

Influenza Vaccination During Pregnancy And Influencing Factors In Korea: A Multicenter Questionnaires Study of Pregnant Women and Obstetrics and Gynecology Doctors.

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Abstract

Background

Our objective was to investigate: (1) the proportion of influenza vaccination, attitudes, and barriers among pregnant women, (2) the proportion of obstetrics and gynecology (OBGYN) doctors who routinely recommend influenza vaccination in pregnant women, and (3) the influencing factors in Korea, during the flu season of 2019-2020, following the introduction of free influenza vaccination program for pregnant women.

Methods

Two separate anonymized questionnaires were developed for pregnant or postpartum women and physicians, and distributed to public or private healthcare centers and clinics, in South Korea. The proportions of women who received influenza vaccination during pregnancy and OBGYN doctors who routinely recommend influenza vaccine for pregnant women were analyzed. Independent influencing factors of influenza vaccination and OBGYN doctors' routine recommendation for pregnant women were analyzed using multivariate logistic regression analysis, respectively.

Result

The self-reported proportion of influenza vaccination during pregnancy among 522 women was 63.2%. Independent factors influencing maternal influenza vaccination were '(ever) received information about influenza vaccination during pregnancy', 'information obtained from OBGYN doctors', and '2nd/3rd trimester or postpartum period' (OR 8.988, 95% CI 4.21–19.188, $p < 0.001$, OR 2.611, 95% CI 1.705–3.998, $p < 0.001$ and OR 3.082, 95% CI 1.508–6.297, $p < 0.001$, respectively).

In 372 OBGYN doctors, the proportion of doctors with the routine recommendation of influenza vaccine for pregnant women was 76.9%. Independent factors affecting the routine recommendation were: 1) affiliation with private hospital or clinic (OR 4.508, 95% CI 2.225–9.133, $p < 0.001$); 2) awareness of guidelines (OR 3.153, 95% CI 1.118–8.894, $p = 0.03$); (3) awareness of 2019 National free influenza vaccination program for pregnant women (OR 4.955, 95% CI 2.377–10.329, $p < 0.001$). For a future recommendation of influenza vaccine for pregnant women, the guidelines proposed by the government or public health care [108 (46%)] and academic committees [59 (25%)] were most commonly chosen by OBGYN doctors.

Conclusion

This study demonstrated that providing information about maternal influenza vaccination and the recommendation by OBGYN doctors are crucial for increasing the vaccination coverage in pregnant women.

Background

Pregnant women with altered immunity and increased cardiopulmonary burden during pregnancy are at high risk of influenza-related complications compared with the general population [1, 2]. In the 2009 H1N1 influenza pandemic season, the maternal infection was associated with severe complications resulting in maternal death and admission to an intensive care unit [3]. In addition, influenza vaccine is not licensed for use in infants under the age of 6 months. Therefore, infants aged below 6 months cannot be protected except through maternal immunization. According to the global statistics, approximately 228,000 (95% CI 150,000 to 344,000) hospitalizations in infants < 6 months, were associated with influenza, annually [4]. According to the previous studies, infants less than 6 months of age, with confirmed influenza infection, were at the highest risk of hospitalization due to influenza, neurologic or pulmonary complications and admission to intensive care unit [5, 6]. Several studies have demonstrated the effectiveness of maternal influenza vaccination for protection of infants aged below 6 months from influenza illness, respiratory infections, and severe pneumonia [7, 8].

Although, the World Health Organization (WHO) and health authorities in most countries recommend pregnant women to receive the inactivated influenza virus vaccine [9–12], the coverage is still limited. Since 2012, the Korean Centers for Disease Control and Prevention (KCDC) also has recommended vaccination of pregnant women and women contemplating pregnancy during the flu season under the ‘Guidelines of Vaccination for Adults’ [13]. However, it has been reported that vaccination rate associated with pregnancy was less than 40% [14, 15]. A National free immunization program about influenza was developed for pregnant women to increase vaccine coverage during the flu season of 2019–2020 in Korea. Our objectives were to 1) investigate the proportion of influenza vaccination in pregnant women and influencing factors, and 2) investigate the proportion of obstetrics and gynecology (OBGYN) doctors who routinely recommend influenza vaccine for pregnant women and influencing factors.

