



# The Prevalence of Seasonal Influenza Vaccination in Pregnant Women Referring to Tertiary Hospitals of Kerman, Iran

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## Abstract

**Background:** Influenza vaccination is the most effective strategy to prevent comorbidity and mortality of this infection in pregnant women.

**Objectives:** The current study aimed at evaluating the influenza vaccination rate and its related factors among pregnant women.

**Methods:** The current cross-sectional study was conducted on 520 pregnant women referring to antenatal clinics of tertiary hospitals affiliated to Kerman University of Medical Sciences from January to April 2019 in Kerman city, Iran. The collected data through a form distributed among the subjects were analyzed using SPSS version 22.

**Results:** The influenza vaccination coverage rate was 30.0% (95% confidence interval (CI): 26.1 - 34.1) among the pregnant women. Age older than 30 years (AOR = 3.79; 95%CI: 1.55 - 9.24), being employed (AOR = 2.44; 95%CI: 1.01 - 5.88), having an underlying chronic disease (AOR = 4.39; 95%CI: 1.33 - 14.51), receiving recommendation to undergo influenza vaccination (AOR = 65.76; 95%CI: 11.04 - 391.48), and having good knowledge of influenza vaccine (AOR = 9.64; 95%CI: 3.87 - 24.02) increased the likelihood of receiving influenza vaccine.

**Conclusions:** The current study highlighted that the influenza vaccination coverage rate was suboptimal. Also, findings of the current study suggested that influenza vaccination, as an important component of antenatal care services, should be considered by health policymakers. Furthermore, educating pregnant women and healthcare providers can improve compliance with influenza vaccination.

**Keywords:** Human Influenza, Pregnant Women, Influenza Vaccine, Iran

## 1. Background

Influenza is a common infectious disease that affects 5% - 20% of the general population annually worldwide (1). Due to more expensive complications and a higher mortality rate of influenza infection during pregnancy, pregnant women are considered as a high-risk group for the disease (1, 2). Pregnant women with influenza experience a higher rate of hospitalization and admission to intensive care units (ICUs) compared to non-pregnant ones (2). Also, influenza infection during pregnancy, particularly in complicated cases, may affect the fetus and lead to negative pregnancy outcomes such as stillbirth, low weight for gestational age, and preterm birth (3, 4).

Influenza vaccination is the most effective strategy to prevent the infection and its complications during pregnancy (4, 5). Vaccination against influenza decreases the

rate of severe infection, hospitalization, ICU admission, and mortality in pregnant women and also reduces negative outcomes of the infection in their fetuses (5, 6). Furthermore, studies demonstrate that influenza vaccination during pregnancy develops effective protection against influenza in infants, at least in the first six months after birth (5, 7). In addition, the safety of the influenza vaccine for mothers and their fetuses in any stage of pregnancy is approved (5, 8).

Despite the recommendation of the World Health Organization to administer the influenza vaccine in pregnant women, influenza vaccination coverage is suboptimal in most areas of the world (8, 9). Several studies in the USA, Ireland, Australia, and Thailand reported seasonal influenza vaccination coverage during pregnancy as 63%, 55.1%, and 25%, respectively (10-12). Also, a systematic review

reported that influenza vaccination in pregnant women ranged from 1.7% to 88.4% (13). In the Eastern Mediterranean region, it is estimated that a small percentage of high-risk groups, including pregnant women, receive the flu vaccine (14). The rate of influenza vaccination during pregnancy is reported as 6% and 5.5% in two studies in Iran, suggesting the low vaccination coverage among this high-risk group (15, 16).

There are various factors affecting influenza vaccination in pregnant women as barriers or facilitators (13). Concerns about vaccine side effects, poor knowledge of influenza, fear of the needle, negative attitude toward vaccination, and concerns about vaccine safety for the fetus are reported as the main factors influencing vaccination in pregnant women (10, 12, 13, 17, 18). To the authors' best knowledge, there are a limited number of studies in Iran on the frequency of influenza vaccination and its outcomes amongst pregnant women (15, 16).

## 2. Objectives

The current study aimed at evaluating the rate of influenza vaccination and outcomes among pregnant women attending antenatal clinics of third-level hospitals affiliated to Kerman University of Medical Sciences.

## 3. Methods

The current cross-sectional study was conducted on pregnant women attending two antenatal clinics of hospitals affiliated to Kerman University of Medical Sciences from January to April 2019 in Kerman city. Kerman province, with over 2.4 million populations, is located in the Southeast of Iran. The clinics were referral centers providing advanced antenatal care. Pregnant women receiving routine antenatal care services in private or state healthcare system affiliated to Kerman University of Medical Sciences were enrolled in the study. The subjects were recruited regardless of their gestational age by the convenience sampling method.

The data were collected by a form comprised of two parts. The first part included demographic baseline data such as age at current pregnancy, education level, occupational status, and household income status, as well as medical history and antenatal care services such as the number of pregnancies, antenatal care provider, time of the first antenatal care, underlying chronic diseases, and the main setting to get antenatal services. Moreover, data regarding influenza vaccination at the current and previous pregnancies and history of influenza vaccination in family members were collected. The second part of the data

collection form was a questionnaire assessing the knowledge of influenza vaccination. The questionnaire had six yes/no/I don't know questions. Content validity and face validity of the questionnaire were approved by the panel of experts. To evaluate the reliability of the questionnaire, Cronbach's alpha coefficient was calculated and the results represented its good reliability ( $\alpha = 0.86$ ). For scoring, correct answers were given a score of 1, and the wrong and I do not know answers were scored 0. Knowledge level was categorized as poor (total score < 4) and good (total score  $\geq 4$ ).

