high uptake in vaccination, more than one-third (35.5%) of the parent participants had breakthrough COVID-19 infections with two- third reported being symptomatic. Slightly fewer children (29.5%) contracted COVID-19 infections and approximately half (42.4%) were asymptomatic. (Table IIa).

There were significantly more children who were vaccine hesitant among those who were unvaccinated against COVID-19. Notably, parental hesitancy to vaccinate their child was significantly associated with increased vaccine hesitancy in children. Half of the parents surveyed in this study reportedly were hesitant to vaccinate their children at some stage. Child and parental history of COVID-19 infection and parental vaccination status did not have a statistically significant association with vaccine hesitancy in children (Table IIa).

Looking at each of the 7 items in the Oxford COVID-19 Vaccine Hesitancy Scale, all but one showed average scores of low-grade hesitancies in a population of almost exclusively and fully vaccinated children (187/200) (Table IIb). There were only 10 children (5%) who were not vaccinated. Of all the seven items in the hesitancy scale, six items were

Table I: Demographic data of 200 pairs of child-parent study participants

Variables	
Parent (n=200)	
Gender	N (%)
Male (father)	38(19.0)
Female (mother)	162(81.0)
Education level	
Primary school	9(4.5)
secondary school	63(31.5)
college/ matriculation/A-level/diploma	84(42.0)
Degree	32(16.0)
Master and above	12(6.0)
Occupation	
Health	18(9.0)
Finance	22(11.0)
Service	32(16.0)
Education	25(12.5)
Self-employed	18(9.0)
Unemployed/ housewife/ retired	36(18.0)
Others (Manufacturing, energy, science, IT, transport)	49 (29.5)
Been working or studying overseas	
No	189(94.5)
Yes	11(5.5)
Monthly household income (RM)	
B40	73(36.5)
M40	83(41.5)
T20	44(22.0)
Marital Status	
Married	188(94.0)
Divorced/ widowed	12(6.0)
Child (n=200)	
Gender	
Male	113(56.5)
Female	87(43.5)
Age (years)	
Primary school (10 -12 years old)	100 (50.0)
Secondary school (13 – 17 years old)	100 (50.0)

statistically significant and positively correlated with a non-vaccinated status. Only the likelihood to refuse COVID-19 vaccination showed a non-significant correlation (Table IIb).

Almost all (93%) children own a smart device. More than half (57.5%) of the children spent at least 6 hours per day on their smart devices, with one-third spending at least three hours on social media. In comparison, only one-third of child participants spent at least 6 hours per day watching television. (Table III). With regards to news about COVID-19 encountered when the child had access on social media platforms, majority reported when they were on YouTube (40.5%), followed by TikTok (39.5%), Facebook (26.5%) and Instagram (21%). Specifically, the children maintained that their preferred choice of media platforms if they were to seek Covid-19 information, were television (20.5%) followed by social media (17%) and lastly printed media (11.5%). There was however, no association between vaccine hesitancy and the different social media platforms accessed. Interestingly, children in the non-vaccine hesitant group preferred printed media and television to access COVID-19 information; t=2.539, p=0.011 and t=2.755, p=0.006 respectively.

In exploring the independent factors for vaccine hesitancy, multivariate analysis showed parental COVID-19 infection was directly associated with vaccine hesitancy among children (Table IV). Of note, parental hesitancy to vaccinate their child was inversely associated with the child's vaccine hesitancy. Partners (80%, fathers) of the parent participants who did not consent to vaccinate their child were directly associated with vaccine hesitancy in the children (Table IV). As for child factors, those who were vaccinated were inversely associated with vaccine hesitancy. Frequently obtaining COVID-19 information on television was also inversely associated with vaccine hesitancy (Table IV).

DISCUSSION

Vaccine hesitancy is a recognised factor that impedes success in the uptake of vaccine preventable diseases. During an epidemic, this could have a significant impact on the control of the spread of diseases and the burden to healthcare services in managing related increases in morbidity and mortality. This study reports results of a survey exploring vaccine hesitancy among children, specifically, and how it relates to their assent to COVID-19 vaccination. In conducting the survey, a valid and reliable instrument to assess COVID-19 vaccine hesitancy among children in the Malaysian context was first developed. It is hoped that this reliable questionnaire can be used for future studies related to childhood vaccination programmes in this country.

