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Prevalence and predictors of maternal seasonal influenza vaccination in Hong Kong

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ABSTRACT

Background: Pregnant women infected with influenza virus are more likely to experience severe complications when compared with their non-pregnant peers. Yet influenza vaccine uptake is low among pregnant women. The purpose of this study was to assess the prevalence of seasonal influenza vaccine uptake among pregnant women in Hong Kong and to identify predictors of vaccine uptake.
Methods: Using a multi-center cross-sectional design, we recruited 2822 new mothers during their immediate postpartum stay from all eight public obstetric hospitals in Hong Kong. We assessed antenatal maternal influenza vaccination status as well as health beliefs and perceptions toward influenza and influenza vaccination. Bivariable and multivariable logistic regression was used to identify the predictors of vaccination uptake.
Results: Only 49 (1.7%; 95% CI 1.3–2.3%) participants were vaccinated during their pregnancy. Fear that the vaccine would cause harm to the fetus or themselves were the most common reasons for not being vaccinated. Being aware of the vaccination recommendations (OR = 2.69; 95% CI 1.06–6.82), being advised by a health-care provider (OR = 6.30; 95% CI 3.19–12.46), history of vaccination (OR = 2.47; 95% CI 1.25–4.91), perceived susceptibility to influenza infection (OR = 3.67; 95% CI 1.64–8.22), and perceived benefits of influenza vaccination (OR = 9.98; 95% CI 3.79–26.24) were all independently associated with vaccination. Perceived barriers to vaccination (OR = 0.17; 95% CI 0.07–0.40) were strongly associated with failure to vaccinate.
Conclusions: Low seasonal influenza vaccination uptake among Hong Kong pregnant women was related to a number of factors, all of which are amenable to interventions. Vaccination promotion strategies need to focus on encouraging health-care providers to discuss vaccination with their pregnant clients and in providing pregnant women with accurate and unbiased information about the risks of influenza infection and the benefits of vaccination.

1. Introduction

Influenza is a viral infection that lasts for approximately one week. It is usually self-limiting and most patients recover in one or two weeks' time. In some population groups, like the very young, the elderly, pregnant women and those with chronic illnesses, however, influenza can cause substantial morbidity and mortality [1]. Pregnant women are at increased risk of influenza infection and are more likely to experience severe complications [2–4] especially those with underlying medical conditions [5–7]. Babies born to a mother who contracted influenza or fever-related diseases during pregnancy were more likely to be preterm or small for gestational age [8] and have congenital abnormalities [9,10]. Evidence also suggests that adult offspring of women infected with influenza virus during pregnancy have higher rates of bipolar disorder [11] and schizophrenia [12,13]. In addition, children under six months of age experience the highest mortality from influenza-related illnesses [14,15] and are not eligible for vaccination.

To reduce the morbidity and mortality from influenza infection in pregnant women and infants under six months of age, the World Health Organization (WHO) currently recommends that pregnant women should have the highest priority for vaccination [16] and

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influenza vaccination is now considered as an essential component of antenatal care [17]. Despite the accumulated evidence of the benefits of vaccination of pregnant women, seasonal influenza vaccine uptake rates are rarely higher than 50–60% [18–20] and are often less than 20% [21–23]. In Hong Kong, pregnant women are also identified as a target group for influenza vaccination. Except for low-income women, however, the vaccine is not subsidized and is not available in publicly funded antenatal clinics. Pregnant women must obtain the vaccine through their primary care practitioner or through a private clinic. Small-scale studies have reported uptake rates of less than 10% [23,24]. However, there has not been any population-based study in Hong Kong or in Asia to examine the uptake of seasonal influenza vaccine during pregnancy. In addition, Hong Kong children have high rates of influenza infection and influenza-related hospital admissions [25,26]. To improve the vaccination uptake rate and to enhance the effectiveness of vaccination campaigns targeted toward pregnant women, it is necessary to estimate the current prevalence of vaccination and to identify factors that predict uptake.