Data were collected through interviews. The interviewer explained the objectives of the study to the interviewees and assured them about the confidentiality of their information; the questionnaires were then completed after obtaining the written consents. Furthermore, the current study protocol was approved by the Ethics Committee of Kerman University of Medical Sciences (ethics code: IR.KMU.AH.REC.1396.2209).

The data were analyzed using Stata version 14 software. Descriptive statistics, including frequency, percentage, mean, standard deviation, and tables, were used to characterize the study sample. The prevalence of influenza vaccination among the participants was assessed using a bi-variable and multivariable logistic regression model, odds ratio (OR), and 95% confidence interval (CI). All independent variables were entered into the bi-variable model. Also, variables with a P value of < 0.2 were entered into the multivariable model. P values less than 0.05 were considered statistically significant.

## 4. Results

Of the 520 participants, 53.7% were  $\leq 30$  years old with the mean  $\pm$  SD age of  $29.35 \pm 4.6$  years. Over 85% of the pregnant women were the residents of urban areas and, approximately, 55% were housewives. Only 9.2% of them had sufficient household income, and education level of 33.1% of them was below high school. Over 60% of the participants had at least an underlying chronic disease such as diabetes, cardiovascular conditions, and chronic respiratory diseases. The majority of the participants (86.5%) received routine antenatal care by obstetricians, and more than 75% of them received routine antenatal care in clinics of the state hospitals. Over 60% of the pregnant women were multiparous, and more than half received their first antenatal care visit in the first gestational trimester (Table 1). The mean  $\pm$  SD score of knowledge of influenza and the vaccine was  $4.02 \pm 1.55$ , and 38.3% of the participants had poor knowledge.

The majority of the participants knew that influenza is more dangerous for pregnant women than non-pregnant

**Table 1.** Demographic Characteristics and Influenza Vaccination Rate During Pregnancy in the Study Participants

Variable, Category	No. (%)	Influenza Vaccination Rate, % (95%CI)	P Value
<b>Total</b>	520 (100)	30.0 (26.1 - 34.1)	
<b>Age, y</b>			< 0.001
< 30	279 (53.6)	19.7 (15.2 - 24.8)	
≥ 30	241 (46.4)	41.9 (35.6 - 48.4)	
<b>Occupational status</b>			0.002
Housewife	288 (55.4)	24.3 (19.4 - 29.7)	
Employed	232 (44.6)	37.1 (30.8 - 43.6)	
<b>Education level</b>			0.003
High school diploma and higher	348 (66.9)	34.2 (29.2 - 39.4)	
Below the high school	172 (33.1)	21.5 (15.6 - 28.4)	
<b>Number of pregnancy</b>			0.276
1	212 (40.7)	28.3 (22.3 - 34.8)	
2	219 (42.1)	28.8 (22.8 - 35.2)	
3 and higher	89 (17.2)	37.1 (27.1 - 47.9)	
<b>Antenatal care provider</b>			0.002
Midwife and others	70 (13.5)	14.3 (7.1 - 24.7)	
Gynecologist	450 (86.5)	32.4 (28.1 - 36.9)	
<b>Household income status</b>			0.074
Relatively sufficient and insufficient	472 (90.8)	31.1 (26.9 - 35.5)	
Sufficient	48 (9.2)	18.7 (8.9 - 32.6)	
<b>Gestational age at first antenatal care visit</b>			0.266
> 3 mn	246 (47.3)	27.6 (22.1 - 33.6)	
3 mn and less	274 (52.7)	32.1 (26.6 - 38.0)	
<b>Underlying chronic disease</b>			< 0.001
No	205 (39.4)	3.4 (1.4 - 6.9)	
Yes	315 (60.6)	47.3 (41.6 - 52.9)	
<b>Influenza vaccine uptake during previous pregnancies</b>			< 0.001
No	292 (91.2)	26.7 (21.7 - 32.2)	
Yes	28 (8.8)	67.8 (47.6 - 84.1)	
<b>Influenza vaccine uptake by family members</b>			< 0.001
No	467 (89.8)	27.4 (23.4 - 31.6)	
Yes	53 (10.2)	52.8 (38.6 - 66.6)	
<b>Setting of routine antenatal care</b>			< 0.001
Primary healthcare centers	92 (17.7)	18.5 (11.1 - 27.9)	
Clinics of state hospitals	391 (75.2)	29.9 (25.4 - 34.7)	
Private clinics	37 (7.1)	59.4 (42.1 - 75.2)	
<b>Recommendation for influenza vaccination</b>			< 0.001
No	273 (53.1)	0.7 (0.1 - 2.6)	
Yes	241 (46.9)	63.9 (57.4 - 70.0)	
<b>Knowledge of influenza vaccine</b>			< 0.001
Poor	199 (38.3)	7.8 (3.4 - 10.5)	
Good	321 (61.7)	44.2 (38.8 - 49.6)	

ones (83.7%), and the influenza vaccine is safe for the pregnant woman (94.4%) and her fetus (89.4%). Also, about 60% of the pregnant women knew that influenza can be a dangerous disease with severe complications and over three-fourths of them knew that the vaccine is effective to protect against influenza; however, only 37.5% were aware of the necessity of influenza vaccination for pregnant women

(Table 2).

