

Knowledge, attitudes, and acceptability about influenza vaccination in Korean women of childbearing age

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Objective

The aims of the present study were to investigate the women's perspective on influenza infection and vaccination and to evaluate how they influence vaccine acceptability, in Korean women of childbearing age.

Methods

This was a prospective study by random survey of women of childbearing age (20 to 45 years). They were asked to complete a questionnaire assessing their knowledge, attitudes and acceptability of influenza vaccination before and during pregnancy. This study utilized data from the Korea National Health and Nutrition Examination Survey (KNHANES) between 2008 and 2012, to analyze the recent influenza vaccination trends.

Results

According to KNHANES (2008–2012), influenza vaccination rates in women of childbearing age have increased up to 26.4%, after 2009. The questionnaire was completed by 308 women. Vaccination rate during pregnancy or planning a pregnancy was 38.6%. The immunization rate increased significantly with the mean number of correct answers ($P<0.001$). Women who received influenza vaccination were more likely to be previously informed of the recommendations concerning the influenza vaccination before or during pregnancy, received the influenza vaccination in the past, and of the opinion that influenza vaccination is not dangerous during pregnancy, with odds ratios of 14.6 (95% confidence interval [CI], 6.44 to 33.33; $P<0.0001$), 3.6 (95% CI, 1.84 to 6.97; $P=0.0002$) and 2.7 (95% CI, 1.34 to 5.47; $P=0.0057$).

Conclusion

Influenza vaccination rate in women of childbearing age has increased in this study and national data. More information and recommendation by healthcare workers, especially obstetricians, including safety of vaccination, might be critical for improving vaccination rate in women of childbearing age.

Keywords: Childbearing; Influenza, human; Vaccination; Women

Introduction

Influenza (flu) is a major cause of worldwide morbidity and mortality. It has been reported that pregnant women have higher rates of infection and hospital admission, and are at increased risk of maternal complications and serious neonatal outcomes, such as neonatal intensive care unit admission, increased rates of stillbirth and preterm birth [1-3]. Vaccination is the primary method of prevention against influenza infection and its resulting complications [4,5]. One additional potential benefit of maternal vaccination is a reduction in the risk of disease through transplacental antibody transfer in in-

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fants during the first several months [5,6].

Influenza immunization has thus been routinely recommended in the US since 2004 and the World Health Organization since 2005, at any time during pregnancy [7,8]. Despite existing recommendations and data on the effectiveness and safety of vaccine, the influenza vaccine is underused in most countries.

The influenza A (H1N1) 2009 pandemic was responsible for at least 18,449 reported deaths globally [9], of which pregnant women represented 4% to 13% [10,11]. However, maternal influenza immunization rate in Korea were very low in the previous studies [12,13]. The Korean Centers for Disease Control and Prevention (KCDC) firstly published 'Guidelines of vaccination for adult' at 2012, wherein it recommended that pregnant women and women who are planning pregnancy at flu season should have priority for influenza vaccination [14].

The awareness of influenza vaccination for women of childbearing age is expected to improve, but there is still limited data evaluating the perception of women of childbearing age on influenza vaccination. The aims of the present study were to investigate the women's knowledge and beliefs towards influenza infection and vaccination and to evaluate how they influence vaccine acceptability during pregnancy, by analyses of recent influenza vaccination trends in Korean women of childbearing age.

Materials and methods

1. Analysis of data from national survey

This study utilized data from the Korea National Health and Nutrition Examination Survey (KNHANES) between 2008 and 2012. The KNHANES was conducted by KCDC to examine the general health and nutritional status of Koreans. To select a representative sample of the Korean population, a stratified three-stage clustered probability design (local district, enumeration district, and household) was utilized. To elucidate the influenza vaccination rate in women of childbearing age in Korea, we analyzed 8,518 women participants to the KNHANES aged between 20 and 45 years, with known influenza vaccination status. We analyzed the KNHANES data considering the weight values, according to the complex sampling design.