2. Materials and methods

2.1. Study design

To examine influenza vaccine uptake among pregnant women, we used a territory wide cross-sectional design. Participants for the study were recruited in the immediate postpartum period over 8 weeks at the end of the 2010–2011 winter influenza season from all eight public hospitals in Hong Kong offering obstetric services. Seasonal influenza vaccine in Hong Kong is usually available from mid October onwards and influenza activity typically peaks from February to March and a second peak often occurs in June and July [27]. All participants were pregnant throughout the winter influenza season and eligible to receive the vaccine. Inclusion criteria for the selection of participants were: 18 years of age or older; Cantonese speaking; Hong Kong resident; and just given birth to a live newborn. Study research nurses visited the postnatal hospital wards daily from Monday to Friday during the study period. All eligible patients who were on the postnatal wards were approached by the research nurse, provided with an explanation of the study, and invited to participate. To assess the impact of non-response bias, we also asked those who declined to participate if they had received the influenza vaccine during their pregnancy. The vaccination status was recorded on a simple tally sheet and no identifying or personal data was collected.

2.2. Data collection instruments

Participants completed a questionnaire that consisted of four sections: (1) general questions about previous influenza infection, the influenza vaccination history of the participant and family members, and reasons for vaccination or non-vaccination; (2) items about the participant's health history before and during the pregnancy; (3) 16 scale items that assessed pregnant women's health beliefs and perceptions about influenza infection and vaccination during pregnancy; and (4) basic demographic and personal data including age, family income, maternal education, and employment status. In addition, maternal and birth data (i.e., obstetrical history, delivery type, gestational age and birth weight) were extracted from the mother's medical record by the study research nurses.

The 16-item scale was adapted by the authors [23] from a questionnaire originally developed by Tong et al. [21] and was used with permission. The 16 scale items were based on the four primary components of the health belief model (HBM): perceived severity of influenza infection (3 items), perceived susceptibility to influenza infection (3 items), perceived benefits of influenza vaccination (4 items) and perceived barriers to receiving the influenza vaccine (6 items) [28]. The HBM proposes that individuals will engage in a health behavior if they perceive that they are susceptible to a disease or health condition, if they believe it to have potentially severe consequences, if they believe that their action would be beneficial and if they believe that the perceived or actual barriers to taking the action are outweighed by its benefits [29]. The HBM is one of the most easily understood and widely used frameworks for examining health beliefs and explaining health behaviors and it has been used extensively to examine immunization uptake [30–33]. Scale items responses were assessed on a four-point Likert scale with responses ranging from strongly disagree to strongly agree. A four-point scale was used to minimize neutral responses, which are common in this population [34]. Scale items were coded so that higher scores reflected higher levels of the relevant construct.

Prior to use, an expert translator translated the questionnaire into Chinese. To ensure the accuracy of the translation, another translator back-translated the Chinese version into English as per established guidelines [35,36]. Any discrepancies between the original English version and the back-translated English version were examined and modifications were made to enhance the accuracy. Two Chinese-speaking researchers then reviewed the Chinese version to ensure that the wording used was culturally appropriate and that the concepts would be clearly understood by Hong Kong pregnant women. To ease readability and understanding, the questionnaire was composed of simple language [37].

2.3. Data analysis

All analyses were conducted using Stata 12.1 (Stata Corp., College Station, TX) [38]. Uptake of seasonal influenza vaccination was the dependent variable. Chi-square statistics were used to assess the relationship between the characteristics of the participants and their vaccination status. Student's t tests were used to compare scores on the HBM items and sub-scales between vaccinated and unvaccinated participants. Multiple logistic regression was used to estimate the impact of study predictor variables on influenza vaccination status. Variables with an unadjusted p value of <.10 in the bivariable analysis were retained and entered into the multivariable model. The HBM sub-scales were entered into the model as continuous variables and all other variables were entered as categorical variables. The multivariable analysis was carried out using a backward stepwise process excluding insignificant variables one by one from the model until the most parsimonious and best fitting model was obtained. To assess the fit and adequacy of the model we used the Hosmer and Lemeshow's [39] goodness of fit test and the McFadden's R^2. Because of potential for bias in the estimated odds ratios when using multiple logistic regression to examine data in which the outcome of interest is rare, we repeated the multivariable analysis using a penalized maximum likelihood logistic regression [40,41]. The penalized logistic regression was run using the *firthlogit* command in Stata [42] and produced a model that was highly consistent with that produced by the multiple logistic regression. Because the two models were similar and because a goodness of fit statistic is not available for *firthlogit*, we are reporting the results of the multiple logistic regression.

Ethical approval was obtained from the Institutional Review Board of the Li Ka-Shing Faculty of Medicine, University of Hong Kong and the participating institutions. Informed written consent was obtained from all participants.