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Investigation of Knowledge, Belief, and Practice of Influenza Vaccination of Doctors and Pregnant Women in an International Hospital in Beijing, China

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Abstract

Objective: To understand the status of knowledge, belief, and practice of influenza vaccine among doctors and pregnant women and explore the promotion strategy of vaccination coverage during pregnancy.

Methods: A cross-sectional study with a questionnaire survey was conducted among 30 doctors in Beijing United Family Hospital and 162 pregnant women who underwent prenatal check-ups in the hospital during November and December 2020.

Results: 93.3% of the doctors were willing to recommend influenza vaccine for pregnant women. 72.8% of pregnant women were unwilling or still considering whether to get an influenza vaccine, and the main reason for their hesitation was the fear of adverse reactions and adverse effects on the fetus. Previous pregnancy vaccination history and source of information about influenza vaccine affect pregnant women's willingness to receive an influenza vaccine ($P<0.05$). In the influenza season of 2020-2021, we put several improvement measures into practice; the vaccination rate of pregnant women in Beijing United Family Hospital was 6.3%, significantly higher than in previous years.

Conclusion: In summary, the awareness of pregnant women on influenza vaccination in Beijing United Family Hospital needs to be improved, and the improvement measures are effective.

Keywords: Pregnant women; Influenza vaccines; Vaccination coverage; Influencing factors; Interventions

Introduction

Multiple studies have confirmed that influenza vaccination during pregnancy can not only reduce risks of influenza, fever, preeclampsia, and premature rupture of membranes but also protect newborns within six months of age from influenza through transplacental antibodies, as well as reduce the incidence of adverse pregnancy outcomes such as stillbirth, low birth weight, and small-for-gestational-age infants [1-5]. The influenza vaccination rates for pregnant women in the UK were 45.2% and 43.7% in 2018-2019 and 2019-2020, respectively [6], and in the US, they were 53.7% and 61.2% in 2018-2019 and 2019-2020 [7,8]. However, the vaccination rate for pregnant women against the flu in China is generally low, with little research and data. The influenza vaccination rate for pregnant women in China was less than 1.5% between 2004 and 2014 [9]. The "Technical Guidelines for Influenza Vaccination in China 2021-2022" recommend influenza vaccination for pregnant women or women planning to become pregnant during the influenza season, and pregnant women can receive the vaccine at any stage of pregnancy [10]. This technical guideline was first established by the Chinese Center for Disease Control and Prevention in 2014, which included pregnant women as a priority group for influenza vaccination. In 2019, it was updated to include pregnant women and those planning to conceive. Despite having technical guidelines, influenza vaccination coverage was still low. In 2016, the influenza vaccination rate for pregnant women in Shenzhen Hospital was only 0.91% [11]. In 2019, only 6.8% of 439 pregnant women in a training class on pregnant-related knowledge at Beijing Obstetrics and Gynecology Hospital received influenza vaccination [12]. Two significant obstacles were identified [13]. Firstly, the national immunization program does not include influenza vaccines, and the public must bear the cost. Although some local governments fund influenza vaccines as part of their immunization program, the target population is mainly school-aged children and the elderly, not pregnant women. Secondly, the latest edition of the "Pharmacopoeia of the People's Republic of China" in 2015 lists pregnant women as a contraindication for receiving influenza vaccines and the same as most package inserts. This inconsistency confuses the concept of public health personnel and creates hesitation when recommending influenza vaccinations to pregnant women. Several Chinese studies [11-14] investigated pregnant women's knowledge, attitude, and practice (KAP), while no study was found to investigate doctors' or health professionals' perspectives.

United family healthcare is a pioneering, international-standard health system providing evidence-based, high-quality healthcare. Obstetrics and Gynecology department is our specialty and a prominent area of expertise. The influenza vaccination coverage among pregnant women in our hospital is even more worth paying attention to, as well as exploring the potential obstacles and improvement strategies. The pregnant women's awareness of the necessity and safety of influenza vaccines and the influencing factors for their attitudes and behaviors are worth investigating. An evaluation of doctors' knowledge and attitudes regarding influenza vaccination is warranted.