Methods

Survey Questionnaires

Two different questionnaires were developed and used anonymously to survey pregnant or postpartum women (within 6 weeks after birth) and OBGYN doctors (Suppl 1&2). The questionnaires were adapted from the previously self-administered questionnaires [16–18], with a multidisciplinary study team including OBGYN doctors, biomedical statisticians and pregnant women. A pilot survey involving both target groups was performed to ensure comprehensiveness. Because some women or OBGYN doctors did not know that the ‘National free influenza vaccination program’ in 2019–2020 flu season include pregnant women yet, we added an answer ‘free vaccination program’ in the question 10 – 2.

The questionnaire for pregnant or postpartum women assessed characteristics including age, pregnancy duration, parity, natural conception or use of assisted reproduction, education level, occupation, and administrative district of residential areas. The questionnaire for physicians asked about characteristics including age, sex, recent maternity care, and characteristics of working clinics/hospitals (private or public) and its located administrative district. Residential areas of pregnant or postpartum women and

physicians' work locations were divided into metropolitan and non-metropolitan areas. Metropolitan areas included Seoul, Busan, Gwangju, Incheon, Ulsan, Daejeon, and Sejong and Kyunggi provinces around Seoul. Non-metropolitan areas included Chuncheon, Gyeongsang, Jeolla, Gangwon, and Jeju provinces.

Pregnant or postpartum women were asked (1) whether they received influenza vaccination during pregnancy in the 2019–2020 flu season; (2) whether or not they received information about influenza vaccination; (3) information sources; (4) influenza vaccination during previous pregnancy; (5) the reasons for not receiving influenza vaccine; and (6) the factors influencing future vaccination. The women were classified depending on whether or not they reported being vaccinated during the flu season of 2019–2020. The question regarding information sources allowed for multiple responses. If a response included OBGYN doctors with or without other sources, it was designated to 'OBGYN doctors'. If a response included other sources of public health care, media, friends, or family, but not included 'OBGYN doctors', it was designated to 'other sources'.

OBGYN doctors were grouped according to routine recommendations of influenza vaccines for pregnant women based on an affirmative response to the question, "Do you recommend influenza vaccines to pregnant women in your clinic?" OBGYN doctors who answered, 'always recommend vaccination' were designated as the 'routine recommendation group' and OBGYN doctors who responded 'sometimes or never recommended vaccination' were designated as the 'passive recommendation group'. Physicians' awareness of '2019 National free influenza vaccination program for pregnant women' and government recommendations, such as 'all pregnant or breastfeeding women during flu season are primarily recommended to receive an inactive influenza vaccine, were evaluated. Their attitudes were analyzed based on their response to the following questions: 1) Do you provide information about influenza vaccine to pregnant women? 2) Do you recommend influenza vaccine during pregnancy?

Also, the survey sought to determine physician's own influenza vaccination during the previous flu season. Physicians were asked about 'influencing factors' for a future recommendation of influenza vaccination in pregnant women. Ethical approval was granted by the institutional review board of the Catholic University of Korea (KC19QES10646).

Study Population And Recruitment

The survey was conducted from October 15, 2019 to December 31, 2019. The questionnaires were distributed to medical doctors who are registered in Korean society of Maternal-fetal medicine (KSMFM), Korean society of perinatal medicine (KSPM), Korean association of obstetrics and gynecology (KAOG), or Korean society of ultrasound in obstetrics and gynecology (KSUOG). The paper questionnaires or an online link to the survey using Google forms for women participants were distributed in person via opportunistic sampling at antenatal clinics or wards, by medical doctors or trained assistants.

The physician questionnaire was distributed to medical doctors who were registered in KSMFM, KSPM, KAOG, or KSUOG, via paper or an online link to the survey using Google forms, by e-mail. The participation was voluntary, and no financial or other incentives were offered. The response to this survey implied their consent. Information provided by the participants was voluntary and possibly incomplete.

