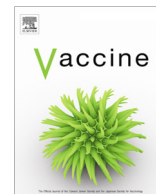




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Vaccine decision-making begins in pregnancy: Correlation between vaccine concerns, intentions and maternal vaccination with subsequent childhood vaccine uptake

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ABSTRACT

Introduction: Maternal and childhood vaccine decision-making begins prenatally. Amongst pregnant Australian women we aimed to ascertain vaccine information received, maternal immunisation uptake and attitudes and concerns regarding childhood vaccination. We also aimed to determine any correlation between a) intentions and concerns regarding childhood vaccination, (b) concerns about pregnancy vaccination, (c) socioeconomic status (SES) and (d) uptake of influenza and pertussis vaccines during pregnancy and routine vaccines during childhood.

Methods: Women attending public antenatal clinics were recruited in three Australian states. Surveys were completed on iPads. Follow-up phone surveys were done three to six months post delivery, and infant vaccination status obtained via the Australian Childhood Immunisation Register (ACIR).

Results: Between October 2015 and March 2016, 975 (82%) of 1184 mothers consented and 406 (42%) agreed to a follow up survey, post delivery. First-time mothers (445; 49%) had significantly more vaccine concerns in pregnancy and only 73% had made a decision about childhood vaccination compared to 89% of mothers with existing children (p-value < 0.001). 66% of mothers reported receiving enough information during pregnancy on childhood vaccination. In the post delivery survey, 46% and 82% of mothers reported receiving pregnancy influenza and pertussis vaccines respectively. The mother's degree of vaccine hesitancy and two attitudinal factors were correlated with vaccine uptake post delivery. There was no association between reported maternal vaccine uptake or SES and childhood vaccine uptake.

Conclusion: First time mothers are more vaccine hesitant and undecided about childhood vaccination, and only two thirds of all mothers believed they received enough information during pregnancy. New interventions to improve both education and communication on childhood and maternal vaccines, delivered by midwives and obstetricians in the Australian public hospital system, may reduce vaccine hesitancy for all mothers in pregnancy and post delivery, particularly first-time mothers.

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1. Introduction

Nearly half of Australian parents have some concerns about childhood vaccines [1,2], with approximately 3.3% of children affected by registered or presumptive vaccine objection. Whilst approximately 93% of Australian children are fully immunised

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[3,4], there is considerable regional variation and many parents report complying with the National Immunisation program schedule despite significant concerns [5]. Maintaining and increasing childhood vaccination rates requires that we understand parents' concerns and the optimal decision-making time points to address them.

Healthcare providers (HCPs) are the most frequently accessed source of vaccine information [6], are highly trusted [7,8], and play a key role in shaping parental attitudes towards maternal [9,10] and childhood vaccination [11]. The nature and content of HCPs' vaccine discussions has been studied [12], but less is known about the optimal timing for delivery of this information. Parents want balanced information about vaccination benefits and harms, the chance to be able to ask questions and to feel a sense of control over the process [13,14].

Childhood vaccine decision-making begins prenatally [8,15]. Compared to parents who accept all vaccines, those who refuse or delay are twice as likely to report thinking about vaccines prenatally, and eight times more likely to report ongoing re-evaluation of their vaccination decisions [8]. The provision of vaccine information before the first vaccine visit has been shown to improve knowledge about vaccination, intention to vaccinate, and uptake [14] and is what parents want [16,17]. However, evidence suggests that information alone is not enough and that provision of vaccine information using *effective communication skills* as part of the healthcare encounter is what is needed to address vaccine concerns [18] and that such discussions should occur during pregnancy [8].

Currently there is no mandated time point in Australia to discuss childhood vaccination with expectant parents, although many antenatal providers discuss Hepatitis B vaccine at birth. Midwives in public hospitals, private and public obstetricians and GPs are encouraged to recommend and facilitate pertussis and flu vaccination in pregnancy [9]. However, ensuring uptake of these vaccines is challenging [19]. In Australia, a funded, state-based maternal pertussis vaccination program was introduced in Australia in 2015, alongside the already funded maternal influenza vaccination program [9].

