

Increasing rotavirus vaccine uptake in children: a randomised controlled trial (abridged secondary publication)

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KEY MESSAGES

1. An intervention package containing a voucher for free rotavirus vaccine, key information about rotavirus, and vaccination reminders increased rotavirus vaccine uptake among Hong Kong children by 1.7-fold or 33 percentage points (from 48% to 81%), regardless of mothers' initial plans concerning rotavirus vaccination during the immediate postpartum period.
2. The effect of the intervention package was greatest in low-income families. This indicates that removal of financial barriers to vaccination may promote vaccine uptake equity.
3. The provision of key information about rotavirus and vaccination reminders substantially increased vaccine uptake in lower-income families potentially by enhancing mothers' perceptions of rotavirus vaccine benefits and their self-efficacy.
4. The intervention package strengthened mothers' confidence in decision to vaccinate their children.
5. In the absence of the voucher for rotavirus vaccination, the main reason mothers cited for not vaccinating their children was that the vaccine is excluded from Hong Kong's routine Childhood Immunisation Programme.

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Introduction

The rotavirus vaccine is safe and effective against hospitalisation and is cost-saving.^{1,2} However, it has not been included in Hong Kong's Childhood Immunisation Programme. This randomised controlled trial examined whether an intervention package involving (1) removal of financial barriers and/or (2) provision of key information about rotavirus, along with vaccination reminders, could increase rotavirus vaccine uptake among Hong Kong children.

Methods

Postpartum mothers were recruited from the postnatal wards of two public hospitals in Hong Kong from 16 February to 30 July 2021. Participants were randomly assigned to either the control group or one of two intervention groups. Participants in the control group received standard publicly available information about rotavirus infection from the Centre for Health Protection by post within 3 to 5 days. Participants in intervention group 1 received the standard information and additionally an information sheet containing (1) key information about rotavirus risks for children and the benefits of vaccination, (2) eligible age for rotavirus vaccination, (3) a hyperlink to a government webpage listing

private clinics that offer rotavirus vaccines, and (4) guidance on locating these clinics. A vaccination reminder text message containing the same hyperlink to the list of private clinics was sent when the child reached 6 to 8 weeks of age. Participants in intervention group 2 received all materials provided to intervention group 1 and additionally (1) contact details of a specific community health centre within the United Christian Nethersole Community Health Service located near their home and (2) a voucher for free rotavirus vaccination at the specified clinic.

An intention-to-treat analysis was used. Any missing rotavirus vaccination data were assumed to be non-vaccination. The effectiveness of the interventions in terms of increasing rotavirus vaccine uptake between groups was assessed using Chi-squared tests. Relative risks with 95% confidence intervals were calculated to determine the likelihood of vaccination across groups. Maternal attitudes were assessed postnatally and when children were approximately 8 months of age; paired differences were analysed using permutation tests.

Results

Of 1129 eligible mothers, 788 (70%) were randomly assigned to the control group (n=263), intervention group 1 (n=263), or intervention group 2 (n=262). In

these three groups, 48%, 56%, and 81% of children received rotavirus vaccines, respectively. The provision of key information about rotavirus and vaccination reminders increased rotavirus vaccine uptake by 1.17-fold or 8 percentage points (from 48% to 56%). Removal of financial barriers further increased uptake by 1.46-fold or 25 percentage points (from 56% to 81%). Overall, the full intervention package increased rotavirus vaccine uptake by 1.7-fold or 33 percentage points (from 48% to 81%), regardless of mothers' initial plans concerning rotavirus vaccination during the immediate postpartum period. Mothers in the intervention group 2 perceived the voucher for free rotavirus vaccination as the most important intervention component influencing their vaccination decision.

Provision of key information about rotavirus and vaccination reminders substantially increased uptake in the lower-income group (Table). The main reasons cited for not vaccinating their children were that the vaccine is excluded from the Childhood Immunisation Programme (according to mothers in intervention group 1 and the control group) and that knowledge of the vaccine is inadequate (according to mothers in intervention group 2) [Fig]. The intervention packages also strengthened mothers' confidence in decision to vaccinate their children.

Discussion

The intervention package effectively increased rotavirus vaccine uptake among Hong Kong children. Removal of the financial barrier was the most important component for increasing rotavirus vaccine uptake. The vaccine prevents hospitalisation in 92% to 96% of cases, and removal of the financial barrier could reduce rotavirus-related hospitalisation incidence by 23% to 24%.¹ Rotavirus vaccination also is cost-saving.² If incorporated into Hong Kong's Childhood Immunisation Programme, rotavirus vaccine uptake is likely to reach 95%,³ potentially reducing rotavirus-related hospitalisation incidence by 57% to 60%. Further studies are needed to determine whether this intervention would be cost-effective if incorporated into routine public antenatal care.

Provision of key information and vaccination reminders substantially increased vaccine uptake in lower-income families. In Hong Kong, mothers from lower-income households tend to perceive less benefit from the rotavirus vaccine and have lower self-efficacy regarding vaccination, and thus are less likely to vaccinate their children against rotavirus.⁴ Our intervention package may increase rotavirus vaccine uptake in this group by enhancing mothers' perceptions of the vaccine's benefits and their self-efficacy.