2. Prospective random survey of women of childbearing age

This was a prospective study by random survey of women of

childbearing age (20 to 45 years) in Seoul and the surrounding area (25,000,000 inhabitants). This study was conducted by means of a self-administered close-ended questionnaire which was distributed by the medical staff in outpatient clinics of obstetrics and gynecology departments in the five primary, secondary, or tertiary hospitals, between October 2012 and July 2013. This study and waiver of written consent was approved by institutional review boards of Catholic University of Korea. Among women of childbearing age who visited the hospitals, women who were planning a pregnancy within 3 months, being pregnant, or in postpartum 6 months were included in this study. This study and waiver of written consent was approved by institutional review boards. They were asked to fill in a questionnaire in the clinic, assessing their knowledge, attitudes and acceptability of Tdap vaccination. No exclusion criterion was applied. Willingness to complete the questionnaire was the only requirement to participate in the study. However, women who were planning pregnancy were surveyed between October 2012 and December 2012, to consider flu season. Postpartum women were asked about vaccination during pregnancy. They were required to complete a questionnaire assessing their knowledge, attitudes and acceptability of influenza vaccination before and during pregnancy.

1) Questionnaire design

The questionnaire by Blanchard-Rohner et al. [15] in Switzerland, adapted from a previous questionnaire established and validated by a Canadian group [16,17], was applied with permission. It consisted of 21 questions grouped into 3 sections (Appendix 1). Section 1 was intended to evaluate the factual knowledge of influenza in general and in specific risk groups (pregnant women and young children), influenza vaccine, its safety and its recommendations during pregnancy. Section 2 contained questions about the pregnancy and the influenza vaccination status. Section 3 consisted of demographic questions (age, education level, etc.). The English questionnaire was translated in Korean. It was pretested for clarity and comprehensiveness with 3 to 5 women without medical background.

2) Statistical analyses

The primary outcome variable was each woman's response to influenza vaccination, during pregnancy, or planning a pregnancy within 3 months, during the flu season. We analyzed the frequency of each response in relation to all variables

including demographic characteristics, knowledge, attitude, and risk perception in this study. Chi-square test, Fisher's exact test, or *t*-test were used to identify significant associations between women's vaccination and their survey responses. The variables with $P < 0.10$ in univariate analyses, were entered into the stepwise multiple logistic regression analysis to identify factors associated with influenza vaccination, planning or during pregnancy. All statistical analyses were conducted using SAS ver. 12.1 (SAS Institute, Cary, NC, USA). A *P*-value of 0.05 or less was considered significant.

Results

1. Influenza vaccination rates in women of childbearing age from KNHANES (2008–2012)

From the KNHANES (2008–2009), influenza vaccination rates in women of childbearing age were less than 20% (Fig. 1). Since 2010, vaccination rate showed increasing tendency up to 26.4% at 2012 KNHANES.

2. Prospective random survey results of childbearing aged women

1) Demographic characteristics

During the study period, the complete survey response rate for individuals who agreed to participate was 97.2% (308/317). Demographic characteristics were presented in Table 1. The median age was 32.2 ± 4.1 years and most women (99.0%) received more than high school education level. Two hundred fifty-five women (84.1%) were in ongoing pregnancy, 127 women (41.2%) were housewives and 49 women (15.9%) were health care workers. Vaccination rate during pregnancy or planning a pregnancy was 38.6%. Groups were separated according to the influenza vaccination during pregnancy or planning a pregnancy. There was no significant difference among groups in mean age, parity, education level, monthly family income level, and occupation. However, women aged < 25 years old and > 35 years old, and women who were planning a pregnancy and were in postpartum were significantly higher in the non-vaccination group ($P = 0.0015$ and $P < 0.0001$, respectively).