Objectives and Methods

Objectives

This article aims to analyze the current status and potential obstacles of influenza vaccination among pregnant women from the perspectives of doctors and pregnant women through a questionnaire survey, explore the factors influencing the willingness of pregnant women to receive vaccination, and take intervention measures to promote the vaccination of pregnant women against influenza in Beijing United Family Hospital.

Participants

Pregnant women received prenatal check-ups at Beijing United Family Hospital during the 2020-2021 influenza season; Obstetricians and primary care doctors provided medical services at Beijing United Family Hospital during the same period.

Methods

Questionnaire survey part: A questionnaire in both Chinese and English was designed for the survey. The survey was conducted using a QR code generated by Questionnaire Software. Pregnant women and doctors were invited to fill out the questionnaire. The pregnant women's questionnaire consisted of 16 questions, including basic information, history of influenza vaccination, information sources for influenza vaccination, understanding of influenza and influenza vaccines, willingness to receive influenza vaccination (unwilling, considering, willing, planned, and vaccinated), and reasons for their decision (See appendix 1). A scale was developed based on a similar survey [15] to assess pregnant women's understanding of influenza and influenza vaccines. The scale consisted of five factual statements about influenza and influenza vaccines. Five response options ranging from "strongly disagree" to "strongly agree" were provided, and each choice was assigned a score of 1-5. The average score for each item was calculated. The reliability and validity of the scale were verified using SPSS tools provided by Questionnaire Star. The scale's reliability was good, with a Cronbach's alpha coefficient of 0.811. The validity analysis showed that the factor loading coefficients were between 0.68 and 0.82, the KMO (Kaiser-Meyer-Olkin) value was 0.655, and the cumulative variance explained was 82.43%, indicating good validity. The doctors' questionnaire consisted of 13 questions, including basic information, whether they recommended influenza vaccination for pregnant women, recommended timing of immunization during pregnancy, training needs, most effective measures to increase vaccination rates among pregnant women, and the effectiveness and safety of influenza vaccination during pregnancy for pregnant women and fetuses (See appendix 2). The questionnaire content was drafted based on the research objectives and was determined after multiple discussions and revisions by the research team's experts. The English version was reviewed and revised by an American pharmacist.

Intervention part: Interventions that work or factors facilitate influenza vaccination among pregnant women were summarized based on a systemic literature review (See appendix 3 for literature review summary).

The following actions were taken in the 2020-2021 flu seasonal year based on literature review results and the hospital's actual situation : (1) multi-channel health education: health education posters; health education information on the official WeChat account; when pregnant women filled out a questionnaire by scanning a code and selected that they were not willing or considering getting vaccinated, a web-based vaccination education information would pop up; pharmacists actively collected questionnaires and explained influenza vaccine knowledge. (2) Green channel for pregnant women to get vaccinated: Pregnant women could directly make an appointment and get vaccinated on the day of their prenatal examination, only paying for the vaccine cost, and could allow one accompanying family member to get vaccinated simultaneously. (3) Doctors' active recommendations: strengthening continuing education for all medical staff and fully utilizing the influence of doctors to recommend vaccination during prenatal check-ups actively. Two CME (Continuing Medical Education) lectures were scheduled. In addition, we selected influenza vaccines that do not list pregnant women as a contraindication.

The action effects were tested by comparing the influenza vaccine rate among pregnant women over the historical years. The proportions of pregnant women who received influenza vaccines at the hospital during the 2018-2019, 2019-2020, and 2020-2021 flu seasons were retrieved from the hospital information system.

Calculations of the Proportion of pregnant women who received influenza vaccination at Beijing United Family Hospital during the influenza season from 2018 to 2021.

The influenza vaccination rate for pregnant women=number of pregnant women who received influenza vaccination at Beijing United Family Hospital during the influenza season/total number of pregnant women who visited Beijing United Family Hospital during the influenza season x 100%.

This study was approved by the Ethics Committee of Beijing United Family Hospital (2020-03-001-H01).