Totally 30% of the pregnant women (n = 156) reported receiving the influenza vaccine during the current pregnancy. More than 10% reported a history of influenza vaccination among family members and 8.8% received the vaccine in their previous pregnancies.

The influenza vaccination rate was significantly (P <

**Table 2.** Frequency of Correct Answers to Knowledge Items Among the Study Participants

Item	Correct Answer, No. (%)	Incorrect or I Do Not Know Answer, No. (%)
1. Influenza can be a serious disease with severe complications.	310 (59.6)	210 (40.4)
2. Influenza is more dangerous to pregnant women than non-pregnant ones.	435 (83.7)	85 (16.3)
3. Vaccine is effective to protect against influenza.	393 (75.6)	127 (24.4)
4. Pregnant women should receive influenza vaccine.	195 (37.5)	325 (62.5)
5. Influenza vaccine is safe for fetus.	465 (89.4)	55 (10.6)
6. The influenza vaccine is safe for pregnant woman.	491 (94.4)	27 (5.6)

0.001) higher among the women older than 30 years (41.9% vs. 19.7%) and the ones with underlying chronic diseases (57.3% vs. 3.4%). The housewives had lower coverage of influenza vaccination compared with the employed ones (37.1% vs. 24.3%,  $P=0.002$ ), while the women with higher educational levels had a higher rate of undergoing influenza vaccination (34.2% vs. 21.5%,  $P=0.003$ ). The women receiving influenza vaccine during their previous pregnancy had higher vaccination coverage (67.8% vs. 26.7%,  $P < 0.001$ ), and also women living in families whose members had received an influenza vaccine in the current year reported higher rates of vaccine uptake compared to those who lived in families that no family member was vaccinated (52.8% vs. 27.4%,  $P < 0.001$ ). The influenza vaccination rate was different in terms of setting of routine antenatal care ( $P < 0.001$ ). The women receiving their routine antenatal care in private clinics (59.4%) had the highest rate of influenza vaccination, followed by clinics of state hospitals (29.9%) and primary healthcare centers (18.5%). Influenza vaccination coverage was significantly higher ( $P < 0.001$ ) among the women receiving antenatal care from obstetricians (32.4%) compared with the ones receiving such care from midwives (14.2%). The participants recommended by antenatal care providers (63.9%) to receive the influenza vaccine had a significantly higher rate of influenza vaccination than the ones that were not (0.7%) ( $P < 0.001$ ). There were no significant differences in influenza vaccination coverage among the participants in terms of the number of pregnancies ( $P = 0.276$ ), gestational age at the first antenatal care ( $P = 0.266$ ), and household income ( $P = 0.076$ ). Moreover, influenza vaccination coverage was significantly higher ( $P < 0.001$ ) in women with good knowledge compared to the ones with poor knowledge (44.2% vs. 7.8%) (Table 1).

In the bi-variable model, being recommended for influenza vaccination (OR = 239.8; 95%CI: 58.2 - 987.9), having an underlying chronic disease (OR = 25.38; 95%CI: 11.57 - 55.69), having good knowledge of the vaccine (OR = 11.3; 95%CI: 7.3 - 17.5), receiving influenza vaccine during the previous pregnancy (OR = 5.79; 95% CI: 2.51 - 13.34), history

of influenza vaccination in family members (OR = 2.96; 95%CI: 1.66 - 5.27), age above 30 years (OR = 2.93; 95%CI: 1.98 - 4.34), receiving routine antenatal care from obstetricians (OR = 2.88; 95%CI: 1.43 - 5.79), having high school diploma or higher education level (OR = 1.89; 95%CI: 1.23 - 2.90), and being employed (OR = 1.85; 95%CI: 1.26 - 2.70) were associated with receiving influenza vaccine in the pregnant women (Table 3).

In the multivariable model, being recommended for influenza vaccination (AOR = 65.76; 95%CI: 11.04 - 391.48) and having good knowledge of influenza vaccine (AOR = 9.64; 95%CI: 3.87 - 24.02) were the strongest predictors for influenza vaccination among the pregnant women. Also, having an underlying chronic disease (AOR = 4.39; 95%CI: 1.33 - 14.51), age above 30 years (AOR = 3.79; 95%CI: 1.55 - 9.24), and being employed (AOR = 2.44; 95%CI: 1.01 - 5.88) were the significant variables in the model (Table 3).

The most common reason to undergo influenza vaccination (91.4%) in the vaccinated women was the vaccination recommendation by healthcare providers, followed by prevention of influenza complications in the fetus (66.4%) and protection of themselves from the disease (64.9%). Also, the most common reason not to receive influenza vaccine in the unvaccinated group was lack of receiving a vaccination recommendation (75.8), followed by being concerned about the vaccine side effects on their fetuses (12.1%), not considering influenza as a severe disease (11.5%), and high cost of the vaccine (9.6%) (Table 4).