Table IIa: Parent-child demographic factors, parental COVID-19 vaccination status, infection history, parental hesitancy to vaccinate, and vaccine hesitancy among Malaysian children aged 10 -17 years

Variables	Vaccine Hesitancy			
	N (%) n = 108 (54.0%)	Non-hesitant n = 92 (46.0%)	Hesitant (p-value)	χ^2
Parent participant				
Father	38(19.0)	20(53.6)	18(47.4)	0.035 (0.851)
Mother	162(81.0)	88(54.3)	74(45.7)	
Education level				
Primary school	9(4.5)	4(44.4)	5(55.6)	4.429 (0.351)
Secondary school	63(31.5)	28(44.4)	35(55.6)	
College/ matriculation/A-level/diploma	84(42.0)	49(58.3)	35(41.7)	
Degree	32(16.0)	19(58.3)	13(40.6)	
Masters and above	12(6.0)	8(66.7)	4(33.3)	
Occupation				
Health	18(9.0)	15(83.3)	3(16.7)	23.303 (0.010)*
Finance	22(11.0)	10(45.5)	12(54.5)	
Service	32(16.0)	20(62.5)	12(37.5)	
Education	25(12.5)	13(52.0)	12(48.0)	
Self-employed	18(9.0)	10(55.6)	8(44.4)	
Unemployed/ housewife/ retired		36(18.0)	11(30.6)	25(69.4)
Others (Manufacturing, energy, science, IT, transport)	49(29.5)	29 (59.0)	20 (41.0)	
Had overseas work or study experience				
No	189(94.5)	98(51.9)	91(48.1)	6.384 (0.012)*
Yes	11(5.5)	10(90.9)	1(9.1)	
Household income categories				
B40	73(36.5)	36(49.3)	37(50.7)	3.318 (0.190)
M40	83(41.5)	43(51.8)	40(48.2)	
T20	44(22.0)	29(65.9)	15(34.1)	
Marital Status				
Married	188(94.0)	102(54.3)	86(45.7)	0.082 (0.774)
Divorced/ widowed	12(6.0)	6(50.0)	6(50.0)	
Child participant				
Gender				
Male	113(56.5)	66(58.4)	47(41.6)	2.031 (0.154)
Female	87(43.5)	42(48.3)	45(51.7)	
School level				
Primary school	100 (50.0)	44(44.0)	56(56.0)	8.052 (0.005)*
Secondary school	100 (50.0)	64(64.0)	36(36.0)	
Vaccination status and Covid-19 infection history				
Parent				
Not vaccinated	7(3.5)	3(42.9)	4(57.1)	0.3626 (0.547)
Fully vaccinated	193(96.5)	105(54.4)	88(45.6)	
Parental COVID-19 infection				
No	129(64.5)	70(54.3)	59(45.7)	0.010 (0.920)
Yes	71(35.5)	38(53.5)	33(46.5)	
Child				
Not vaccinated	13(6.5)	3(23.0)	10(76.9)	5.352 (0.020)*
Fully vaccinated	187(93.5)	105(56.1)	82(43.9)	
Child Covid-19 infection				
No	141(70.5)	76(53.9)	65(46.1)	0.002 (0.965)
Yes	59(29.5)	32(54.2)	27(45.8)	
Parental hesitance to vaccinate child(ren) for COVID-19				
Not hesitant	100 (50.0)	71 (71.0)	29 (29.0)	23.28 (<0.001)*
Slightly hesitant	86 (43.0)	32 (37.2)s	54 (62.8)	
Very hesitant	14 (7.0)	5 (35.7)	9 (64.3)	
Give consent for child(ren) to be vaccinated				
No	18 (9.0)	6 (33.3)	12 (66.7)	3.401 (0.065)
Yes	182 (91.0)	102 (56.0)	80 (44.0)	
Partner give consent for child(ren) to be vaccinated				
No	22 (11.0)	8 (36.4)	14 (63.6)	3.095 (0.079)
Yes	178 (89.0)	100 (56.2)	78 (43.8)	