2) Knowledge about influenza and influenza vaccination

A summary of the questions with the corresponding percent-

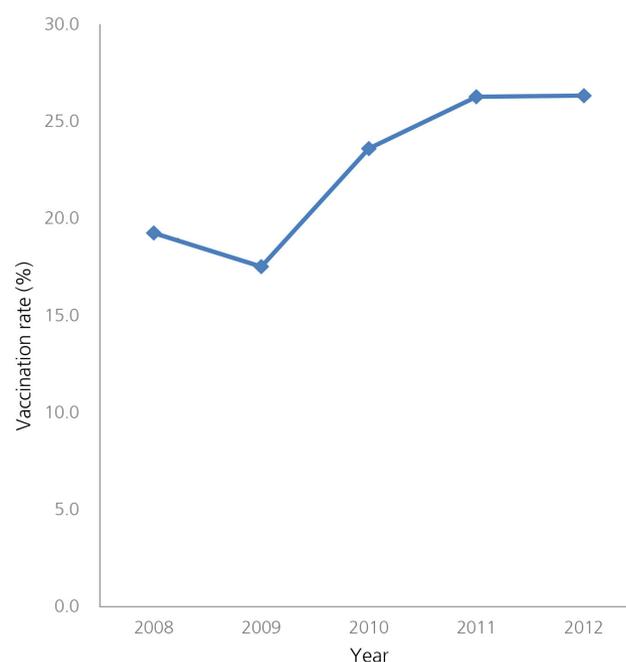


Fig. 1. Influenza vaccination rates in 8,518 women participants (aged between 20 and 45 years), to the Korea National Health and Nutrition Examination Survey between 2008 and 2012.

age of correct answers were given in Table 2, with a comparison between vaccinated and non-vaccinated women. Significant differences were found between women who received influenza vaccination in 1) perceived risk of hospitalization in young children infected by influenza ($P = 0.0116$), 2) awareness about recommendation by Korean government about influenza vaccination, during pregnancy ($P < 0.0001$), and 3) concern about safety of influenza vaccination during pregnancy and breastfeeding ($P < 0.0001$ and $P = 0.0002$, respectively), including risk of preterm birth by vaccination ($P = 0.0002$). We observed a higher proportion of correct answers in vaccinated than non-vaccinated women concerning the risks of influenza complications during pregnancy and the existence of a recommendation for pregnant women. The immunization rate increased significantly with the mean number of correct answers ($P < 0.001$)

3) Information sources and personal experience with influenza vaccination

Information sources with respect to influenza vaccination were summarized in Table 3. More vaccinated women had been previously informed and previously received influenza vaccination in the past ($P < 0.0001$, respectively). More than 60% of vaccinated women received influenza vaccination in obstetric

Table 1. Characteristics according to influenza vaccination

Characteristics	Vaccination (n=119)	No-vaccination (n=189)	P-value
Age (yr)	32.5±3.4	32.0±4.5	0.3360
≤25	0 (0.0)	14 (7.4)	0.0015
26–35	99 (83.2)	135 (71.4)	
≥36	20 (16.8)	40 (21.5)	
Parity			0.1196
Primiparous	49 (41.2)	95 (50.3)	
Multiparous	70 (58.8)	94 (49.7)	
Education			0.1425
Less than elementary school	0 (0.0)	3 (1.6)	
Middle school			
High school	14 (11.8)	34 (18.0)	
College or above	105 (88.2)	152 (80.4)	
Pregnancy status			<0.0001
Planning pregnancy	1 (0.8)	35 (18.5)	
Ongoing pregnancy	115 (96.6)	144 (76.2)	
Postpartum status	3 (2.5)	10 (5.3)	
Monthly family income (US dollar)			0.0547
≤1,000	0 (0.0)	2 (1.1)	
1,000–3,000	27 (22.7)	66 (34.9)	
3,000–5,000	47 (39.5)	68 (36.0)	
≥5,000	45 (37.8)	53 (28.0)	
Job			0.2259
Housewife	55 (46.2)	72 (38.1)	
Office worker	20 (16.8)	36 (19.1)	
Production worker	1 (0.8)	5 (2.7)	
Service worker	0 (0.0)	6 (3.2)	
Self-employed	0 (0.0)	4 (2.1)	
Professional	15 (12.6)	28 (14.8)	
Student	0 (0.0)	1 (0.5)	
Health care worker	22 (18.5)	27 (14.3)	
Others	6 (5.0)	10 (5.3)	

Values were presented as mean±standard deviation or n (%); P-values were obtained by chi-square or Fisher's exact test.

department of clinics or university hospital. Main reasons for non-vaccination were insufficient information (61.2%) and safety concern about influenza vaccination (26.1%). To change opinion in the non-vaccinated group, sufficient information and recommendation by health care workers was considered as the most important factor (47.8%).