Statistical analysis

Excel 2016 and SPSS 23.0 were used for data collection and statistical analysis. The chi-square test was used to compare the influenza vaccination rates of pregnant women in 2020-2021 with that of previous seasonal years of 2018-2019 and 2019-2020 and to analyze the effects of various categorical variables on the knowledge and behavior of pregnant women and doctors regarding influenza vaccination. The outcome variable was analyzed as the proportion of pregnant women who were willing to receive, had planned to receive, or had already received the influenza vaccine when evaluating the influencing factors on pregnant women's willingness. Fisher's exact probability method was used when the expected cell count was less than 5. Pairwise comparisons between groups were performed using the chi-square segmentation method, and the test level was adjusted using the Bonferroni method. Two-tailed tests were used, and the significance level was set at $\alpha=0.05$.

Results

Characteristics and Demographics

(1) Response from doctors: The survey was conducted from November 13, 2020, to November 26, 2020, and 30 responses were

received (27 responses from Chinese doctors and three replies from foreign doctors). The response rate for obstetricians was 89.5% (17/19), and the response rate for primary care doctors was 46.4% (13/28).

(2) Response from Pregnant Women: The survey was conducted from November 13, 2020, to December 31, 2020, and 162 responses were received (155 in Chinese and 7 in English). The pregnant women ranged from 21 to 45 years, with a median age of 32. The other essential information is summarized in table 1.

Survey Results on Knowledge, Attitudes, and Practices of Pregnant Women

Knowledge of Influenza and Influenza Vaccines among Pregnant Women: The results of the survey showed in figure 1. They agreed that influenza could induce severe complications for the mother and the baby. Their attitudes to the necessity and safety of influenza vaccine during pregnancy were between unsure and agreed. 47.5% (77/162) of them were unsure whether receiving a flu shot during pregnancy was necessary. 51.9% and 45.1% of pregnant women were unsure of the safety of influenza vaccine for fetuses and mothers.

Willingness and Reasons for Pregnant Women to Receive Influenza Vaccines: The results are shown in figure 2. In total, 72.8% of pregnant women were unwilling or still considering receiving the influenza vaccine. The reasons for this were concerns about adverse reactions (63.8%), concerns about the vaccine harming the baby (58.6%), the belief that it was unnecessary to receive the influenza vaccine during pregnancy (18.1%), lack of recommendation from a doctor (11.2%), contraindications to vaccination (7.8%), inconvenient appointment and scheduling (5.2%), previous adverse reactions to influenza vaccines (2.6%), and other reasons (4.3% believed that the risk of infection was low during the COVID-19 pandemic or it was not possible to receive vaccines during pregnancy).

27.2% of pregnant women were willing to receive, had planned to accept, or had already received the influenza vaccine. The reasons for this were that receiving the influenza vaccine could protect themselves and their babies (84.6%), a recommendation from a doctor (46.2%), the belief that the influenza vaccine was safe (30.8%), previous experience of receiving the influenza vaccine (28.2%), prior experience of receiving the influenza vaccine during pregnancy (7.7%), and being a healthcare professional (2.6%).

Factors Affecting the Willingness of Pregnant Women to Receive Influenza Vaccines: Compared to Chinese pregnant women, foreign pregnant women were more willing to accept the influenza vaccine (P=0.016). However, only seven foreign pregnant women were included, which is hard to conclude the nationality factor. Pregnant women who had a history of receiving the influenza vaccine during a previous pregnancy were more willing to receive the influenza vaccine than those who had received the vaccine outside of pregnancy or had never received the vaccine (P<0.001). The proportion of pregnant women who were willing to accept or had planned to receive or had already received the influenza vaccine was higher among those who received information about the influenza vaccine from doctors at the hospital than those who received information from other hospital staff other than doctors (pharmacists, nurses, and receptionists) (P=0.018). No significant effects of education level or gestational age on the willingness to accept the influenza vaccine were found among pregnant women. If only considering actual behavior "had already received the influenza vaccine," only nationality (P=0.009) and previous vaccination history during pregnancy (P<0.001) returns statistically significant.

Survey Results on Knowledge, Attitudes, and Practices of Doctors

Analysis of Doctor's Recommendations for Pregnant Women to Receive Influenza Vaccines: 93.3% of doctors recommended pregnant women receive the influenza vaccine, of which 82.1% believed pregnant women could receive the vaccine at any stage of pregnancy. 6.7% of doctors chose not to recommend the vaccine, citing concerns about increasing clinical workload and respecting the choices of pregnant women. Among Chinese doctors, 92.6% (25/27) were willing to recommend the vaccine, and among foreign doctors, 100% (3/3) were willing to recommend the vaccine. The difference was not statistically significant (Fisher's exact test P=1.0).

