



Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.



Letter to the Editor

Likelihood of COVID-19 vaccination among primary school students in Hong Kong

Kin On Kwok^{1,2,3,4,*}, Kin-Kit Li⁵, Wan In Wei^{1,**}, Margaret Ting Fong Tsoi¹, Arthur Tang⁶, Hugh Simon Lam⁷, Edward B. McNeil¹, Samuel Yeung Shan Wong¹¹ JC School of Public Health and Primary Care, The Chinese University of Hong Kong, Hong Kong Special Administrative Region of China² Stanley Ho Centre for Emerging Infectious Diseases, The Chinese University of Hong Kong, Hong Kong Special Administrative Region of China³ Hong Kong Institute of Asia-Pacific Studies, The Chinese University of Hong Kong, Hong Kong Special Administrative Region of China⁴ Shenzhen Research Institute of the Chinese University of Hong Kong, Shenzhen, China⁵ Department of Social and Behavioural Sciences, City University of Hong Kong, China⁶ Department of Software, Sungkyunkwan University, Seoul, Republic of Korea⁷ Department of Paediatrics, The Chinese University of Hong Kong, Hong Kong Special Administrative Region of China

ARTICLE INFO

Article history:

Received 14 August 2021

Received in revised form

15 September 2021

Accepted 25 September 2021

Available online 4 October 2021

Editor: L. Leibovici

To the Editor

Although coronavirus disease 2019 (COVID-19) may pose a lower risk of transmission to children than to adults, and schools have contributed little to infection among parents, many countries nevertheless implemented school closure. Following the emergence of the δ variant, which is more transmissible and globally dominant, the percentage of primary school-aged children testing positive has been increasing [1]. Progressively, the circumstances have become more favourable to recommend vaccination of children [2] because of the increased burden on children resulting from the new variants and the supporting evidence from the ongoing vaccine trials among school-aged children. The rollout of COVID-19 vaccines for children is an important step in reopening schools safely. Understanding parental intention to vaccinate their children against COVID-19 will help inform broad strategies to maximize immunization rates among children.

This study was conducted in Hong Kong, a densely populated travel hub in southeast China where residents average 12.5 daily contacts [3]. Participants were Chinese-literate permanent residents aged ≥ 18 years, having at least one dependent child studying in a publicly funded primary school. They completed an online questionnaire soliciting demographics, presence of chronic diseases, history of influenza vaccination, intention to travel outside Hong Kong, and intention to accept the COVID-19 vaccine for themselves and for their child (yes/no). They also rated, from 1 (strongly disagree) to 7 (strongly agree), statements measuring the 5C psychological antecedents of vaccine hesitancy on a validated 15-item scale. Multivariate logistic regression was employed to determine factors associated with parental acceptance of COVID-19 vaccination for their child. Adjusted odds ratios (aORs) with 95% confidence intervals (95% CIs) are presented. See Supplementary Material for further methodological details.

Between 26 February and 27 April 2021, all 455 public primary schools were approached (77% of all schools), of which 19 distributed 13 120 invitations and online survey links via intranet or leaflets. There were 349 (out of 638) eligible and complete responses. Parents' mean (SD) age was 41.1 (5.4) years. Most were female (83.4%), married (89.7%), and had completed high school (85.7%). Children's mean (SD) age was 8.1 (1.8) years (range 5–13) and 55.3% were male. Parents tended to agree with 'calculation' (mean (SD) 5.7 (1.0)) and 'collective responsibility' (5.1 (1.3)), disagree with 'constraints' (2.9 (1.1)) and 'complacency' (3.3 (1.2)), and were evenly divided on 'confidence' (4.0 (1.4)) constructs (Table 1) (Supplementary Material Fig. S1).

Parents were less likely to accept COVID-19 vaccination for their child (21.2%, 95% CI 16.7–25.2%) than for themselves (36.1%, 95% CI

* Corresponding author: Kin On Kwok, Room 419, 4/F, JC School of Public Health and Primary Care Building, Prince of Wales Hospital, Shatin, New Territories, Hong Kong.

** Corresponding author: Wan In Wei, Room 429, 4/F, JC School of Public Health and Primary Care Building, Prince of Wales Hospital, Shatin, New Territories, Hong Kong.

E-mail addresses: kkokwok@cuhk.edu.hk (K.O. Kwok), vivian1628@cuhk.edu.hk (W.I. Wei).

Table 1
Factors associated with parental intention to accept a coronavirus disease 2019 (COVID-19) vaccine for their youngest child, Hong Kong, 2021

Factor	COVID-19 child vaccination intention ^a (n = 349)		Unadjusted OR(95%CI)	Adjusted OR(95%CI)
	Accept (n = 74)	Reject (n = 275)		
Parent's sex:				
Female	54 (18.6)	237 (81.4)	—	—
Male	20 (34.5)	38 (65.5)	2.31 (1.25–4.28)	2.07 (0.96–4.46)
Parent's education attainment:				
College or above	22 (15.1)	124 (84.9)	—	—
Secondary school or below	52 (25.6)	151 (74.4)	1.94 (1.12–3.37)	2.26 (1.15–4.44)
Parent's intention to travel outside Hong Kong in the near future:				
No	44 (16.8)	218 (83.2)	—	—
Yes	30 (34.5)	57 (65.5)	2.61 (1.51–4.51)	2.41 (1.23–4.71)
Parent's intention to take the influenza vaccination this season:				
No	16 (11.9)	118 (88.1)	—	—
Yes	23 (47.9)	25 (52.1)	6.78 (3.14–14.7)	4.57 (1.93–11.1)
Undecided	16 (19.3)	67 (80.7)	1.76 (0.83–3.75)	1.07 (0.44–2.59)
Already vaccinated	19 (22.6)	65 (77.4)	1.29 (0.55–3.00)	1.29 (0.55–3.00)
Vaccine hesitancy constructs ^a , mean (SD):				
Confidence [trust in vaccines and authorities]	5.2 (1.2)	3.7 (1.3)	2.40 (1.88–3.05)	2.34 (1.72–3.18)
Complacency [perceived the disease as low-risk]	3.2 (1.5)	3.3 (1.1)	0.91 (0.73–1.14)	1.03 (0.76–1.40)
Constraint [perceived low vaccine accessibility]	2.7 (1.4)	3.0 (1.1)	0.83 (0.66–1.04)	0.85 (0.60–1.19)
Calculation [information search]	5.6 (1.0)	5.6 (1.1)	0.90 (0.71–1.15)	0.71 (0.49–1.03)
Collective responsibility [vaccination for the public good]	5.4 (1.4)	4.9 (1.3)	1.34 (1.08–1.65)	0.97 (0.71–1.31)