4) Factors associated with the influenza vaccination—stepwise multiple logistic regression

The variables with $P < 0.10$ in univariate analyses, were entered into the stepwise multiple logistic regression analysis. The variables with $P < 0.10$ were pregnancy status, monthly family income, knowledge items of 1, 3, 4, 5, 6, 7, 8, and 9, number of correct answers, previous information about recommendations concerning the flu vaccination before or during pregnancy, and past experience about flu vaccination. In the stepwise multiple logistic regression model, women who received influenza vaccination were more likely to be previously informed of the

Table 2. Knowledge on influenza and influenza immunization

Items	Vaccination (n=119)	No-vaccination (n=189)	P-value
Flu is contagious (T)	116 (97.5)	175 (92.6)	0.0767
Typical season's of flu circulation (winter)	89 (74.8)	142 (75.1)	0.9461
Flu can sometimes be serious enough that a person needs to be admitted to hospital (T)	117 (98.3)	176 (93.1)	0.0545
Young children have a higher risk of hospitalization for flu compared to adults (T)	118 (99.2)	176 (93.1)	0.0116
Pregnant women have a higher risks of flu complications (T)	105 (88.2)	153 (81.0)	0.0915
In Korea, it is recommended that all pregnant women and women who are planning her pregnancy at flu season be immunized (T)	105 (88.2)	94 (49.7)	<0.0001
The flu vaccine is not dangerous during pregnancy (T)	90 (75.6)	47 (24.9)	<0.0001
The flu vaccine is not dangerous during breastfeeding (T)	46 (38.7)	36 (19.1)	0.0002
Studies have shown that the flu vaccine can cause preterm births (F)	31 (26.1)	19 (10.1)	0.0002
Total number of correct answers	6.9±1.4	5.4±1.6	<0.0001
0-3	2 (1.7)	21 (11.1)	
4-6	42 (35.3)	124 (65.6)	
7-9	75 (63.0)	44 (23.3)	

Values were presented as number of correct answers (%) or mean±standard deviation; P-values were obtained by chi-square test, Fisher's exact test, or t-test.

T, true; F, false.

recommendations concerning the influenza vaccination before or during pregnancy; have received influenza vaccination in the past; and think that influenza vaccination is not dangerous during pregnancy; with odds ratios of 14.6 (95% confidence interval [CI], 6.44 to 33.33; $P<0.0001$), 3.6 (95% CI, 1.84 to 6.97; $P=0.0002$) and 2.7 (95% CI, 1.34 to 5.47; $P=0.0057$) (Table 4).

Discussion

Between 2008 and 2012, influenza vaccination rate in women of childbearing age from the analysis data of the KNHANES has increased since 2010. In this prospective study, vaccination rate during pregnancy or planning a pregnancy was 38.6%, which was much higher than previous studies [12,13]. In 2009, while undergoing an influenza pandemic, the recognition of influenza vaccination for women of childbearing age was expected to improve. It might also have lead to the recognition that obstetricians should recommend influenza vaccination. However, this study comprised a relatively high percentage of women who were health care workers and might have thus affected the vaccination rate. In Korea, an influenza epidemic usually occurs from October to April of the following

year, with the peak of the epidemic usually in December and January. The basic elements for influenza prevention and control in medical institutions include the following [18]: influenza vaccination, adherence to precautions, influenza surveillance, infection control according to the environment and facilities of the institution, use of prophylactic and therapeutic antiviral agents, education of patients, guardians, and medical staff.