The sample size for a survey of pregnant or postpartum women was calculated with the following assumptions: 50% of women in pregnancy took influenza vaccination, a confidence interval of 95%, and alpha of 0.05. The initial calculated minimum sample size was 384 participants, but considering the nonresponse rate (10%) and the incomplete rate (30%) to the questionnaire, 538 pregnant women were required to meet the minimum sample size. The sample size for a survey of OBGYN doctors was calculated based on the estimation that 60% of the OBGYN doctors routinely recommend influenza vaccination for pregnant women, a 95% confidence interval, and alpha of 0.05. Therefore, the estimated minimum number of OBGYN doctors required was estimated at 360. In addition, accounting for the response rate of 55%, the minimum number of participants required was estimated as 640.

Data analysis

Data analysis was performed using SPSS (version 24.0, Chicago, IL, USA). Categorical data were expressed as number (%) and compared using Chi-square test. Continuous variables were presented as mean \pm standard deviation and compared using Student's t-test. To assess independent predictors of vaccine uptake by pregnant women, we calculated the odds ratios (ORs) and 95% confidence intervals (CIs) using logistic regression models, adjusted for maternal age and metropolitan residence which were variables with statistical cutoff, $P < 0.07$, between vaccinated and unvaccinated groups, in univariate analysis.

Multivariate logistic regression analysis for independent predictors associated with OBGYN doctors' routine recommendation of influenza vaccination was adjusted for physician's age, sex, and location of clinic/hospital. Statistical significance was set at $P < 0.05$.

Result

Demographic characteristics of pregnant women

A total of 522 questionnaires were eligible to be analyzed, after excluding 34 incomplete questionnaires, which had not responded whether they had vaccinated or not. Questionnaires were collected via an on-line survey (10.2%, 53/522), and paper survey (89.8%, 487/522). Residential distribution of pregnant/postpartum women is presented in **Fig. 1(A) and suppl 3**, which indicates that 80.8% of respondents lived in the metropolitan area.

Demographic characteristics associated with influenza vaccination are presented in Table 1. There were significant differences in the gestational period and metropolitan residence, between two groups. Women in the vaccinated group were significantly more informed about the influenza vaccine compared with

women in the unvaccinated group ($p < 0.001$). Besides, women in the vaccinated group were more informed by OBGYN doctors than women in the unvaccinated group ($p < 0.001$).

Table 1

Demographic characteristics of pregnant or postpartum women associated with influenza vaccination during pregnancy.

Characteristics	Vaccinated(n = 330)	Unvaccinated(n = 192)	p-value
Maternal age(yr) (mean \pm SD)	33.32 \pm 3.85	33.18 \pm 4.53	0.069
Gestational age (weeks) (mean \pm SD)	31.28 \pm 20.27	26.31 \pm 9.12	0.002
Pregnancy period			0.002
\leq 13 weeks(n, %)	17(5.2)	25 (13.0)	
14–27 weeks(n, %)	67(20.3)	45(23.4)	
\geq 28 weeks~(n, %)	230(69.7)	108(56.3)	
Postpartum(n, %)	16(4.8)	14(7.3)	
Nulliparous women (n, %)	219 (66.4)	122 (63.5)	0.514
Assisted reproduction (n, %)	29(6.6)	19 (9.9)	0.79
Education (college degree or higher) (n, %)	304 (92.1)	168 (87.5)	0.084
Metropolitan residence(n, %)	270 (81.8)	15 (79.2)	0.047
Occupation			0.186
housewife(n, %)	145 (43.9)	73 (38.0)	
other than housewife(n, %)	185 (56.1)	119 (62.0)	
(Ever) received information about influenza vaccination during pregnancy(n, %)	321(97.3)	155 (80.7)	< 0.001
Source of information			< 0.001
OBGYN ^a doctors(n, %)	239(72.4)	83 (43.2)	
Non-OBGYN doctors, public health care, media, friends or family(n, %)	91(27.6)	109 (56.8)	
Influenza vaccination in the previous pregnancy (n, %) ^b	71 (61.6)	34 (32.4)	0.096
^a OBGYN, Obstetrics and gynaecology, ^b responses from parous women			

Values are presented as mean \pm standard deviation or n (%).