Doctors Views on the Most Effective Measures to Increase Vaccination Rates Among Pregnant Women:

The most effective measure was to strengthen public education on the necessity and safety of influenza vaccine during pregnancy, followed by professional recommendations from doctors. Other measures included simplifying the appointment process for pregnant women to receive the vaccine, providing brands with package inserts more friendly to pregnant women, and government or public health policy support Figure 3.

Table 1: Survey results of basic information on pregnant women.

	Number	Percentage
Nationality		
China	155	95.70%
Other countries	7	4.30%
Trimesters		
The first trimester	32	19.80%
The second trimester	46	28.40%
The third trimester	84	51.80%
Educational Level		
Doctoral degree or above	6	3.70%
Master's degree	63	38.90%
Bachelor's degree	82	50.60%
College degree or below	11	6.80%
Have you previously received a flu shot?		
No	85	52.50%
Yes, outside the pregnancy period	57	35.20%
Yes, during one or more previous pregnancies	12	7.40%
Not sure	8	4.90%
Where did you get information about flu shots?		
Doctor	68	42.00%
Nurse	18	11.10%
Pharmacist	25	15.40%
Receptionist	5	3.10%
Other hospitals' staff	12	7.40%
WeChat articles of United family hospital	32	19.80%
Other media's WeChat articles	39	2.40%
Others (YouTube et al., TV, radio, newspapers, magazines, et al.)	40	24.70%

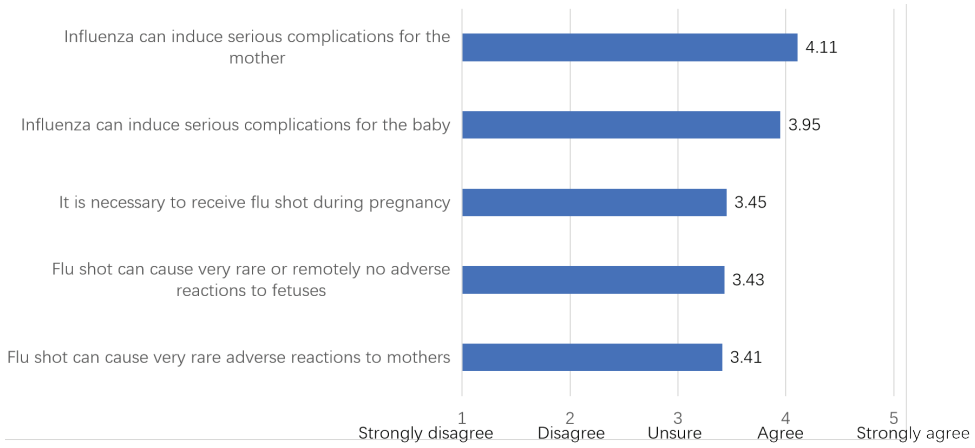

Figure 1: Summary of findings from awareness scales for influenza and influenza vaccine among pregnant women.

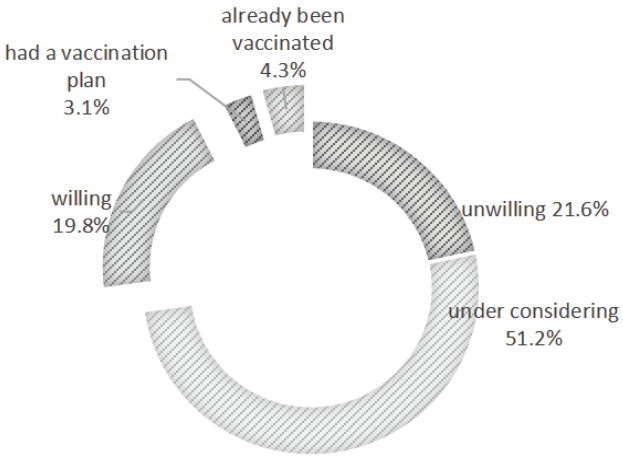

Figure 2: The proportion of pregnant women's willingness to receive influenza vaccines.

