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Cross-sectional study on factors associated with influenza vaccine uptake and pertussis vaccination status among pregnant women in Germany

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ABSTRACT

Pregnant women and their newborns are at increased risk for influenza-related complications; the latter also have an increased risk for pertussis-related complications. In Germany, seasonal influenza vaccination is recommended for pregnant women since 2010. A dose of pertussis-containing vaccine has been recommended since 2004 for women of childbearing age if they have not been vaccinated within the past 10 years. We conducted a nationwide cross-sectional survey among pregnant women in February/March 2013 to assess knowledge, attitudes, and practices related to influenza vaccination during pregnancy and to identify factors associated with their pertussis vaccination status. In total, 1025 pregnant women participated and provided information through a self-administered questionnaire. Of these, 23.2% were vaccinated against seasonal influenza during the 2012/13 season; 15.9% during their pregnancy. Major reasons for being unvaccinated ($n = 686$ respondents) were lack of confidence in the vaccine (60.4%) and the perception that vaccination was not necessary (40.3%). Influenza vaccination during pregnancy was independently associated with having received influenza vaccine in the previous season, having received a recommendation from a physician, a high level of vaccine-related knowledge and of perceived disease severity. In contrast, knowledge of the recommendation for regular hand-washing to prevent influenza and the perception that vaccine-related side effects were likely to occur or likely to be severe were negatively associated with vaccine uptake. Receipt of a pertussis vaccine in the past 10 years was reported by 22.5% of participants. Pertussis vaccine uptake was independently associated with living in the Eastern federal states and receiving seasonal influenza vaccination annually, while a migration background was associated with a lower uptake. To enhance vaccine uptake in pregnant women and women of childbearing age, special efforts must be undertaken to improve knowledge of both recommendations and the benefits of vaccination. Gynecologists could serve as important facilitators.

1. Introduction

Both pregnant women and newborns are at increased risk for influenza-related complications and hospitalization [1–3]. Influenza during pregnancy can cause stillbirth, preterm delivery, and growth retardation in the child [4,5]. Studies have demonstrated that influenza vaccination during pregnancy is safe and can effectively prevent influenza illness in pregnant women and also their newborns [6–9]. For these reasons, the World Health Organization declared pregnant women as a group to be targeted by seasonal influenza vaccination with highest priority [10].

Despite compelling evidence on the safety and benefits of influenza vaccination during pregnancy, data from industrialized countries suggest only a low to moderate vaccine uptake in this target-group [11,12]. In Germany, seasonal influenza vaccination was recommended in August 2010 for all pregnant women from the 2nd trimester and for pregnant women with underlying chronic disease from the 1st trimester [13]. However, in the absence of an immunization registry no data on the vaccine uptake in this target-group is available thus far.

In Germany, antenatal care is based on a nationwide standardized program for all pregnant women that is fully funded by health insurances and provided by office-based gynecologists, midwives and maternity clinics. Primary prenatal care including

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pregnancy-related vaccination is primarily provided by office-based gynecologists [14].

Knowledge on the perceptions of pregnant women regarding influenza and on barriers and promoters for their decision to receive influenza vaccine are crucial to design tailored communication strategies and to increase vaccination coverage. Some studies reported on barriers such as vaccine safety concerns, mistrust in the vaccine, low risk perception of the disease, and poor vaccine-related knowledge [15–18]. However, several of these studies had limitations due to their study design and small sample size, and knowledge/attitude among pregnant women may considerably vary from country to country.

Similar to influenza, pertussis infection is associated with an increased risk for complications in infants when compared to other age-groups [19,20]. Since 2004, the German Standing Committee on Vaccination (STIKO) recommends pertussis vaccination for women of childbearing age as well for all close contacts of infants who have not received a pertussis vaccination within the past 10 years (so-called cocooning strategy). If a pregnant woman is not vaccinated before conception, STIKO recommends vaccination preferably in the first days after the birth of the child [21]. In contrast to the US or the United Kingdom, pertussis vaccination of pregnant women is currently not recommended in Germany [22,23].

We conducted a nationwide cross-sectional study among pregnant women aged 18 years and older living in Germany to assess influenza vaccine uptake during the 2012/13 season and pertussis vaccine uptake in the previous 10 years. In particular we aimed to assess knowledge of and attitudes towards seasonal influenza vaccination in this target-group.