Table IIb: Modified Oxford Covid-19 Vaccine Hesitancy Scores for each item and their correlations with children's non-vaccinated status

Modified Oxford Covid-19 Vaccine Hesitancy Scale[19]	Mean (SD)	Pearson correlation
Total score	2.44 (0.43)	1
Hesitant about taking the COVID-19 vaccine, even though it has been approved for use in Malaysia	2.22 (1.01)	0.476
Unsure or unwilling to get the COVID-19 vaccination	2.16 (0.83)	0.755
Consider taking the COVID-19 vaccine to be of low importance	2.19 (0.83)	0.744
No encouragement or positive opinions if friends are considering getting the COVID-19 vaccine	2.28 (0.80)	0.766
Uncertain about following my parents' decision regarding COVID-19 vaccination	2.21 (1.03)	0.685
Likely to refuse the COVID-19 vaccination	3.44 (0.99)	0.075
Hesitant or unlikely to request the COVID-19 vaccination	2.25 (0.93)	0.728

Table III: Daily usage of various media sources by children

Variables	Vaccine Hesitancy			
	N (%)	Non-hesitant n = 108 (54.0%)	Hesitant n = 92 (46.0%)	χ^2 statistics (p-value)
Usage of smart device				
Parent				
No	3(1.5)	0	3(100.0)	3.575 (0.059)
Yes	197 (98.5)	108 (54.8)	89 (45.2)	
Child				
Usage of smart device				
No	14 (7.0)	10(71.4)	4(28.6)	1.841 (0.175)
Yes	186 (93.0)	98(52.7)	88(47.3)	
Hours of smart device use (per day)				
< 6	85 (42.5)	44 (51.8)	41 (48.2)	0.301 (0.860)
6 - 12	95 (47.5)	53 (55.8)	42 (44.2)	
> 12	20 (10.0)	11 (55.0)	9 (45.0)	
Duration spent by children on social media when with a smart device				
Low (less than half the time)	127 (63.5)	67 (52.8)	60 (47.2)	0.217 (0.641)
High (more than half the time)	73 (36.5)	41 (56.2)	32(43.8)	
Hours spent watching television (per day)				
< 6	135 (67.5)	75 (55.6)	60 (44.4)	0.931 (0.700)
6 - 12	57 (28.5)	28 (49.1)	29 (50.9)	
> 12	8 (4.0)	5 (62.5)	3 (37.5)	

Table IV: Univariate and Multivariate Linear regression of determinants associated with vaccine hesitancy among Malaysian school children aged 10-17 years

Variables	Simple Linear Regression analysis			Multiple Linear Regression analysis		
	Crude β	95% CI	p-value	Adjusted β	95% CI	p-value
Parents						
Occupation	0.175	0.004,0.036	0.013*	0.078	-0.006, 0.024	0.248
Household income	-0.181	-0.184,				
-0.025	0.010*	-0.078	-0.022, 0.008	0.256		
COVID-19 infection	0.159	0.018,0.269	0.025*	0.148	0.017, 0.252	0.025*
Smart device usage	-0.160	-1.066, -0.078	0.023*	-0.114	-0.891, 0.080	0.101
Hesitant to vaccinate child(ren) for COVID-19	-0.326	-0.320, -0.135	<0.001*	-0.211	-0.249, -0.046	0.004*
Give consent for child(ren) to be vaccinated	-0.270	-0.615, -0.205	<0.001*	-0.153	-0.472, 0.009	0.059
Partner gives consent for child(ren) to be vaccinated	-0.151	-0.402, -0.018	0.032*	0.175	0.015, 0.472	0.037*
Children						
Age (years)	-0.153	-0.253, -0.013	0.030*	-0.074	-0.175. 0.047	0.256
Vaccination status	-0.259	-0.381, -0.120	<0.001*	-0.176	-0.303, -0.037	0.013*
COVID-19 information Intensity: newspaper and printed materials	-0.196	-0.158, -0.028	0.005*	-0.066	-0.098. 0.035	0.357
COVID-19 information Intensity: television	-0.245	-0.154, -0.044	<0.001*	-0.173	-0.129. -0.011	0.020*