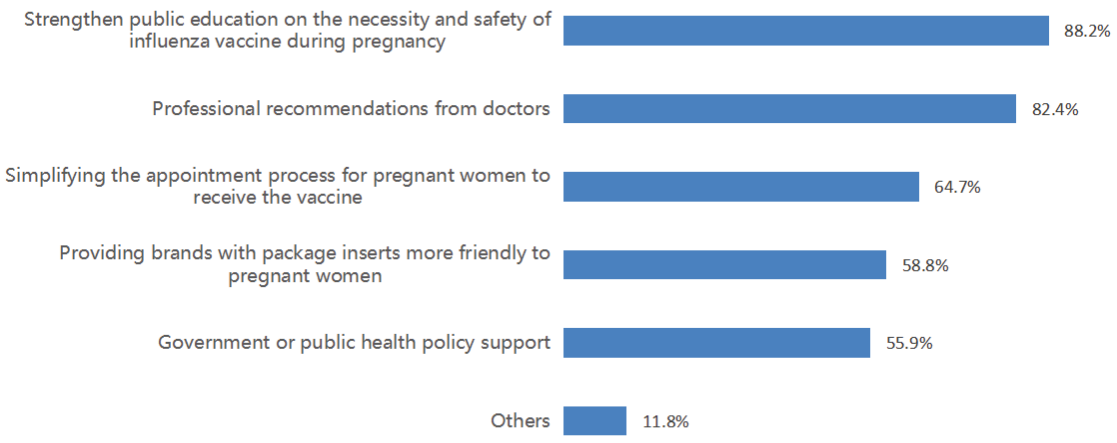

Figure 3: Doctors views on the most effective measures to increase vaccination rates among pregnant women.

Table 2: Distribution of pregnant women vaccinated with influenza vaccine in Beijing United Family Hospital during different pregnancy periods.

Years	The first trimester (%)	The second trimester (%)	The third trimester (%)	χ2	P
2018-2019	11 (22.9%)	21 (43.8%)	16 (33.3%)	4.688	0.096
2019-2020	13 (18.3%)	35 (49.3%)*	23 (32.4%)	15.380	<0.001
2020-2021	11 (9.5%)	58 (50.0%)*	47 (40.5%)	46.888	<0.001

*Compared with the first trimester of pregnancy, P<0.05.

Others: Doctors wrote in free texts as "In China, imported vaccines may be more acceptable to patients than domestic ones; Update the package inserts; No charge for consultation fees."

Proportions of Pregnant Women Who Received Influenza Vaccines at Beijing United Family Hospital in the Past Three Flu Seasons

(1) The proportions of pregnant women who received influenza vaccines at the hospital during the 2018-2019, 2019-2020, and 2020-2021 flu seasons were 1.6%(48/2927), 2.9%(71/2432), and 6.3%(116/1830), respectively. The differences in vaccination rates between each year were statistically significant ($\chi2=80.046$, $P<0.001$). (2) In the 2019-2020 and 2020-2021 flu seasons, there were significant differences in the proportions of pregnant women who received the influenza vaccine at different stages of pregnancy, with a significantly higher proportion in the second trimester compared to the first trimester, as shown in table 2.

Discussion

This is the first study of KAP (Knowledge, Attitude, and Practice) exploring pregnant women and doctors in a non-public medical institution in China.

Consistent with the previous study finding [16], believing the potential of vaccine-induced harm is the primary reason for vaccination hesitation among pregnant women based on the questionnaire results.

Several related studies about influenza vaccination among pregnant women in Chinese public hospitals exist. Compared with those existing studies [9-10, 14], the strengths of our study are: (1) we investigated both doctors and pregnant women's attitudes and behavior. Although 93.33% of doctors were willing to recommend influenza vaccination, only 27.1% (42/155) of Chinese pregnant women and 85.17% (6/7) of foreign pregnant women reported that their doctors actively recommended it. This indicates that there may still be many obstacles for doctors to recommend vaccination in practice, changing their willingness to action. (2) Promotion actions were taken in the study, and the effect was evaluated with historical comparison. None of the existing studies put intervention measures into practice. The influenza vaccination rate for pregnant women during the 2020-2021 influenza season at United Family Healthcare in Beijing significantly increased compared to previous years. These measures in the study could be effective ways for promotion.