## 5. Discussion

The current study results showed that 30% of the women received influenza vaccine during pregnancy. Several studies reported the influenza vaccination coverage during pregnancy in developed countries such as the USA, Ireland, and Canada as 63%, 55.1%, and 42%, respectively (10, 11, 19). Also, studies in two developing countries of Saudi Arabia and Turkey revealed that 19.8% and 8.9% of pregnant women received the influenza vaccine, respectively (20, 21). A systematic review reported global vaccination coverage

**Table 3.** The Prevalence of Influenza Vaccine Uptake Among the Study Participants

Variable, Category	Crude OR (%CI)	P Value	Adjusted OR (%CI)	P Value
<b>Age, y</b>				
< 30	1		1	
≥ 30	2.93 (1.98 - 4.34)	< 0.001	3.79 (1.55 - 9.24)	0.003
<b>Occupational status</b>				
Housewife	1		1	
Employed	1.85 (1.26 - 2.70)	0.003	2.44 (1.01 - 5.88)	0.049
<b>Education level</b>				
Below high school	1		1	
High school diploma and higher	1.89 (1.23 - 2.90)	0.003	1.39 (0.46 - 4.22)	0.557
<b>Number of pregnancies</b>				
1	1			
2	1.02 (0.67 - 1.55)	0.915		
3 and higher	1.49 (0.88 - 2.52)	0.134		
<b>Antenatal care provider</b>				
Midwife and others	1		1	
Gynecologist	2.88 (1.43 - 5.79)	0.003	1.85 (0.15 - 2.50)	0.632
<b>Household income status</b>				
Relatively sufficient and insufficient	1		1	
Sufficient	0.51 (0.24 - 1.08)	0.079	0.39 (0.08 - 1.73)	0.218
<b>Gestational age at first antenatal care visit</b>				
>3 mn	1		-	-
3 mn and less	1.23 (0.84 - 1.80)	0.267	-	-
<b>Underlying chronic disease</b>				
No	1		1	
Yes	25.38 (11.57 - 55.69)	< 0.001	4.39 (1.33 - 14.51)	0.015
<b>Influenza vaccine uptake during previous pregnancies</b>				
No	1		1	
Yes	5.79 (2.51 - 13.34)	< 0.001	1.72 (0.52 - 5.62)	0.370
<b>Influenza vaccine uptake in family members</b>				
No	1		1	
Yes	2.96 (1.66 - 5.27)	< 0.001	0.61 (0.10 - 3.81)	0.604
<b>Setting of routine antenatal care</b>				
Primary healthcare centers	1		1	
Clinics of state hospitals	1.88 (1.06 - 3.32)	0.029	2.25 (0.33 - 15.05)	0.400
Private clinics	6.47 (2.78 - 15.01)	< 0.001	1.36 (0.05 - 37.49)	0.853
<b>Recommendation for influenza vaccination</b>				
No	1		1	
Yes	239.8 (58.2 - 987.9)	< 0.001	65.76 (11.04 - 391.48)	< 0.001
<b>Knowledge of influenza vaccine</b>				
Poor	1		1	
Good	11.3 (7.3 - 17.5)	< 0.001	9.64 (3.87 - 24.02)	< 0.001

of 1.7% to 88.4% (13). As a result, consistent with studies in neighboring countries such as Saudi Arabia and Turkey, influenza vaccination coverage among pregnant women was suboptimal. Also, 8.7% of the multipara women in the current study reported receiving the influenza vaccine during

the previous pregnancy. Moreover, two studies in Iran reported the influenza vaccination rate as 5.5% and 6% (15, 16). One explanation to a higher rate of influenza vaccination in the current study may be the fact that the majority of the studied women had underlying chronic diseases

**Table 4.** Reasons for Receiving and Not Receiving the Influenza Vaccine During Pregnancy Among the Study Participants

Reasons for Receiving and Not Receiving the Influenza Vaccine	Percentage (95%CI)
<b>Reason for Receiving Influenza Vaccine</b>	
Vaccination recommendation by healthcare providers	91.4 (85.6 - 94.9)
To prevent the fetus from influenza virus infection	66.2 (58.2 - 73.4)
To prevent from influenza virus infection	64.9 (56.8 - 72.1)
<b>Reasons for not Receiving Influenza Vaccine</b>	
Healthcare providers did not recommend to uptake the vaccine	75.8 (71.1 - 80.0)
Worry about the influenza vaccine side effects on the fetus	12.1 (9.0 - 15.9)
Not considering influenza as a severe disease	11.5 (8.5 - 15.2)
Cost of influenza vaccination	9.6 (6.8 - 13.1)
Ineffectiveness of the influenza vaccine	7.6 (5.2 - 10.8)
Fear of injection	6.5 (4.3 - 9.5)
Worry about the influenza vaccine side effects	1.7 (0.7 - 3.7)

as an indication to get the influenza vaccine. Additionally, in the current study, 46.8% of pregnant women were recommended to receive the influenza vaccine by their antenatal care providers, while this figure was 0% and 9.9% in the two studies in Iran (15, 16). Therefore, another reason for the vaccine uptake improvement may be that pregnant women in recent years were more likely to be recommended for vaccination by the antenatal care providers.

The current study showed that vaccination recommendation by healthcare providers was the most predicting factor to uptake the influenza vaccine in pregnant women so that over 63% of the women receiving the recommendation were vaccinated. In line with the current study findings, two studies in Australia and the USA reported that receiving advice from an antenatal care provider to uptake the vaccine was the main factor affecting influenza vaccination (10, 12). Similar to the current study findings, a systematic review reported that influenza vaccine uptake was 20 to 100 times more likely in women receiving a recommendation from healthcare providers compared with the ones receiving none (13). Vaccination recommendation by healthcare workers raises the awareness of influenza risks, ensures the vaccine safety and effectiveness, and enhances vaccination acceptance (22).