Our study found almost half of the child participants between ages of 10 and 17 years were vaccine hesitant. This is 5-10 times higher compared to the vaccine hesitancy rates reported among Malaysian parents by Lee et al. (11.6%) and Wong et al. (5.7%).[3,20] A comparison study between Malaysian and Singaporean parents showed similar rates of 16.4% and 5.8%, respectively.[17] It is speculated that hesitancy rates may be low depending on the perception and trust in governmental channelled publicity and mandatory vaccination policies enforced. Nevertheless, vaccine hesitancy was high in certain populations, such as in Hong Kong, with the highest rates in Asia at 60%.[10] It is conceivable that children who may be lacking in understanding and exposure to such policies, mandates and recommendations, could result in the higher vaccine hesitancy rate.

Our study also found that a history of parental COVID-19 infection increases vaccine hesitancy among children. Doubts over the efficacy of the vaccine itself, especially in situations of breakthrough infections may contribute to developing vaccine hesitancy. Witnessing the disease manifestation in their parents despite having been vaccinated, potentially compromise further their conviction of the benefit and need for vaccination. Previous research supports this finding too, whereby parents with a history of COVID-19 infection are more likely to be hesitant about vaccination, and this hesitation may also influence similar perception in their children. Others reported that a history of COVID-19 infection may lead to greater vaccine hesitancy as parents began to develop an inclination towards the sufficiency of natural immunity.[21-23]

Interestingly, our study found that parental hesitancy to vaccinate their child was inversely associated with vaccine hesitancy in the child. Parental vaccine acceptance may thus be the opposite in the child. Parental consent for a child to be vaccinated is best met with the assent from the child. Engaging children in the discussion of an intervention could tailor better to meet their own expectations and this may result in more effective outcomes in the long run. It also fosters a sense of agency in their own health decision making. Children are able to process information from trusted sources, personal experiences, household influences, and peer interactions, which allows them to develop consistent views on vaccine acceptance or hesitancy.[24-26] Importantly, children can influence the decisions of those around them, including their parents, making their involvement crucial in discussions. To that effect, children might become even more informed and less hesitant despite their parents' opposing views.[24,25] It is imperative to cultivate and promote a positive perspective in a child towards assenting to a medical procedure or health intervention. It is suggested that children aged at least 9 years should be involved in this process.[27] Our survey of 200 children of 10 years old and above showed it was possible and reliable to engage children for their opinions and assent to vaccination. Moreover, our study showed that children who were vaccinated were those who were non-hesitant. Our research provides unique insights into vaccine hesitancy from the perspective of children themselves, demonstrating that they are capable of forming informed, reliable opinions about vaccines. Their input could offer valuable insights for designing effective communication strategies and policies in preventive health education targeting to specific age groups while promoting and respecting children's agency in decision making. Positive prior vaccination experiences in parents—mild side effects in a supportive vaccination environment—can shape children's attitudes towards future vaccines and strengthen their trust in the healthcare system.[28]

Our study also revealed an interesting observation of children who preferred obtaining COVID-19 information from television and printed media was inversely associated with vaccine hesitancy. Whether this reflects on the maturity of the child in discerning that official news portals are trusted sources of verified information on vaccination will need to be confirmed in future studies. Conversely, children may be exposed to misinformation on social media, which has been shown to negatively influence vaccine attitudes.[13,29] Instead publicly-run, government regulated television stations has been reported as a source that provides consistent and credible information, which can counteract vaccine hesitancy effectively.[30,31] Even so, almost all the child participants in this survey who actually owned a smart device and the overwhelmingly more time spent preferentially on social media, should justify the need to leverage on this platform as a way to reach out to children on health promotion programmes such as vaccination.

This study has several limitations of which, the cross-sectional design limits our ability to establish any causal relationships and the temporal relationship between vaccination uptake, COVID-19 infections and vaccine hesitancy. Additionally, the purposive cluster sampling of study participants in a single-centre at a tertiary-level and academic specialist children's hospital may introduce selection bias, and restrict the generalizability of the results to the broader Malaysian population. A larger, more diverse sample size including normal healthy school children, for example, may be necessary to address factors associated with vaccine hesitancy among children. A comparative prospective study of vaccine hesitancy, assent to vaccination, parental consent and the actual vaccination uptake would be an important area for research in the future. A mixed-method study design incorporating qualitative research questions could identify additional factors that may lead to vaccine hesitancy.