Vaccination is the most effective way to prevent influenza, and pregnant women are included in priority subjects for vaccination. Additionally, KCDC included women planning a pregnancy during flu season as priority subjects and a recent guideline approved by Korean Society of Infectious Diseases and Korean Society for Nosocomial Infection Control included postpartum women (within 2 weeks post-delivery) as priority subjects [14,18]. Our study did not investigate vaccination rate postpartum, but investigated the vaccination status during pregnancy, in postpartum women.

In this study, recommendation of influenza vaccination before or during pregnancy, past experience of influenza vaccination, and the information that influenza vaccination is not dangerous during pregnancy were significant factors associated with influenza vaccination in stepwise multiple logistic regression analysis. Therefore, inadequate information and recommendation, as well as safety concern about the vaccina-

Table 3. Sources of information and personal experience with influenza vaccination

Items	Vaccination (n=119)	No-vaccination (n=189)	P-value
Were previously informed of the recommendations concerning the flu vaccination before or during pregnancy			<0.0001
No	10 (8.4)	137 (72.5)	
Yes	109 (91.6)	52 (27.5)	
If informed previously, source of information			0.0048
Only HCW (doctor/midwife/nurse)	74 (69.2)	22 (42.3)	
Only other sources (TV/radio/newspaper/internet/friends)	24 (22.4)	23 (44.2)	
HCW+other sources	9 (8.4)	7 (13.5)	
Had been received the flu vaccination in the past			<0.0001
No	28 (23.5)	109 (57.7)	
Yes	91 (76.5)	80 (42.3)	
Healthcare center received the flu vaccination before or during pregnancy			
OBGYN clinic	36 (30.3)		
Family medicine	8 (6.7)		
Internal medicine	19 (16.0)		
Pediatrics	13 (10.9)		
OBGYN at the university hospital	41 (34.5)		
Public health center	2 (1.7)		
Reasons for non-vaccination (several options possible)			
Were not sufficiently informed		115 (61.2)	
Did not consider the flu as dangerous enough		2 (1.1)	
Held an general "anti-vaccine" attitude		2 (1.1)	
Lacked belief in the efficacy of the vaccine		20 (10.6)	
Did not consider the flu vaccine risk-free		49 (26.1)	
If not vaccinated, might change their opinion			
No		50 (30.3)	
Yes		115 (69.7)	
If yes, which can change your opinion			
Sufficient information and recommendation by HCW		53 (47.8)	
Information from other sources (TV/radio/newspaper/internet)		40 (36.0)	
Recommendation by their family/friends		1 (0.9)	
Sufficient information and recommendation by HCW+other sources		16 (14.4)	
Others		1 (0.9)	

Values were presented as number of answers (%); P-values were obtained by chi-square test.

HCW, health care worker; OBGYN, obstetrics and gynecology.

tion, before or during pregnancy, might be important barriers in women of childbearing age. 64.8% of women who were pregnant or planning a pregnancy received influenza vaccination in obstetric departments. Therefore, education of patients, guardians, and medical staffs in obstetric departments might be important.

Several studies already suggested that obstacles to influenza immunization include insufficient awareness of the disease burden and of the importance and safety of immunization, and insufficient recommendation by medical staffs [15-17,19,20]. Information pamphlets with correct recommendations significantly increased influenza vaccination rates

Table 4. Factors associated with influenza vaccination

Factors	Odds ratio	95% confidence interval	P-value
Were previously informed of the recommendations concerning the flu vaccination before or during pregnancy			
No	1	-	
Yes	14.6	6.44–33.33	<0.0001
Had been received the flu vaccination in the past			
No	1	-	
Yes	3.6	1.84–6.97	0.0002
The flu vaccine is not dangerous during pregnancy			
Incorrect	1	-	
Correct	2.7	1.34–5.47	0.0057

P-values were obtained by stepwise multiple logistic regression using factors with $P < 0.10$ in univariate analyses.