Influencing factors for maternal influenza vaccination using univariate and multivariate analysis

In univariate analysis, '(ever) received information about influenza vaccination during pregnancy', 'received information from OBGYN doctors,' and 'second/third trimester' were significantly associated with maternal influenza vaccination. In multivariate analysis adjusted for maternal age and metropolitan residential status, '(ever) received information about influenza vaccination during pregnancy' significantly increased odds for vaccination (OR 8.988, 95% CI 4.21-19.188, $p < 0.001$). 'received information from OBGYN doctors,' and 'second/third trimester' were also independent factors influencing influenza vaccination (OR 2.611, 95% CI 1.705–3.998, $p < 0.001$ and OR 3.082, 95% CI 1.508–6.297, $p < 0.001$, respectively). (Table 2)

Table 2
Influencing factors for maternal influenza vaccination using univariate and multivariate analysis

	Univariate analysis			Multivariate analysis		
	OR	95% CI	p-value	Adjusted OR ^a	95% CI	p-value
(ever) received information about influenza vaccination						
No	1			1		
Yes	8.514	4.009–18.083	< 0.001	8.988	4.21-19.188	< 0.001
Source of information						
Non-OBGYN ^a doctors, public health care, media, friends and family	1			1		
OBGYN ^b doctors	2.62	1.729–3.971	< 0.001	2.611	1.705–3.998	< 0.001
Pregnancy period						
1st trimester	1			1		
2nd and 3rd trimester,	2.756	1.447–5.249	0.001	3.082	1.508–6.297	0.001
^a Adjusted for maternal age and metropolitan residence						
^b OBGYN, Obstetrics and gynaecology						

Barriers Against Influenza Vaccination And Factors For Future Vaccination

Among 192 women in the unvaccinated group, 169 women (88%) responded to the question about the reasons for not receiving influenza vaccine. 59 (34.9%) women replied, 'I didn't know that I should be vaccinated' and 37 (21.9%) women answered, 'I'm planning to have vaccination at the time of vaccination schedule, but waiting for the appropriate time'. 73 (43.2%) women replied, 'I didn't want to have an influenza vaccination'. About 'the reasons for not wanting influenza vaccination', all respondents (n = 73) answered 'not knowing the importance of vaccine' (Table 3).

Among 192 women included in the unvaccinated group, 92 women responded to the question about influencing factors for future vaccination, allowing multiple responses, "If you didn't know the importance of vaccination, in which case would you get the vaccination?". 122 choices were received from 92 women. A majority of the respondents (n = 81, 88%) said that they will receive the influenza vaccine in the future if obstetricians recommend influenza vaccination.

Table 3

Reasons for not wanting influenza vaccination in unvaccinated women and factors for future vaccination during pregnancy

Reasons for not wanting influenza vaccination in unvaccinated women (multiple responses)(Total responders, n = 73).	
Not knowing the importance of vaccine	48 (66%)
Not knowing the importance of vaccine + Distrust of effect	1 (1%)
Not knowing the importance of vaccine + Fear of side effect	1 (1%)
Not knowing the importance of vaccine + others	23 (32%)
Major influencing factors for future vaccination during pregnancy (multiple responses) (Total responders, n = 92).	
OBGYN doctors ^a	81 (88%)
Other medical doctors ^b	4 (2.1%)
Family or friends	4 (2.1%)
TV/Radio/Paper/Internet	9 (9.8%)
Free vaccination program	16 (17.4%)
Pediatric doctors	8 (8.7%)
^b OBGYN, Obstetrics and gynaecology, ^b Other medical doctors: medical doctors except OBGYN or pediatric doctors	

Demographic Characteristics, Awareness, And Attitudes Of Obgyn Doctors

A total of 373 questionnaires were eligible to be analyzed, after excluding 3 incomplete responses and 86 responses from non-OBGYN doctors. Questionnaires were collected via an on-line survey (88.7%, 331/373), and paper survey (11.3%, 42/373). As shown in **Fig. 1(B) and suppl 3**, the distribution of OBGYN doctors' clinics/hospitals suggests that 80.5% of respondents worked in metropolitan areas, with 37.8% in Seoul and 43.2% in Gyeonggi and other metropolitan cities. Demographic characteristics, awareness and attitudes are presented in Table 4. 287 (76.9%) of the 373 OBGYN doctors included in the routine recommendation group. Significant differences were found between routine and passive recommendation groups in 1) affiliation with private clinic/hospital; 2) personal influenza vaccination in the previous year; 3) provided maternity care within the last 5 years; 4) awareness of KCDC guidelines; 5) consensus on the recommendation of influenza vaccine during pregnancy; 6) appropriate time for influenza vaccination during pregnancy; 7) awareness of 2019 National free influenza vaccination program for pregnant women.