It was observed that pregnant women with good knowledge of the influenza vaccine were more likely to receive the vaccine. This finding was consistent with those of several other studies (15, 22, 23). There are many negative attitudes and misperceptions about the influenza vaccine, such as inoculation of infectious agents or thimerosal into vaccines, harmful ingredients, lack of perceiving influenza risk in pregnancy, mistrust of vaccine efficacy, and vaccine side effects on the mother or her fetus (13, 16, 17, 19,

21, 24-28). Communication between healthcare providers and patients and advising the patients to get treatment or prevention methods, such as vaccines or drugs, lead to improving awareness and enhancing compliance with the interventions (29, 30).

The current study results showed that pregnant women above 30 years had a higher rate of influenza vaccination compared with the younger ones (41.9% vs. 19.7%, OR = 3.79). In accordance with the findings, a study in the USA found that pregnant women older than 30 had higher influenza vaccination coverage (10). Another study reported that pregnant women in the age range of 18 - 24 years were less likely to get influenza vaccine (13). One explanation may be that older pregnant women have more antenatal complications and underlying chronic conditions, and thus, they have more medical visits and receive more prevention recommendations such as influenza vaccination. Studies demonstrated that patients with a higher number of medical visits have better compliance with treatment and preventive interventions. Inconsistent with the current findings, a study in Australia reported that younger women were associated with higher influenza vaccination coverage, and some studies in Iran and other countries revealed no significant association between age and influenza vaccination in pregnant women (4, 12, 15, 18, 31, 32).

The current study demonstrated that pregnant women with underlying chronic diseases, such as cardiovascular diseases and diabetes, were more likely to get an influenza vaccine. In accordance with the current study findings, a study in Australia showed that having a chronic condition increases 2.46 times the likelihood of receiving an influenza vaccine in pregnant women (12). An explanation

for this finding may be that women with a chronic underlying disease, regardless of pregnancy status, are the target population for the influenza vaccination. As a result, it is more likely to receive vaccination recommendations and consequently get the influenza vaccine. Several studies, inconsistent with the current study, reported no association between having underlying chronic disorders and influenza vaccine uptake in pregnant women (10, 11, 33).

The univariate analysis of the present study showed that the history of influenza vaccination in the previous pregnancy and those of the family members were positively associated with receiving the vaccine during the current pregnancy. A study in the USA reported that receiving the influenza vaccine in the five past years was the main predictor for vaccination during pregnancy (34). A study in Thailand, in accordance with the findings of the present study, reported that the pregnant women receiving the influenza vaccine in a previous pregnancy were more likely to receive the vaccine during the current pregnancy (32). Another study showed that a history of influenza vaccination had a direct association with getting the vaccine during pregnancy (35). Overall, it can be expected that women with a history of influenza vaccine uptake have higher awareness and a more positive attitude toward vaccine efficacy and safety, and thus, are more likely to receive the vaccine.

The current study had two limitations. Firstly, the study was conducted on women attending antenatal clinics of the third-level hospitals, which may lead to the overestimation of the influenza vaccination coverage, and the results cannot be generalized to the population of pregnant women. Second, since the current study had a cross-sectional design, the cause and effect relationships cannot be approved.

### 5.1. Conclusions

The current study highlighted that influenza vaccination coverage is suboptimal among pregnant women in Iran. Vaccination recommendation by physicians and other antenatal care providers is the key factor influencing influenza vaccination and should be considered as an essential measure of pregnancy care. Also, a good level of knowledge of the influenza vaccine is another important factor in influenza vaccine uptake. In this regard, enhancing awareness of vaccine safety and effectiveness improves vaccination coverage among pregnant women. These findings suggest that influenza vaccination is a component of antenatal care services that should be considered by healthcare providers.

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### Footnotes

**Authors' Contribution:** Study concept and design: Ali Khalooei, Mehran Nakhaeizadeh, and Sulmaz Bahar; analysis and interpretation of data: Ali Khalooei and Mehran Nakhaeizadeh; drafting of the manuscript: Ali Khalooei, Mehran Nakhaeizadeh, and Sulmaz Bahar; critical revision of the manuscript for important intellectual content: Ali Khalooei and Mehran Nakhaeizadeh; statistical analysis: Ali Khalooei and Mehran Nakhaeizadeh.