in Canada [17]. In a USA study, physician education program and distribution of posters advertising the influenza vaccine to all offices offering prenatal care in local areas increased influenza vaccination rates from 19% to 31% [19]. The patient recall rates for influenza vaccination to pregnant women were also increased from 28% to 51% [19]. Because women are especially concerned of their own health and the baby's health, before pregnancy, during pregnancy and breastfeeding, it seems that education might be effective and vaccination rate can increase, if adequate information and recommendations on safety of vaccination are provided by medical staff. Prepregnancy counseling during flu season needs to include influenza vaccination. Furthermore, if Korean government incurs vaccination cost at least for pregnant women, the vaccination coverage in this high risk population will increase. Historically, national immunization programs have been successful in Korea, i.e., the fight against tuberculosis, prevention of Vertical Transmission of Hepatitis B program, measles elimination [21]. It reflects great interest of public health related to vaccination, including the awareness of preventable diseases and safety issues of vaccines, in Korea. It seems that active information communication, in digital information era, took an important role in Korea.

In conclusion, influenza vaccination rate in women of child-bearing age was increased in this study and national data. More information and recommendation by healthcare workers, especially by obstetricians, including the safety of vaccination, might be critical to improving the vaccination rate in women of childbearing age.

Conflict of interest

No potential conflict of interest relevant to this article was reported.

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Appendix 1. Questionnaire about influenza (the flu) and the influenza vaccine

Please tick each of the boxes that correspond to your answer(s):

A. Few questions concerning influenza (flu) and its vaccine:

1. Flu is contagious. (1 answer only)
True False Don't know
2. What season(s) of the year does flu typically occur? (Tick as many as you think correct)
 Spring
 Summer
 Autumn
 Winter
3. Flu can sometimes be serious enough that a person needs to be admitted to the hospital.
True False Don't know
4. Young children have a higher risk of hospital admission due to the flu than adults.
True False Don't know
5. Pregnant women have a higher risk of complications from the flu than non-pregnant women.
True False Don't know
6. In Korea, it is recommended that pregnant women who will deliver their baby during flu season get the flu vaccine.
True False Don't know
7. The flu vaccine is not dangerous during pregnancy.
True False Don't know
8. The flu vaccine is not dangerous during breastfeeding.
True False Don't know
9. Studies have shown that the flu vaccine during pregnancy can cause preterm delivery.
True False Don't know
10. Before giving birth, have you known/been informed that pregnant women are advised to be vaccinated against influenza?
No Yes
→ if yes, how/through whom did you get that information? (Please tick all answers that apply.)
 TV/radio
 Internet
 Books / magazines / pamphlets
 A doctor, midwife, nurse
 Family, friends
 Other source(s):

B. Few questions regarding your own pregnancy:

11. Have you ever received a flu vaccine (before your pregnancy)?
Yes No Don't know
12. Have you ever been received the flu vaccine during your pregnancy?
No Yes
→ if yes, where? Please tick all answers that apply:
 OBGYn clinic
 Family medicine
 Internal medicine
 Pediatrics
 OBGYn at the university hospital
 Public health care center
13. If you have not received the flu vaccine during your pregnancy, what would you consider the reason(s)? (Please tick all the options that apply)
 I was not / have not been sufficiently informed.
 I don't think the flu is very dangerous.
 I am against vaccines in general.
 I don't think the flu vaccine is very efficient.
 I don't think that the flu vaccine is entirely safe.
14. Do you think anything could have changed your mind?
No Yes
→ if yes, which can change your opinion?
 Sufficient information and recommendation by HCW
 Information from other sources (TV/radio/newspaper/internet)
 Recommendation by their family/friends
 Sufficient information and recommendation by HCW+other sources
 Others

C. Demographic questions

15. How old are you? [] [] []
16. How many children have you already had before this pregnancy? [] [] []
17. What is your pregnancy status?
Preparing pregnancy (within 3 months)
Pregnancy Postpartum (within 6 months)
18. How is your monthly family income?
≤1,000 1,000–3,000 3,000–5,000 ≥5,000
19. What is your profession?.....
20. What is your highest level of education?
Less than elementary school Middle school
High school College or above

Thank you so much for your time!