2. Methods

2.1. Study design and population

We conducted a nationwide cross-sectional survey among pregnant women between February and March 2013. The interviews were conducted by USUMA GmbH, a professional market and research company. Pregnant women were recruited based on a special sampling frame designed as an area sample (ADM-Sampling-System for Face-to-Face Surveys), which allows the assembly of representative samples for Germany [24]. Inclusion criteria for study participation were (i) being at least 18 years of age, (ii) being at least 12 weeks pregnant, and (iii) having a good command of the German language as assessed by study assistants responsible for the recruitment and data collection process in an area. Women were recruited in different ways: either (i) direct outreach, whereby pregnant women were invited to participate by our study assistants at specific sampling points in places where pregnant women typically congregate (e.g. gynecologist's office, midwife's office, maternity clinic), (ii) distribution of information leaflets by study assistants in these places inviting women to contact them by phone if interested in participating, or (iii) asking women to inform other pregnant women about the study. To obtain a study sample approximately representative for factors relevant to the study question, recruitment procedures included the use of quota proportions for specific population characteristics (age, educational status, and nationality) that were previously associated with vaccination against seasonal or pandemic influenza in the general population in Germany [25–27]. For this purpose, at the beginning of the survey study assistants were provided with quotas derived from different datasets gathered by the Federal Statistical Office of Germany to be met during recruitment. Since no representative perinatal dataset was available for Germany, quotas were based on data of mothers' average age at the time of giving birth, on educational level of women of childbearing age, and on nationality of newborns and their parents, respectively.

All interested pregnant women were informed about the background, the objectives and the data protection and privacy related to this study. After providing verbal consent, participating women completed an anonymous, self-administered questionnaire that they returned directly to the study assistant. Participants did not receive any incentives. The institutional data protection officer of the Robert Koch Institute approved the study protocol; since no personal or clinical data were collected during the survey, an approval by the German Federal Commissioner for Data Protection and Freedom of Information was not required.

2.2. Study questionnaire and definitions

The questionnaire elicited socio-economic and demographic data as well as information on knowledge, attitudes, and behavior regarding seasonal influenza vaccination and the disease, information needs concerning influenza vaccination, pertussis vaccination status, as well as women's health status. Some of the sociodemographic items were used in previous surveys (such as the GEDA [28]), but were adapted to our setting. Further survey items were developed by reviewing the international literature. We applied single-item scales to the majority of items. Before study implementation, the questionnaire was pretested and subsequently modified.

To assess the influenza vaccination status for season 2012/13, we asked whether the women had been vaccinated since 1st September 2012 and whether this was during or before their pregnancy. Furthermore, we asked for any pertussis vaccination within the last 10 years. We assessed disease- and vaccination-related knowledge of influenza. For this purpose, participants were asked to give their level of agreement with different statements that were answered on a 4-point Likert scale supplemented with the option of "don't know". Under the assumption that both incorrect as well as lack of knowledge reflect a lack of awareness for the importance of obtaining vaccination, we collapsed responses into two categories "agreed/disagreed correctly" vs. "agreed/disagreed incorrectly", in which "don't know" was assigned to "incorrect". Vaccination-related questions were summed to obtain a knowledge score (range 0–4). We tested the scale's internal consistency and excluded one item to obtain a final Cronbachs $\propto$ of 0.7. Based on the distribution of quartiles, the range of vaccination knowledge score was divided into four levels of knowledge. Migration background was defined as described by Schenk et al. on the basis of parents' country of birth [29].

2.3. Data analysis

To control for possible selection biases, weighting factors were constructed. Since results of previous studies demonstrated that in Germany both age and place of residence were associated with influenza vaccine uptake in the general population [25,30], and since the above-mentioned quotas were not always fully met and did not take into account region-specific differences, we used the number of live births per federal state and per mother's year of birth to calculate respective weighting factors. These factors were created on the basis of population data gathered by the Federal Statistical Office of Germany for 2011 [31]. Statistical analysis was performed using StataSE12 (StataCorp LP, College Station, Texas, US) using complex survey methods.

Univariate and multivariate logistic regression analysis was applied to determine a potential association between influenza vaccine uptake during pregnancy and demographic characteristics, health-relevant factors, as well as attitude and knowledge. Odds ratios (OR) and 95% confidence intervals (CI) were calculated. Statistical significance was accorded when $p < 0.05$. All variables

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