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### References

1. Carrillo-Santistev P, Ciancio BC, Nicoll A, Lopalco PL. The importance of influenza prevention for public health. *Hum Vaccin Immunother*. 2012;**8**(1):89-95. doi: [10.4161/hv.8.1.19066](https://doi.org/10.4161/hv.8.1.19066). [PubMed: [22251992](https://pubmed.ncbi.nlm.nih.gov/22251992/)].
2. Mertz D, Lo CK, Lytvyn L, Ortiz JR, Loeb M, Flurisk I. Pregnancy as a risk factor for severe influenza infection: an individual participant data meta-analysis. *BMC Infect Dis*. 2019;**19**(1):683. doi: [10.1186/s12879-019-4318-3](https://doi.org/10.1186/s12879-019-4318-3). [PubMed: [31375073](https://pubmed.ncbi.nlm.nih.gov/31375073/)]. [PubMed Central: [PMC6679491](https://pubmed.ncbi.nlm.nih.gov/PMC6679491/)].
3. Yudin MH. Risk management of seasonal influenza during pregnancy: current perspectives. *Int J Womens Health*. 2014;**6**:681-9. doi: [10.2147/IJWH.S47235](https://doi.org/10.2147/IJWH.S47235). [PubMed: [25114593](https://pubmed.ncbi.nlm.nih.gov/25114593/)]. [PubMed Central: [PMC4122531](https://pubmed.ncbi.nlm.nih.gov/PMC4122531/)].
4. Eppes C, Wu A, You W, Cameron KA, Garcia P, Grobman W. Barriers to influenza vaccination among pregnant women. *Vaccine*. 2013;**31**(27):2874-8. doi: [10.1016/j.vaccine.2013.04.031](https://doi.org/10.1016/j.vaccine.2013.04.031). [PubMed: [23623863](https://pubmed.ncbi.nlm.nih.gov/23623863/)].
5. Fell DB, Azziz-Baumgartner E, Baker MG, Batra M, Beaute J, Beutels P, et al. Influenza epidemiology and immunization during pregnancy: Final report of a World Health Organization working group. *Vaccine*. 2017;**35**(43):5738-50. doi: [10.1016/j.vaccine.2017.08.037](https://doi.org/10.1016/j.vaccine.2017.08.037). [PubMed: [28867508](https://pubmed.ncbi.nlm.nih.gov/28867508/)].
6. Nayak S. Influenza Vaccine Requirements in Pregnant Women. *J Obstet Gynaecol India*. 2016;**66**(2):76-80. doi: [10.1007/s13224-016-0867-1](https://doi.org/10.1007/s13224-016-0867-1). [PubMed: [27046959](https://pubmed.ncbi.nlm.nih.gov/27046959/)]. [PubMed Central: [PMC4818833](https://pubmed.ncbi.nlm.nih.gov/PMC4818833/)].
7. O'Grady KA, Dunbar M, Medlin LG, Hall KK, Toombs M, Meiklejohn J, et al. Uptake of influenza vaccination in pregnancy amongst Australian Aboriginal and Torres Strait Islander women: a mixed-methods pilot study. *BMC Res Notes*. 2015;**8**:169. doi: [10.1186/s13104-015-1147-3](https://doi.org/10.1186/s13104-015-1147-3). [PubMed: [25928130](https://pubmed.ncbi.nlm.nih.gov/25928130/)]. [PubMed Central: [PMC4423150](https://pubmed.ncbi.nlm.nih.gov/PMC4423150/)].