CONCLUSION

In surveying children's assent to COVID-19 vaccination, we identified three significant factors that were associated with increased vaccine hesitancy: parental COVID-19 infection; parental hesitancy to vaccinate their child; parental partners, mainly fathers who did not consent to vaccination, and two factors were negatively associated with vaccine hesitancy: vaccinated status of the child and, preferred COVID-19 information from television source. These findings may be applicable for health policymakers to consider and in particular to incorporate assent from minor when developing health promotion programmes to bolster vaccination acceptance.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest in the conduct and completion of this study.

REFERENCES

1. Ministry of Health Malaysia. COVID-19 vaccination dashboard [Internet]. 2024 [cited Jan 2024] Available from: https://data.moh.gov.my/dashboard/covid-vaccination
2. 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. Arch Dis Child 2021; 106: 429-39.
3. Bai MS, Miao CY, Zhang Y, Xue Y, Jia FY, Du L. COVID-19 and mental health disorders in children and adolescents: review. Psychiatry Res 2022; 317: 114881.
4. Cheah FC, Thong M, Keong I, Ismail Z, Alwi Z, Hamzah A, et al. COVID-19 vaccination for children in Malaysia: a position statement by the College of Paediatrics, Academy of Medicine of Malaysia. Malays J Pathol 2022; 44: 177–85.
5. COVID-19 Malaysia. COVID-19 Malaysia updates [Internet]. 2022 Apr 13 [cited Jan 2024] Available from: https://covid-19.moh.gov.my/vaksin-covid-19/pickids/semasa/2022/04/tarikh-akhir-dos-1-program-imunisasi-covid-19-kebangsaan-kanak-kanak-pickids
6. Joachim G, Shih SF, Singh A, Rajamoorthy Y, Harapan H, Chang HY, et al. Parental vaccine hesitancy and acceptance of a COVID-19 vaccine: An internet-based survey in the US and five Asian countries. PLOS Glob Public Health 2024; 4: e0002961.
7. MacDonald NE; SAGE Working Group on Vaccine Hesitancy. Vaccine hesitancy: Definition, scope and determinants. Vaccine 2015; 33: 4161-4.
8. Harrison EA, Wu JW. Vaccine confidence in the time of COVID-19. Eur J Epidemiol 2020; 35: 325-30.
9. de Figueiredo A, Simas C, Karafillakis E, Paterson P, Larson HJ. Mapping global trends in vaccine confidence and investigating barriers to vaccine uptake: a large-scale retrospective temporal modelling study. Lancet 2020; 396: 898-908.
10. Sallam M. COVID-19 vaccine hesitancy worldwide: A concise systematic review of vaccine acceptance rates. Vaccines (Basel). 2021; 9: 160.
11. Ng DLC, Gan GG, Chai CS, Lim YAL, Lee LY, Wong CY, et al. The willingness of parents to vaccinate their children younger than 12 years against COVID-19: a cross-sectional study in Malaysia. BMC Public Health 2022; 22: 1265.
12. Larson HJ, Jarrett C, Schulz WS, Chaudhuri M, Zhou Y, Dubé E, et al. Measuring vaccine hesitancy: The development of a survey tool. Vaccine 2015; 33: 4165-75.
13. Lee KW, Gew LT, Siau CS, Peh SC, Chia YC, Yacob S, et al. COVID-19 vaccine hesitancy and its associated factors in Malaysia. PLOS One 2022; 17: e0266925.
14. Wouters OJ, Shadlen KC, Salcher-Konrad M, Pollard AJ, Larson HJ, Teerawattananon Y, et al. Challenges in ensuring global access to COVID-19 vaccines: production, affordability, allocation, and deployment. Lancet 2021; 397: 1023-34.
15. Marzo RR, Chakraborty R, Soh SY, Thew HZ, Chong C, Siau CS, et al. Factors influencing parents' hesitancy to vaccinate their children aged 5–11 years old against COVID-19: results from a cross-sectional study in Malaysia. Front Public Health 2023; 11: 1091015.
