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Parental perceptions of childhood seasonal influenza vaccination in Singapore: A cross-sectional survey

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ABSTRACT

Purpose: Seasonal influenza vaccination is recommended in children aged 6–59 months, but little is known about child vaccination coverage and determinants in Asian settings. We report the results of a survey of knowledge, attitudes, practices, and determinants of child influenza vaccination in Singapore.
Methods: In December 2015-March 2016, we conducted a survey of 332 parents of children aged 6 months to 5 years attending pre-schools. We assessed child influenza vaccine coverage and parental knowledge, attitudes, and practices of child influenza vaccination. We used multivariable regression and structural equation models to identify factors associated with child influenza vaccination.
Results: Knowledge about influenza, perceived benefit of vaccination, and willingness to vaccinate were high. However, only 32% of children had ever received influenza vaccine, and only 15% in the past year. Factors independently associated with child influenza vaccination included: being recommended influenza vaccine by a child's doctor (prevalence ratio (PR) = 2.47, 95% CI: 1.75–3.48); receiving influenza vaccine information from a private general practitioner (PR = 1.47, 95% CI: 1.05–2.04); regularly receiving pre-travel influenza vaccine (PR = 1.64, 95% CI: 1.19–2.25); higher willingness to vaccinate (PR = 1.58, 95% CI:1.24–2.04 per unit increase in willingness score); and feeling well-informed about influenza vaccine (PR = 1.44, 95% CI: 1.04–1.99). Parents who obtained influenza vaccine information from television were less likely to have vaccinated their child (PR = 0.44, 95% CI: 0.23–0.85). Path analysis indicated that being recommended vaccination by a child's doctor increased willingness to vaccinate and self-efficacy (feeling well-informed about influenza vaccine). Median willingness-to-pay for a dose of influenza vaccine was SGD30 (interquartile range: SGD20-SGD50), and was higher in parents of vaccinated compared with unvaccinated children (SGD45 vs SGD30, p = 0.0012).
Conclusion: Knowledge and willingness to vaccinate was high in this parent population, but influenza vaccine uptake in children was low. Encouraging medical professionals to recommend vaccination of eligible children is key to improving uptake.

1. Introduction

Influenza is a major cause of disease burden among children below 5 years of age, causing an estimated 870,000 hospitalisations and 10,200 deaths per year worldwide [1,2]. Most influenza-associated deaths occur in low-income countries, but there is a substantial disease burden in high-income countries, where an estimated 55 cases of influenza, 15 cases of influenza-associated lower respiratory infection, and 1 case of severe influenza infection occur per 1000 children below 5 years of age [3].

Influenza vaccine effectiveness varies between countries and across influenza seasons, but studies in Asia [4,5] and Europe [6,7] have shown good effectiveness of seasonal influenza vaccine among young children. As parents are the main healthcare decision makers for their young children, understanding parental perceptions towards influenza vaccination is important for informing interventions to encourage uptake. A survey carried out in England found that vaccine uptake was associated with parental perception that the influenza vaccine was effective and their child was susceptible to influenza [8]. Conversely, in the National Flu Survey in the United States, parents' perception that their child was not at risk

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for influenza or severe illness from influenza was the most common reason for not vaccinating their child [9]. In both studies, the perception that the vaccine was unsafe was associated with children not being vaccinated [8,9]. Perceived safety was also found to be significantly associated with parents' acceptance of an offer to vaccinate their child against influenza in a study carried out in Sydney, Australia [10].

Although several studies of parental perceptions regarding child influenza vaccination have been published, most of these have been conducted in Western settings. Parental perceptions that influence uptake of child influenza vaccine are not well described in Asian settings, and no previous studies have been conducted in Singapore, where influenza epidemiology [11], vaccination policy and financing, healthcare structure, and patient-doctor dynamics are generally very different from Western settings.

In Singapore, a high-income country in the tropics, influenza circulates year-round with two main peaks in December and June coinciding with Northern and Southern Hemisphere epidemics. Between 2010 and 2012, influenza-associated hospitalisations were estimated at approximately 96 per 100,000 person-years among children aged 6–23 months and 64 per 100,000 person-years among children aged 2–4 years, corresponding to an excess in hospitalisations coded as pneumonia and influenza of 13% and 9% respectively [12].