8. World Health Organization. *How to implement influenza vaccination of pregnant women: An introduction manual for national immunization programme managers and policy makers*. WHO; 2016.
9. Hirve S; World Health Organization. *Seasonal influenza vaccine use in low and middle income countries in the tropics and subtropics: a systematic review*. WHO; 2015.
10. Henninger ML, Irving SA, Thompson M, Avalos LA, Ball SW, Shiflett P, et al. Factors associated with seasonal influenza vaccination in pregnant women. *J Womens Health (Larchmt)*. 2015;**24**(5):394-402. doi: [10.1089/jwh.2014.5105](https://doi.org/10.1089/jwh.2014.5105). [PubMed: [25874550](https://pubmed.ncbi.nlm.nih.gov/25874550/)]. [PubMed Central: [PMC4441002](https://pubmed.ncbi.nlm.nih.gov/PMC4441002/)].
11. Barrett T, McEntee E, Drew R, O'Reilly F, O'Carroll A, O'Shea A, et al. Influenza vaccination in pregnancy: vaccine uptake, maternal and healthcare providers' knowledge and attitudes. A quantitative study. *BJGP Open*. 2018;**2**(3):bjgpopen18X101599. doi: [10.3399/bjgpopen18X101599](https://doi.org/10.3399/bjgpopen18X101599). [PubMed: [30564732](https://pubmed.ncbi.nlm.nih.gov/30564732/)]. [PubMed Central: [PMC6189777](https://pubmed.ncbi.nlm.nih.gov/PMC6189777/)].
12. Taksdal SE, Mak DB, Joyce S, Tomlin S, Carcione D, Armstrong PK, et al. Predictors of uptake of influenza vaccination—a survey of pregnant women in Western Australia. *Aust Fam Physician*. 2013;**42**(8):582-6. [PubMed: [23971070](https://pubmed.ncbi.nlm.nih.gov/23971070/)].
13. Yuen CY, Tarrant M. Determinants of uptake of influenza vaccination among pregnant women - a systematic review. *Vaccine*. 2014;**32**(36):4602-13. doi: [10.1016/j.vaccine.2014.06.067](https://doi.org/10.1016/j.vaccine.2014.06.067). [PubMed: [24996123](https://pubmed.ncbi.nlm.nih.gov/24996123/)].
14. Zaraket H, Melhem N, Malik M, Khan WM, Dbaibo G, Abubakar A. Review of seasonal influenza vaccination in the Eastern Mediterranean Region: Policies, use and barriers. *J Infect Public Health*. 2019;**12**(4):472-8. doi: [10.1016/j.jiph.2018.10.009](https://doi.org/10.1016/j.jiph.2018.10.009). [PubMed: [30446255](https://pubmed.ncbi.nlm.nih.gov/30446255/)].
15. Honarvar B, Odoomi N, Mahmoodi M, Kashkoli GS, Khavandegaran F, Bagheri Lankarani K, et al. Acceptance and rejection of influenza vaccination by pregnant women in southern Iran: physicians' role and barriers. *Hum Vaccin Immunother*. 2012;**8**(12):1860-6. doi: [10.4161/hv.22008](https://doi.org/10.4161/hv.22008). [PubMed: [23032162](https://pubmed.ncbi.nlm.nih.gov/23032162/)]. [PubMed Central: [PMC3656077](https://pubmed.ncbi.nlm.nih.gov/PMC3656077/)].
16. Abasi E, Tahmasebi H, Tofighi M, Zafari M. Knowledge and practice about influenza vaccination and compliance with influenza immunization among pregnant women in Sari, 2013. *JNMS*. 2015;**2**(3):25-31. doi: [10.7508/jnms.2015.03.004](https://doi.org/10.7508/jnms.2015.03.004).
17. Shavell VI, Moniz MH, Gonik B, Beigi RH. Influenza immunization in pregnancy: overcoming patient and health care provider barriers. *Am J Obstet Gynecol*. 2012;**207**(3 Suppl):S67-74. doi: [10.1016/j.ajog.2012.06.077](https://doi.org/10.1016/j.ajog.2012.06.077). [PubMed: [22920063](https://pubmed.ncbi.nlm.nih.gov/22920063/)].
18. Vila-Candel R, Navarro-Illana P, Navarro-Illana E, Castro-Sanchez E, Duke K, Soriano-Vidal FJ, et al. Determinants of seasonal influenza vaccination in pregnant women in Valencia, Spain. *BMC Public Health*. 2016;**16**(1):1173. doi: [10.1186/s12889-016-3823-1](https://doi.org/10.1186/s12889-016-3823-1). [PubMed: [27871262](https://pubmed.ncbi.nlm.nih.gov/27871262/)]. [PubMed Central: [PMC5117491](https://pubmed.ncbi.nlm.nih.gov/PMC5117491/)].
19. Yudin MH, Salaripour M, Sgro MD. Pregnant Women's Knowledge of Influenza and the Use and Safety of the Influenza Vaccine During Pregnancy. *Journal of Obstetrics and Gynaecology Canada*. 2009;**31**(2):120-5. doi: [10.1016/s1701-2163\(16\)34095-6](https://doi.org/10.1016/s1701-2163(16)34095-6).
20. AlMusailhi SA, AlShehri NM, AlHarbi WM. Knowledge, utilization and barriers of pregnant women to influenza vaccine in primary health care centers in Dammam and Al Khobar, Saudi Arabia, 2017-2018. *Int J Womens Health*. 2019;**11**:207-11. doi: [10.2147/IJWH.S194061](https://doi.org/10.2147/IJWH.S194061). [PubMed: [30988642](https://pubmed.ncbi.nlm.nih.gov/30988642/)]. [PubMed Central: [PMC6440453](https://pubmed.ncbi.nlm.nih.gov/PMC6440453/)].
21. Ozer A, Arikian DC, Kirecci E, Ekerbicer HC. Status of pandemic influenza vaccination and factors affecting it in pregnant women in Kahramanmaraş, an eastern Mediterranean city of Turkey. *PLoS One*. 2010;**5**(12): e14177. doi: [10.1371/journal.pone.0014177](https://doi.org/10.1371/journal.pone.0014177). [PubMed: [21152073](https://pubmed.ncbi.nlm.nih.gov/21152073/)]. [PubMed Central: [PMC2995732](https://pubmed.ncbi.nlm.nih.gov/PMC2995732/)].