Dashes (–) indicate reference groups. OR, odds ratio; CI, confidence interval.

^a Average scores of items under each construct were computed, with higher scores indicating higher levels of the constructs. This was also shown by the original authors when they constructed their 5C model. The first item 'When everyone is vaccinated, I don't have to get vaccinated too' under the construct of 'collective responsibility' was negatively worded, which decreased the internal consistency of this construct. We omitted this question when deriving this particular construct.

31.1–41.1%). Parents with secondary education or less (aOR 2.26, 95% CI 1.15–4.44), intentions to travel outside Hong Kong (aOR 2.41, 95% CI 1.23–4.71), receiving the seasonal influenza vaccine (aOR 4.57, 95% CI 1.93–11.1), and having confidence in vaccines and authorities (aOR 2.34, 95% CI 1.72–3.18) were more likely to accept COVID-19 vaccination for their child (Table 1).

In this survey, conducted when Hong Kong's vaccination campaign was launched and daily infections fluctuated around 20 cases, parental intention to accept COVID-19 vaccination for their child (21.2%) was lower than for themselves (36.1%). The vaccination rate for children was lower than the rate reported from England (89.1%) [4] but similar to the rate among adults in Hong Kong (37.6%) [5]. The low intention may be partly attributable to the low infection rate and recently reported deaths after vaccination, despite the government's assurance that vaccination did not increase the mortality risk. Consistent with the findings for the general adult population [5], it is unsurprising that increased confidence in vaccines and health authorities was associated with higher parental intention to vaccinate their children. Vaccine scepticism might be related to mistrust towards the government [5], apprehension about the speed of vaccine development, and doubts about the return to normalcy after mass vaccination. Special attention should be given to tertiary-educated parents as they might be more sensitive and critical towards the government, and hence more likely to resist their vaccination recommendations. With the abundant new evidence and divergent comments on vaccines, hesitancy among highly educated parents may swing as the pandemic progresses and varies across sociopolitical contexts.

Study limitations include the low response rate and restricted generalizability of Chinese-literate parents of children who study in public schools.

Our research findings have implications for enhancing COVID-19 vaccinations among children. First, the higher actual influenza vaccination rate among children (63.0%) due to school-based vaccination outreach programmes compared to among parents (24.1%) suggests that schools are seemingly viable platforms to promote COVID-19 vaccination for children. Second, countries

enforcing a COVID-19 vaccine passport might motivate parents who have future family travel plans to vaccinate their children.

To conclude, ongoing research needs (a) to explore ways to improve parents' confidence in vaccines, (b) the possibilities of co-administration of both COVID-19 and influenza vaccine in terms of safety, immunogenicity, and efficacy profile, (c) to use more intensive educational efforts to encourage educated parents via different intervening platforms [5], and (d) to develop secure, standardized and ethical vaccine passport systems globally.

Ethics consideration

This study was approved by the Survey Behavioural Research Ethics Committee of The Chinese University of Hong Kong (reference number: SBRE-20-245).

Author contributions

KOK: conceptualization, methodology, formal analysis, writing—original draft. KKL: formal analysis, methodology and writing—review and editing. WIW: conceptualization, methodology and writing—review and editing. SYSW: writing—review and editing, supervision. AT: writing—review and editing. TTF: data collection and data curation. HSL: writing—review and editing, supervision. EBM: data curation and formal analysis, writing—review and editing. All authors critically assessed the final version of the submitted manuscript.

Transparency declaration

None of the authors has any conflicts of interest to declare. KOK acknowledges support from Health and Medical Research Fund (reference numbers: INF-CUHK-1, 17160302, 18170312), General Research Fund (reference numbers: 14112818, 24104920), Wellcome Trust Fund (United Kingdom, 200861/Z/16/Z), and Group Research Scheme of The Chinese University of Hong Kong.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.cmi.2021.09.029>.

References

- [1] UK office for national statistics: coronavirus (COVID-19) infection survey, UK: 30 July 2021. 2021. <https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/conditionsanddiseases/bulletins/coronaviruscovid19infectionsurvey/pilot/30july2021>. [Accessed 3 August 2021].
- [2] Opel DJ, Diekema DS, Ross LF. Should we mandate a COVID-19 vaccine for children? *JAMA Pediatr* 2021;175:125–6.
- [3] Kwok KO, Cowling B, Wei V, Riley S, Read JM. Temporal variation of human encounters and the number of locations in which they occur: a longitudinal study of Hong Kong residents. *J R Soc Interface* 2018;15:20170838.
- [4] 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;38:7789–98.
- [5] Kwok KO, Li KK, Tang A, Tsoi MTF, Chan EYY, Tang JWT, et al. Psychobehavioral responses and likelihood of receiving COVID-19 vaccines during the pandemic, Hong Kong. *Emerg Infect Dis* 2021;27:1802–10.