The Singapore Ministry of Health recommends annual vaccination of children aged 6–59 months old with trivalent or quadrivalent inactivated influenza vaccine, but there is currently no universal childhood influenza vaccination programme. Financing of childhood vaccines in Singapore is complex and depends on the specific vaccine, residential status of the child, and whether vaccines are administered in the public or private sector. Vaccines included in the National Childhood Immunisation Schedule, such as those for tuberculosis (BCG); Hepatitis B; Diphtheria, Tetanus, Pertussis (DTaP); Measles, Mumps, Rubella (MMR); Poliovirus (IPV); and *Haemophilus influenza* type b (HiB), are available free of charge in the public sector for Singaporeans and subsidised for Permanent Residents [13,14]. The cost of other recommended vaccines that are not in the National Childhood Immunisation Schedule is not covered by the public health sector. These include the influenza vaccine, pneumococcal vaccine, chicken pox vaccine, and human papillomavirus vaccine. However, parents can choose to pay for their child's influenza vaccine through a variety of ways: (i) their Medisave, a mandatory medical savings account for Singaporeans and Permanent Residents, (ii) their child's Baby Bonus cash gift, a one-time cash gift for children born on or after 1 January 2015, or (iii) savings in the Child Development Account, a special savings account for which the government will match the amount of savings for children born on or after 24 March 2016 [15,16]. In addition, influenza vaccine can be purchased out-of-pocket in the private sector. Administration of influenza vaccine is not universally documented on child electronic immunisation records, particularly for children vaccinated in the private sector, so reliable data on child influenza vaccination coverage in Singapore are lacking.

We conducted a cross-sectional survey to (i) estimate influenza vaccine coverage among children aged 6 months to 5 years in Singapore, (ii) examine parental knowledge, attitudes, and practices regarding child influenza and influenza vaccination, and (iii) investigate factors associated with child influenza vaccination.

2. Methods

2.1. Sample

Between December 2015 and March 2016, we conducted a cross-sectional survey of parental perceptions of child influenza vaccination in Singapore. The study was conducted by medical students as part of a capstone community health project. We approached 102 pre-schools with students aged 6 months to 5 years, selected at random from a list of institutions registered with the Early Childhood Development Agency, a regulatory authority which oversees pre-schools in Singapore. Of these, 17 agreed to disseminate information about the study to parents and a link to an online survey. Due to time constraints, and because initial response was low, additional pre-schools from the list were recruited through convenience sampling. Overall, a total of 325 pre-schools were approached, of which 92 agreed to disseminate study information. 36 out of the 92 pre-schools also allowed the students to visit the pre-schools in pairs to recruit parents in person and invite them to complete the online questionnaire on site or at their own convenience with a link to the online survey for parents who did not have time to complete it at the child care centre.

Eligible parents were those with a child aged 5 years or below attending a pre-school included in the study. A target sample size of 385 was pre-determined based on the ability to estimate an influenza vaccine coverage of 50% ± 5% with 95% precision.

2.2. Questionnaire

The anonymous, online survey questionnaire was developed using Qualtrics software (Qualtrics Labs, Inc.) and could be completed on mobile devices. The questionnaire consisted of 81 questions, assessing factors which were found to be associated with child vaccinations in the literature. These included cost of vaccine [17], place of vaccination [18], doctor's recommendation [19,20], government guidelines [21], parents' influenza vaccination status [19], and intention to travel [22]. Our survey questionnaire consisted of questions in seven domains: (i) Knowledge of Influenza and Influenza Vaccination, (ii) Perceptions of Influenza Severity and Susceptibility, (iii) Perceptions of Vaccination Barriers and Benefits, (iv) Willingness to Vaccinate, (v) Vaccination Practices, (vi) Self-efficacy, and (vii) Cues to Vaccination. Response options for questions in the Knowledge of Influenza domain were "True", "False", or "Not sure", while questions in the Willingness to Vaccinate domain were on a 5-point Likert scale. For the majority of other questions, responses were binary. On average, the questionnaire took 18 min to complete.

2.3. Data analysis

The main outcome measures were participant-reported child influenza vaccination prevalence in the past year, and at any time in the past. In addition, we conducted an analysis of factors associated with ever having vaccinated one's child against influenza. We framed our analysis around the Health Belief Model of health behaviour [23]. We hypothesised that children's vaccination status is influenced by parents' demographic characteristics and knowledge of influenza and influenza vaccine, their own influenza vaccination practices and willingness to vaccinate their children, their perceptions of the severity of influenza and their children's susceptibility to it, their perceptions of influenza vaccination benefits and barriers, as well as external cues to action. A conceptual framework for this model is shown in Fig. 1.

Participants' knowledge was assessed using a 15-point knowledge score, with 1 point given for each correctly answered knowledge question. To assess constructs of perceived severity and susceptibility to influenza, and benefits of and barriers to vaccination, parents were presented with a series of statements with which they were asked to agree or disagree. Willingness to vaccinate was assessed using a series of 14 scenario questions. For each scenario, participants were asked if they would definitely vaccinate their child, probably vaccinate, probably not vaccinate, definitely

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