22. Blanchard-Rohner G, Meier S, Ryser J, Schaller D, Combescuré C, Yudin MH, et al. Acceptability of maternal immunization against influenza: the critical role of obstetricians. *J Matern Fetal Neonatal Med*. 2012;**25**(9):1800-9. doi: [10.3109/14767058.2012.663835](https://doi.org/10.3109/14767058.2012.663835). [PubMed: [23399083](https://pubmed.ncbi.nlm.nih.gov/23399083/)].
23. Yuet Sheung Yuen C, Yee Tak Fong D, Lai Yin Lee I, Chu S, Sau-mei Siu E, Tarrant M. Prevalence and predictors of maternal seasonal influenza vaccination in Hong Kong. *Vaccine*. 2013;**31**(45):5281-8. doi: [10.1016/j.vaccine.2013.08.063](https://doi.org/10.1016/j.vaccine.2013.08.063). [PubMed: [24016814](https://pubmed.ncbi.nlm.nih.gov/24016814/)].
24. Drees M, Johnson O, Wong E, Stewart A, Ferisin S, Silverman PR, et al. Acceptance of 2009 H1N1 influenza vaccine among pregnant women in Delaware. *Am J Perinatol*. 2012;**29**(4):289-94. doi: [10.1055/s-0031-1295660](https://doi.org/10.1055/s-0031-1295660). [PubMed: [22147638](https://pubmed.ncbi.nlm.nih.gov/22147638/)].
25. Goldfarb I, Panda B, Wylie B, Riley L. Uptake of influenza vaccine in pregnant women during the 2009 H1N1 influenza pandemic. *Am J Obstet Gynecol*. 2011;**204**(6 Suppl 1):S112-5. doi: [10.1016/j.ajog.2011.01.007](https://doi.org/10.1016/j.ajog.2011.01.007). [PubMed: [21345408](https://pubmed.ncbi.nlm.nih.gov/21345408/)].
26. Fabry P, Gagneur A, Pasquier JC. Determinants of A (H1N1) vaccination: cross-sectional study in a population of pregnant women in Quebec. *Vaccine*. 2011;**29**(9):1824-9. doi: [10.1016/j.vaccine.2010.12.109](https://doi.org/10.1016/j.vaccine.2010.12.109). [PubMed: [21219988](https://pubmed.ncbi.nlm.nih.gov/21219988/)].
27. Sim JA, Ulanika AA, Katikireddi SV, Gorman D. 'Out of two bad choices, I took the slightly better one': vaccination dilemmas for Scottish and Polish migrant women during the H1N1 influenza pandemic. *Public Health*. 2011;**125**(8):505-11. doi: [10.1016/j.puhe.2011.05.005](https://doi.org/10.1016/j.puhe.2011.05.005). [PubMed: [21802701](https://pubmed.ncbi.nlm.nih.gov/21802701/)].
28. Maher L, Hope K, Torvaldsen S, Lawrence G, Dawson A, Wiley K, et al. Influenza vaccination during pregnancy: coverage rates and influencing factors in two urban districts in Sydney. *Vaccine*. 2013;**31**(47):5557-64. doi: [10.1016/j.vaccine.2013.08.081](https://doi.org/10.1016/j.vaccine.2013.08.081). [PubMed: [24076176](https://pubmed.ncbi.nlm.nih.gov/24076176/)].
29. Chandra S, Mohammadnezhad M, Ward P. Trust and Communication in a Doctor-Patient Relationship: A Literature Review. *Journal of Healthcare Communications*. 2018;**3**(3). doi: [10.4172/2472-1654.100146](https://doi.org/10.4172/2472-1654.100146).
30. Benrazavy L, Khalooei A. Medication Adherence and its Predictors in Type 2 Diabetic Patients Referring to Urban Primary Health Care Centers in Kerman City, Southeastern Iran. *Shiraz E-Medical Journal*. 2019;**20**(7). doi: [10.5812/semj.84746](https://doi.org/10.5812/semj.84746).
31. Mohammed H, Clarke M, Koehler A, Watson M, Marshall H. Factors associated with uptake of influenza and pertussis vaccines among pregnant women in South Australia. *PLoS One*. 2018;**13**(6): e0197867. doi: [10.1371/journal.pone.0197867](https://doi.org/10.1371/journal.pone.0197867). [PubMed: [29902184](https://pubmed.ncbi.nlm.nih.gov/29902184/)]. [PubMed Central: [PMC6002099](https://pubmed.ncbi.nlm.nih.gov/PMC6002099/)].
32. Ditsungnoen D, Greenbaum A, Praphasiri P, Dawood FS, Thompson MG, Yoocharoen P, et al. Knowledge, attitudes and beliefs related to seasonal influenza vaccine among pregnant women in Thailand. *Vaccine*. 2016;**34**(18):2141-6. doi: [10.1016/j.vaccine.2016.01.056](https://doi.org/10.1016/j.vaccine.2016.01.056). [PubMed: [26854910](https://pubmed.ncbi.nlm.nih.gov/26854910/)]. [PubMed Central: [PMC4811693](https://pubmed.ncbi.nlm.nih.gov/PMC4811693/)].
33. Prospero E, Galmozzi S, Paris V, Felici G, Barbadoro P, D'Alleva A, et al. Factors influencing refusing of flu vaccination among pregnant women in Italy: Healthcare workers' role. *Influenza Other Respir Viruses*. 2019;**13**(2):201-7. doi: [10.1111/irv.12600](https://doi.org/10.1111/irv.12600). [PubMed: [30099856](https://pubmed.ncbi.nlm.nih.gov/30099856/)]. [PubMed Central: [PMC6379633](https://pubmed.ncbi.nlm.nih.gov/PMC6379633/)].
34. Frew PM, Owens LE, Saint-Victor DS, Benedict S, Zhang S, Omer SB. Factors associated with maternal influenza immunization decision-making. Evidence of immunization history and message framing effects. *Hum Vaccin Immunother*. 2014;**10**(9):2576-83. doi: [10.4161/hv.32248](https://doi.org/10.4161/hv.32248). [PubMed: [25483468](https://pubmed.ncbi.nlm.nih.gov/25483468/)]. [PubMed Central: [PMC4977431](https://pubmed.ncbi.nlm.nih.gov/PMC4977431/)].
35. Offeddu V, Tam CC, Yong TT, Tan LK, Thoon KC, Lee N, et al. Coverage and determinants of influenza vaccine among pregnant women: a cross-sectional study. *BMC Public Health*. 2019;**19**(1):890. doi: [10.1186/s12889-019-7172-8](https://doi.org/10.1186/s12889-019-7172-8). [PubMed: [31277611](https://pubmed.ncbi.nlm.nih.gov/31277611/)]. [PubMed Central: [PMC6612156](https://pubmed.ncbi.nlm.nih.gov/PMC6612156/)].