Table 4
Demographic characteristics, awareness, and attitudes of OBGYN doctors, associated with recommendation of Maternal influenza vaccination.

Characteristics	Routine recommendation group (n = 287)	Passive recommendation group(n = 86)	p value
Age (years old) (mean ± SD)	47.51 ± 9.4	45.76 ± 12.52	0.231
Female (n, %)	154(53.7)	54(62.8)	0.135
Private clinic/hospital (n, %)	263(91.6)	54(62.8)	< 0.001
Metropolitans area (n, %)	231(80.5)	71(82.6)	0.668
Provided maternity care within the last 5 years (n, %)	259(90.2)	68(79.1)	0.006
Received influenza vaccination in the previous year (n, %)	272(94.8)	71(82.6)	< 0.001
Awareness of safety, importance and priority groups of vaccination before, during and after delivery, recommended by KCDC ^a guidelines (n, %)	278(96.9)	68(79.1)	< 0.001
Do you provide information about influenza vaccine to pregnant women?			< 0.001
Always (n, %)	276 (96.2)	8 (9.3)	
Sometimes (n, %)	11 (3.8)	61 (70.9)	
No (n, %)	0 (0)	17 (19.8)	
Appropriate time for influenza vaccination related to pregnancy ^b (n, %)	158 (70.2%)	33 (49.3%)	0.001
All trimesters, prepregnancy, and postpartum	61 (27.1%)	26 (38.8%)	
2nd and 3rd trimester, prepregnancy, and postpartum	6 (2.7%)	8 (11.9%)	
2nd and 3rd trimester, and postpartum			
Awareness about 2019 pregnant women free vaccination (n, %)	268 (93.4)	51 (59.3)	< 0.001
^a KCDC : Korean Centers for Disease Control and Prevention; ^b Total 292 OBGYN doctors responded to this question.			

Univariate and multivariate analyses of factors for OBGYN doctors' recommendation of influenza vaccination

In both univariate and multivariate analyses, 1) working at private clinic/hospital (OR 4.508, 95% CI 2.225–9.133, p < 0.001), 2) awareness of guidelines (OR 3.153, 95% CI 1.118–8.894, P = 0.03), and (3)

awareness of 2019 National free influenza vaccination program for pregnant women (OR 4.955, 95%CI 2.377–10.329, $p < 0.001$) were significantly independent factors for ‘routine recommendation’ (Table 5).

Table 5
Univariate and Multivariate logistic regression analyses.

	Univariate analysis			Multivariate analysis		
	OR	95% CI	p-value	OR	95% CI	p-value
Working at private clinic or hospital	6.494	3.547–11.89	< 0.001	4.508	2.225–9.133	< 0.001
Provided maternity care within the last 5 years	2.449	1.279–4.688	0.006	1.865	0.862–4.033	0.113
Received influenza vaccination in the previous year	3.831	1.788–8.207	< 0.001	2.571	0.96–6.882	0.06
Awareness of safety, importance and priority groups of vaccination before, during and after delivery, recommended by KCDC ^a guidelines	8.176	3.519–18.996	< 0.001	3.153	1.118–8.894	0.03
Awareness about 2019 pregnant women free vaccination	9.68	5.136–18.243	< 0.001	4.955	2.377–10.329	< 0.001
Multivariate logistic regression analysis was adjusted for age, sex, location of clinic (hospital)						
^a KCDC : Korean Centers for Disease Control and Prevention,						

Factors expected to affect for a future recommendation for maternal influenza vaccination (multiple responses)

Among 235 choices from 217 respondents, the guidelines recommended by government or public healthcare [108 (46%)] and academic committees [59 (25%)] were suggested as major factors influencing OBGYN doctors’ future recommendation for maternal influenza vaccination. Other factors included academic papers and lectures [31 (13%)], media advertisements [28(12%)], and free vaccination [9(4%)].