16. Daniel WW. Biostatistics: A foundation for analysis in the health sciences. 7th ed. New York: John Wiley & Sons; 1999.
17. Lee LY, Low JM, Soo C, Tran AP, Khoo EJ, Thong MK, Cheah FC. Comparing parental vaccine hesitancy in two neighbouring Asian countries. In: 41st Annual Meeting of the European Society of Paediatric Infectious Diseases (ESPID); 2023 May 8–12; Lisbon, Portugal. European Society of Paediatric Infectious Diseases.
18. Freeman D, Loe BS, Chadwick A, Vaccari C, Waite F, Rosebrock L, et al. COVID-19 vaccine hesitancy in the UK: the Oxford coronavirus explanations, attitudes, and narratives survey (Oceans) II. Psychol Med 2022; 52: 3127-41.
19. Cheah FC, Abdul Jalal MI, Gill HS, Khoo EJ. [Instrumen Soalselidik - Kesan keraguan vaksin oleh media sosial - Adakah anda bersetuju mendapatkan vaksin Covid-19?]. Bangi, Malaysia: Universiti Kebangsaan Malaysia; 2025.
20. Wong LP, Alias H, Wong PF, Lee HY, Abu Bakar S. The use of the health belief model to assess predictors of intent to receive the COVID-19 vaccine and willingness to pay. Hum Vaccin Immunother 2020; 16: 2204-14.
21. Willis DE, Andersen JA, Bryant-Moore K, Selig JP, Long CR, Felix HC, et al. (2021). COVID-19 vaccine hesitancy: Race/ethnicity, trust, and fear. Clin Transl Sci 2021; 14: 2200-7.
22. McNeil A, & Purdon C. (2022). Anxiety disorders, COVID-19 fear, and vaccine hesitancy. J Anxiety Disord 2022; 90: 102598.
23. Huang Y, Zhang L, Fu J, Wu Y, Wang H, Xia, W, et al. (2023). COVID-19 Vaccine Hesitancy Among Patients Recovered From COVID-19 Infection in Wuhan, China: Cross-Sectional Questionnaire Study. JMIR Public Health Surveill 2023; 9: e42958.
24. Raimi MO, Emeka CL, Ebikapaye O, Clement A, Ogbointuwei C, & Atoyebi B. (2021). Making better informed, more confident COVID-19 decisions: Vaccine hesitancy, its barriers and impact studies: Taking Bayelsa State as an example. Int. J. Vaccine Immunisation 2021; 5: dx.doi.org/10.16966/2470-9948.126
25. Santibanez TA, Nguyen KH, Greby SM, Fisher A, Scanlon P, Bhatt A, et al.. Parental Vaccine Hesitancy and Childhood Influenza Vaccination. Pediatrics. 2020;146: e2020007609.
26. Elnaem MH, Mohd Taufek NH, Ab Rahman NS, Mohd Nazar NI, Zin CS, Nuffer W, et al. COVID-19 vaccination attitudes, perceptions, and side effect experiences in Malaysia: Do age, gender, and vaccine type matter? Vaccines. 2021; 9: 1156.
27. Khoo EJ, Zilfalil BA, Thong MK, Yong SC, Chee SC, Lee JK, et al. Obtaining assent for research involving children in Malaysia: A position statement from the Academy of Medicine of Malaysia College of Paediatrics. Med J Malaysia. 2024; 79: 494-7.
28. Bono SA, Siau CS, Chen WS, Low WY, Faria de Moura Villela E, et al. Adults' acceptance of COVID-19 vaccine for children in selected lower- and middle-income countries. Vaccines 2021; 10: 11.
29. Gabarron E, Oyeyemi SO, Wynn R. COVID-19-related misinformation on social media: A systematic review. Bull World Health Organ 2021; 99: 455-63A.

30. Kuwahara K, Kato M, Ishikawa H, Shinozaki T, Tabuchi T. Association between watching wide show as a reliable COVID-19 information source and preventive behaviors: A nationwide survey in Japan. PLOS One 2023; 18: e0284371.

31. Ridzuan AR, Luthfia A, Mohideen RS, Allam SNS, Zamri NAK, Zulkarnain A, et al. The effectiveness of television in creating awareness towards movement control order during COVID-19. AIP Conference Proceedings 2021; 2347: 020095.