Doctors remain an effective source of information for pregnant women to obtain information about influenza vaccination. In 2020, a systematic review by Kilich et al. [16] showed that a doctor's professional recommendation is the most effective measure to improve influenza vaccination rates (OR 12.02, 95% CI 6.80-21.44) and emphasizing the protective effect of influenza vaccination on newborns when recommending the vaccine may be more effective [17]. Training for doctors not only knowledge base but also communication or counseling skills may be needed for better practice.

Regarding the influencing factors, there is meta-analysis using Chinese language databases[18] concluded that a few factors influenced the rate, including vaccination policy, vaccination history, and knowledge and attitudes toward influenza and vaccination. In comparison, the study was for all populations instead of pregnant women. The study by Su Lixian et al. [11] found that citizenship, being a doctor, recommendations from doctors, and knowing the government policy were associated with influenza vaccination of pregnant women. The study by Chaohong H, et al. [12] investigated pregnant women's cognition and behaviors of immunization of five vaccines, including the influenza vaccine, by questionnaire. 53.5% (235/439) of pregnant women know they can receive the influenza vaccine during pregnancy. 6.8% of pregnant women receive the influenza vaccine. The likelihood of vaccination may be related to the educational level. Our study did not find a relationship between education level and pregnant women's vaccination willingness or behavior, possibly because access to quality health education information is no longer limited by education level in today's world of accessible new media. The study [12] investigated five vaccines instead of only the influenza vaccine, which is a mixed result that may cause these different results.

Our study found that pregnant women with a history of influenza vaccination during pregnancy have a significantly higher willingness to get vaccinated than those with a history of non-pregnancy vaccination or no vaccination history. This is particularly significant in the context of China's policy of allowing families to have up to three children.

This survey showed that among pregnant women who were willing to or had planned to get vaccinated or had already been vaccinated, 43.75% obtained information from the official WeChat account of United Family Healthcare, while 41.18% obtained information from doctors. This suggests that new media platforms such as official WeChat accounts are efficient channels of high quality for health education and should be fully utilized.

The second trimester may be a good time for recommendation. The study did not find any significant influence of the stage of pregnancy on pregnant women's willingness to get vaccinated against influenza. However, the proportion of pregnant women who received the vaccine was higher in the second trimester. This may be related to pregnant women's inherent beliefs that the second trimester is relatively safe.

Limitations of the study: (1) The study was limited to one hospital with a small sample size, and multi-center studies with a larger sample size are needed. Influencing factors such as nationality cannot be concluded due to the small sample size. (2) The study subjects were all from a non-public medical institution, and selection bias may exist when extrapolating the results. (3) The statistics on influenza vaccination rates were limited to data from pregnant women who received the influenza vaccine at United Family Healthcare in Beijing. (4) The promotion measures were mixed and not standardized for circulation. The effect size was not specified due to the study design and methodology limitations. (5) The doctor's number is relatively low. However, the response rate of obstetricians is high, and the results could at least represent all obstetricians in our hospital. Since all pregnant women visited the Obstetrics department, the gap could be seen between the reporting data from pregnant women about

whether their doctors recommend the vaccination and the data from doctors about their willingness to recommend the vaccination. (6) The questionnaire for doctors has yet to be strictly validated. Chua (2014) [19] and MacCallum, Widaman, Zhang, & Hong (1999) [20] suggested that the number of sample sizes should be greater than five times the number of variables. The sample size of pregnant women (more than ten times) met this criterion, while the doctors' number did not meet. In addition, the respondents' pre-survey and feedback will further help improve the accurate description of the questionnaire questions and options.

In summary, the awareness of influenza vaccination among pregnant women needs to be improved. The education of safety should be further strengthened. The influenza vaccination rate could be improved by health education, simplifying the vaccination process and doctors' recommendations, and removing the inconsistency barrier of package inserts content. However, the influenza vaccine coverage among pregnant women in China is far from ideal.

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