Discussion

In this study, 63.2% of responded pregnant women had an influenza vaccination and, 76.9% of responded OBGYN doctors routinely recommended influenza vaccine for pregnant women, Both univariate and multivariate analyses showed that ‘(ever) received information about influenza vaccination during pregnancy’ was the most significant factor to get an influencing influenza vaccination in pregnant women. Also, ‘received information from OBGYN doctors’, and ‘second/third trimester’ were independent influencing factors for influenza vaccination. The most significant barrier about influenza vaccination

was the lack of awareness in pregnant women. In the survey for OBGYN doctors working in private rather than public clinics/hospitals, the awareness of KCDC guidelines for influenza vaccination for pregnant women and the 'National Free Influenza Vaccination Program for Pregnant Women in 2019 Flu Season' were independent factors for routine recommendation of OBGYN doctors.

The pregnancy-related vaccination rates in USA were between 49.1% and 53.6% from 2015 to 2018 [19]. In Europe, the highest vaccination rates reported in pregnant women were 62% and 58% during 2017-18 and 2016–2017 flu seasons, respectively, in Ireland [20]. The highest vaccination rate during pregnancy in Western Australia was 61% in 2015 [21]. Previous questionnaire studies from Korea reported 35–40% vaccination rates in pregnant women [14, 15]. However, the vaccination coverage in the overall pregnant population of Korea has been unknown until 2018–2019 flu season, because influenza vaccination was not covered by insurance and performed in a private area. We speculate that the National free influenza vaccination program started in 2019–2020 flu season of Korea might increase the awareness of vaccination and confidence among OBGYN doctors, which may result in an increased routine recommendation for pregnant women. A past study from Korean obstetricians about maternal influenza vaccination reported that only 26.5% of obstetricians strongly recommended maternal influenza vaccination [22]. It is well known that advice and encouragement from familiar healthcare professionals (HCPs) significantly improve vaccine acceptance by pregnant women [23]. Also, several studies have shown that HCPs' knowledge about vaccine efficacy and safety is considerably associated with their vaccine recommendation. HCPs' confidence about vaccination is crucial for vaccination implementation in pregnant women [24–26]. Because OBGYN doctors are most familiar with pregnant women's conditions, the professional information and recommendations provided by them may directly affect vaccination decisions. Because most of the OBGYN doctors considered 'guidelines for vaccination' as an important factor for a future recommendation, further education of existing guidelines and supporting 'position statements' or 'programs' by the academic committee, especially related to maternal-fetal medicine, might increase the routine recommendation by OBGYN doctors, by increasing their confidence.

This study has several limitations. First, this study included all provinces of Korea to maximize the demographic diversity of study populations. However, it cannot be considered as representative of all pregnant women and OBGYN doctors in Korea. Secondly, although we distributed the survey by academic committees, the responded doctors and hospitals may have a positive attitude toward vaccination, which can increase the possibility of selection bias. Thirdly, the self-reported vaccination status may lead to potential reporting bias in our estimation. Lastly, the number of non-respondents among the surveyed pregnant women/OBGYN doctors was not recorded.

This study also has several strengths. First, this study had significant numbers of respondents who lived or worked not only in metropolitan areas but also in non-metropolitan areas. Although only about 20% of respondents lived in local provinces, it correlated with the percentage of live births in local provinces, which was about 30% of all births in Korea [27]. In pregnant women, there was no significant difference in terms of residential area distribution between vaccinated and unvaccinated groups. Also, the effect of physicians' workplace location between routine and passive recommendation groups was insignificant.

The surveys of pregnant women and OBGYN doctors were conducted anonymously, thereby allowing free expression of opinions by the responders. Most importantly, over doubled proportion of OBGYN doctors who routinely recommend maternal influenza vaccination, compared to previous similar studies, were correlated with significantly increased proportion of maternal influenza vaccination, in this study.

Conclusion

In this study, the proportion of pregnant women who reported receiving influenza vaccination was 63.2%, and the proportion of OBGYN doctors who routinely recommend it was 76.9%, respectively. Based on the high acceptance rates of preventive vaccines in Korea [28, 29], maternal influenza vaccination can be more successful in the future, if the information is provided appropriately. Close cooperation between KCDC and academic societies including obstetrics and gynecology is crucial for the confidence of OBGYN doctors and their routine recommendations, in order to enhance influenza vaccination during pregnancy, which can maximize the benefits of the vaccine for both mothers and infants.