There are no data available in Australia to determine whether vaccine concerns of expectant mothers, particularly first time mothers, correlate with childhood and maternal vaccine uptake. In this study, we aimed to ascertain whether vaccine information is received in pregnancy and post-delivery, mothers' attitudes and concerns regarding childhood vaccination and maternal immunisation uptake. We also aimed to determine any correlation between a) intentions and concerns regarding childhood vaccination, (b) concerns about pregnancy vaccination, (c) socioeconomic status (SES) and (d) uptake of influenza and pertussis vaccines during pregnancy and routine vaccines during childhood.

2. Methods

2.1. Design, setting, participants

We sought to recruit 300 women to complete surveys at four sites (1200 women total); two public hospitals in Melbourne, Victoria (Vic); one public hospital in Adelaide, South Australia (SA) and one in Perth, Western Australia (WA). Between October 2015 and April 2016, researchers asked pregnant women attending antenatal appointments to complete the survey using iPads. After ascertaining interest and eligibility (including English proficiency), an information sheet was provided and consent obtained. Parents with insufficient time to complete the survey were sent an e-mail link. Reminder emails were sent two and four weeks later. Consent was requested for a follow-up telephone interview 3–6 months

post delivery. Courtesy emails were sent prior to telephone contact and mothers were contacted three times before being considered non-responders. Follow-up survey links were emailed to mothers who requested them and were completed online.

2.2. Main study measures

The PINA-A (Parental Immunisation Needs and Attitudes – Antenatal) survey items were developed by the study team, comprised of social scientists, vaccine experts and general paediatricians, and based on the Health belief Model [20]. Items were based on questions validated in other surveys and a previous PINA survey employed in public paediatric outpatients and community settings [21–23]. Attitudes, behaviours and concerns were measured using matrix style questions, with responses provided on a six-point Likert scale [24]. We used the Vaccine Communication Framework (VCF) [25] to group parents into five categories based on their level of vaccine hesitancy and intention to vaccinate: the 'unquestioning acceptor'; the 'cautious acceptor'; the 'hesitant'; the 'late or selective vaccinator'; and the 'refuser' (Table 3).

Parents were asked for consent to access their child's immunisation record on the Australian Childhood Immunisation Register (ACIR) to ascertain if they were up to date with the National Immunisation Program (NIP) [26]. Children were considered up to date if all recommended vaccines for their age had been given at 2, 4 and 6 months, with a one-month grace period. Participant postcodes were obtained to determine socioeconomic status (SES) using Socioeconomic Index for Advantage (SEIFA) [27].

2.3. Data management and statistical analysis

Survey data were collected and managed using REDCap (Research Electronic Data Capture) hosted at the Murdoch Childrens Research Institute. REDCap is a secure, web-based application designed to support data capture and management for research studies [28]. Survey data was transferred to Stata software (Stata/IC 14.2 for Windows) for analysis from REDCap. Demographic profiles, vaccine intentions and concerns, and health system utilisation were analysed using descriptive statistics, with 95% confidence intervals to express uncertainty due to sampling variation for estimated proportions. String variables were analysed individually to assess parents' responses to open questions. Chi-square tests were conducted to compare proportions of bivariate outcomes by exposures. When the sample was small, binary regression was used to estimate the difference in proportions, including confidence intervals and p-values. Logistic regression analysed the probability of a child being up-to-date with scheduled vaccines, using predictors of vaccination intention, vaccine attitudes, beliefs and concerns, SES, and reported vaccine uptake in pregnancy and childhood.

2.4. Ethics

Ethics approval for the Parental Immunisation Needs and Attitudes (PINA-A) study was obtained from the Royal Childrens Hospital HREC (35129A), with State-level approval from SA (HREC AU/15/92A0231) and WA (HREC 2015211EW).

3. Results

3.1. Participants/demographics for initial survey in pregnancy

Between October 2015 and March 2016, 975 (82%) of 1184 of parents approached, consented to participate. By State, 464 (95%)

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