The increase in rotavirus vaccine uptake (ie, the effect of the intervention package) was smallest among families with a monthly household income of HK\$30 000-39 999.

This study had some limitations. First, mothers were recruited from two public hospitals only. Mothers giving birth at private hospitals likely have higher household incomes and greater access to rotavirus vaccine information. However, 63% of Hong Kong births in 2021 occurred in public hospitals.⁵ Second, demographic differences between mothers who declined and agreed to participate may have affected the representativeness of the sample. Mothers who declined were older and had lower education levels, and fewer had heard of rotavirus vaccine during the immediate postpartum period, compared with mothers who agreed to participate (56% vs 68%). Third, more mothers in the control group and intervention group 1 had missing rotavirus vaccination data, compared with intervention group 2. Missing vaccination data were regarded as non-vaccination, and additional analyses of intervention effectiveness were performed to include only those with documented vaccination status. Fourth, 33% of mothers in the control group reported that their vaccination decision had been influenced by study participation. Therefore, involvement in the study alone, without any intervention, may have affected their decision. Fifth, 6.7% of mothers in the intervention groups could not be contacted and may not have reviewed the additional information provided. For a conservative outcome, our intention-to-treat analysis assumed that all mothers in the intervention groups received the intervention.

TABLE. Rotavirus vaccine uptake by monthly household income across groups

Monthly household income, HK\$	Uptake %			Difference in uptake, percentage points		
	Control	Intervention 1	Intervention 2	Intervention 1 vs control	Intervention 2 vs intervention 1	Intervention 2 vs control
<30 000	23	42	75	19	32	52
30 000-39 999	59	62	75	3	13	16
40 000-49 999	51	57	80	5	24	29
≥50 000	59	66	89	6	23	29

Conclusions

Provision of key information about rotavirus, vaccination reminders, and a voucher for free vaccination increased rotavirus vaccine uptake by 1.7-fold or 33 percentage points (from 48% to 81%). The intervention package enhanced mothers' confidence in decision to vaccinate their children. The intervention package was most effective among low-income families. This indicates that with removal of financial barriers, incorporation of the rotavirus vaccine into the Childhood Immunisation Programme could promote vaccine uptake equity and protect additional young children from rotavirus infection.

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Disclosure

The results of this research have been previously published in:

1. Yeung KHT, Yeung CCW, Tam WH, Liu KS, Fung GPG, Nelson EAS. Multiple-component interventions to increase rotavirus vaccine uptake in children: a randomised controlled trial. *Lancet Reg Health West Pac* 2024;50:101153.

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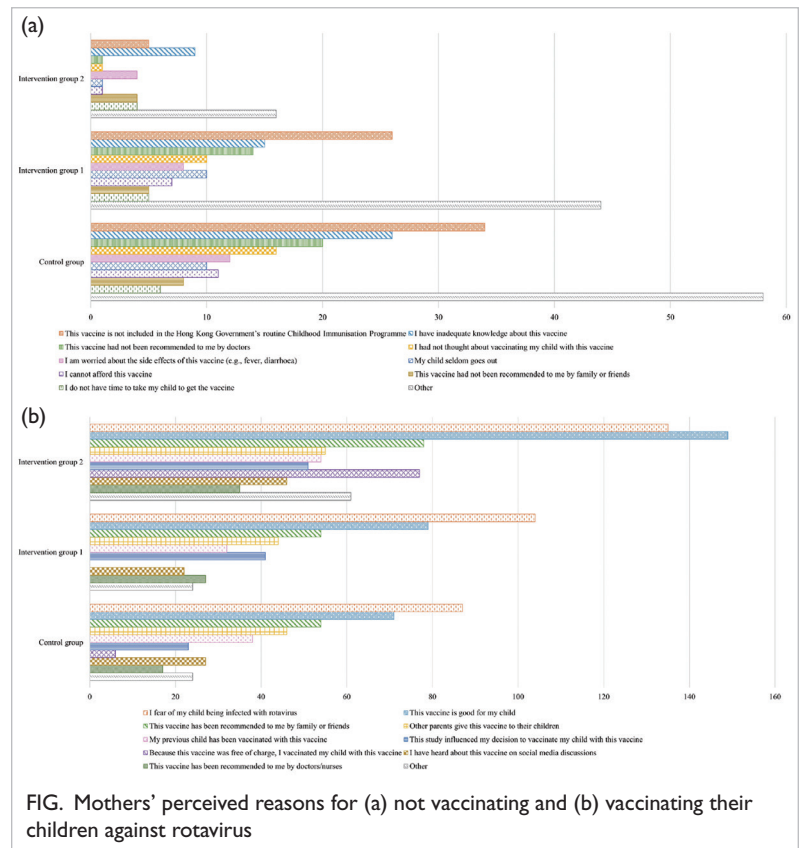


FIG. Mothers' perceived reasons for (a) not vaccinating and (b) vaccinating their children against rotavirus

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