Abbreviations

OBGYN, Obstetrics and gynecology

WHO, World Health Organization

KCDC, Korean Centers for Disease Control and Prevention

KSMFM, Korean society of Maternal-fetal medicine

KSPM, Korean society of perinatal medicine (KSPM)

KAOG, Korean association of obstetrics and gynecology (KAOG)

KSUOG, Korean society of ultrasound in obstetrics and gynecology (KSUOG)

Declarations

Ethics approval and consent to participate

Ethical approval was granted by the institutional review board of the Catholic University of Korea (KC19QES10646). The voluntary response to this survey implied their consent and written consents were exempted. This study is in compliance with the 2013 Helsinki World Medical Association.

Consent for publication

This work has not been published before nor is it under consideration for publication elsewhere. The contents of this manuscript will not be copyrighted, or published elsewhere while acceptance by your

journal is under consideration.

Availability of data and material

All relevant data are within the paper and its Supporting Information files.

Competing interests

The authors declare that they have no competing interests

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Author Contributions

HSK conceptualized, investigated, analyzed, supervised, and edited the study. BKS analyzed the study and wrote the original draft. SHL, WJK and JHW investigated and administrated the study. IYP edited the study. All authors read and approved the final manuscript.

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Figures

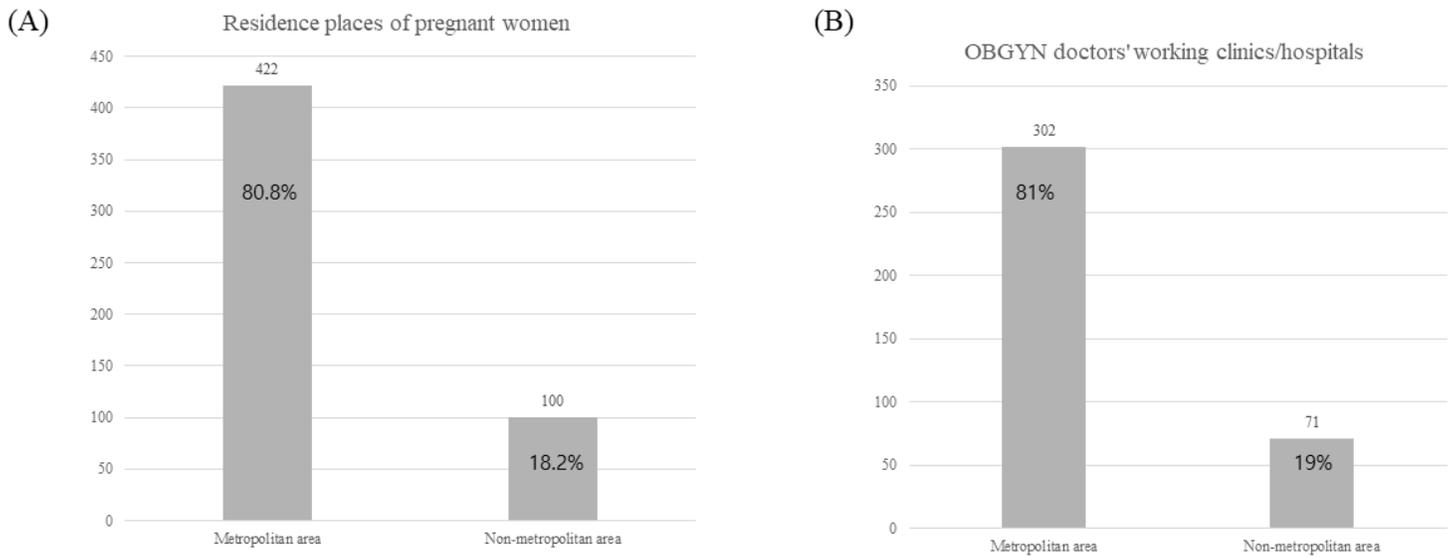


Figure 1

Geographical distributions of pregnant women and OBGYN doctors (A) Residences of pregnant women (n=522) (B) OBGYN doctors working clinics/hospitals (n=373) aOBGYN: obstetrics and gynecology

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